### Course Standards

<table>
<thead>
<tr>
<th>Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>SC.K.E.5.1</td>
<td>Explore the Law of Gravity by investigating how objects are pulled toward the ground unless something holds them up.</td>
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<td>SC.K.E.5.2</td>
<td>Recognize the repeating pattern of day and night.</td>
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<td>SC.K.E.5.5</td>
<td>Observe that things can be big and things can be small as seen from Earth.</td>
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<td>SC.K.L.14.1</td>
<td>Recognize the five senses and related body parts.</td>
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<td>SC.K.L.14.3</td>
<td>Observe plants and animals, describe how they are alike and how they are different in the way they look and in the things they do.</td>
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<td>SC.K.N.1.1</td>
<td>Collaborate with a partner to collect information.</td>
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<td>SC.K.N.1.2</td>
<td>Make observations of the natural world and know that they are descriptors collected using the five senses.</td>
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<td>SC.K.N.1.3</td>
<td>Keep records as appropriate -- such as pictorial records -- of investigations conducted.</td>
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<td>SC.K.N.1.4</td>
<td>Observe and create a visual representation of an object which includes its major features.</td>
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<td>SC.K.N.1.5</td>
<td>Recognize that learning can come from careful observation.</td>
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<tr>
<td>SC.K.P.8.1</td>
<td>Sort objects by observable properties, such as size, shape, color, temperature (hot or cold), weight (heavy or light) and texture.</td>
</tr>
<tr>
<td>SC.K.P.9.1</td>
<td>Recognize that the shape of materials such as paper and clay can be changed by cutting, tearing, crumpling, smashing, or rolling.</td>
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<td>SC.K.P.10.1</td>
<td>Observe that things that make sound vibrate.</td>
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<tr>
<td>SC.K.P.12.1</td>
<td>Investigate that things move in different ways, such as fast, slow, etc.</td>
</tr>
<tr>
<td>SC.K.P.13.1</td>
<td>Observe that a push or a pull can change the way an object is moving.</td>
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<tr>
<td>MAFS.K.MD.1.2</td>
<td>Directly compare two objects with a measurable attribute in common, to see which object has “more of”/“less of” the attribute, and describe the difference. For example, directly compare the heights of two children and describe one child as taller/shorter.</td>
</tr>
<tr>
<td>MAFS.K.MD.2.3</td>
<td>Classify objects into given categories; count the numbers of objects in each category and sort the categories by count.</td>
</tr>
</tbody>
</table>

**Make sense of problems and persevere in solving them.**

Mathematically proficient students start by explaining to themselves the meaning of a problem and looking for entry points to its solution. They analyze givens, constraints, relationships, and goals. They make conjectures about the form and meaning of the solution and plan a solution pathway rather than simply jumping into a solution attempt. They consider analogous problems, and try special cases and simpler forms of the original problem in order to gain insight into its solution. They monitor and evaluate their progress and change course if necessary. Older students might, depending on the context of the problem, transform algebraic expressions or change the viewing window on their graphing calculator to get the information they need. Mathematically proficient students can explain correspondences between equations, verbal descriptions, tables, and graphs or draw diagrams of important features and relationships, graph data, and search for regularity or trends. Younger students might rely on using concrete objects or pictures to help conceptualize and solve a problem. Mathematically proficient students check their answers to problems using different methods, and they continually ask themselves, “Does this make sense?” They can understand the approaches of others to solving complex problems and identify correspondences between different approaches.

**Standard Relation to Course:** Supporting

**Reason abstractly and quantitatively.**

Mathematically proficient students make sense of quantities and their relationships in problem situations. They bring two complementary abilities to bear on problems involving quantitative relationships: the ability to contextualize—to abstract a given situation and represent it symbolically and manipulate the representing symbols as if they have a life of their own, without necessarily attending to their referents—and the ability to decontextualize, to pause as needed during the manipulation process in order to probe into the referents for the symbols involved. Quantitative reasoning entails habits of creating a coherent representation of the problem at hand; considering the units involved; attending to the meaning of quantities, not just how to compute them; and knowing and flexibly using different properties of operations and objects.

**Standard Relation to Course:** Supporting

**Construct viable arguments and critique the reasoning of others.**

Mathematically proficient students understand and use stated assumptions, definitions, and previously established results in constructing arguments. They make conjectures and build a logical progression of statements to explore the truth of their conjectures. They are able to analyze situations by breaking them into cases, and can recognize and use counterexamples. They justify their conclusions, communicate them to others, and respond to the arguments of others. They reason inductively about data, making plausible arguments that take into account the context from which the data arose. Mathematically proficient students are also able to compare the effectiveness of two plausible arguments, distinguish correct logic or reasoning from that which is flawed, and—if there is a flaw in an argument—explain what is it. Elementary students can construct arguments using concrete referents such as objects, drawings, diagrams, and actions. Such arguments can make sense and be correct, even though they are not generalized or made formal until later grades. Later, students learn to determine domains to which an argument applies. Students at all grades can listen or read the arguments of others, decide whether they make sense, and ask useful questions to clarify or improve the arguments.

**Standard Relation to Course:** Supporting

**Model with mathematics.**

Mathematically proficient students can apply the mathematics they know to solve problems arising in everyday life, society, and the workplace. In early grades, this might be as simple as writing an addition equation to describe a situation. In middle grades, a student might apply proportional reasoning to plan a school event or analyze a problem in the community. By high school, a student might use geometry to solve a design problem or use a function to describe how one quantity of interest depends on another. Mathematically proficient students who can apply what they know are comfortable making assumptions and approximations to simplify a complicated situation, realizing that these may need revision later. They are
able to identify important quantities in a practical situation and map their relationships using such tools as diagrams, two-way tables, graphs, flowcharts and formulas. They can analyze those relationships mathematically to draw conclusions. They routinely interpret their mathematical results in the context of the situation and reflect on whether the results make sense, possibly improving the model if it has not served its purpose.

**Standard Relation to Course: Supporting**

**Use appropriate tools strategically.**

Mathematically proficient students consider the available tools when solving a mathematical problem. These tools might include pencil and paper, concrete models, a ruler, a protractor, a calculator, a spreadsheet, a computer algebra system, a statistical package, or dynamic geometry software. Proficient students are sufficiently familiar with tools appropriate for their grade or course to make sound decisions about when each of these tools might be helpful, recognizing both the insight to be gained and their limitations. For example, mathematically proficient high school students analyze graphs of functions and solutions generated using a graphing calculator. They detect possible errors by strategically using estimation and other mathematical knowledge. When making mathematical models, they know that technology can enable them to visualize the results of varying assumptions, explore consequences, and compare predictions with data. Mathematically proficient students at various grade levels are able to identify relevant external mathematical resources, such as digital content located on a website, and use them to pose or solve problems. They are able to use technological tools to explore and deepen their understanding of concepts.

**Standard Relation to Course: Supporting**

**Attend to precision.**

Mathematically proficient students try to communicate precisely to others. They try to use clear definitions in discussion with others and in their own reasoning. They state the meaning of the symbols they choose, including using the equal sign consistently and appropriately. They are careful about specifying units of measure, and labeling axes to clarify the correspondence with quantities in a problem. They calculate accurately and efficiently, express numerical answers with a degree of precision appropriate for the problem context. In the elementary grades, students give carefully formulated explanations to each other. By the time they reach high school they have learned to examine claims and make explicit use of definitions.

**Standard Relation to Course: Supporting**

**Look for and make use of structure.**

Mathematically proficient students look closely to discern a pattern or structure. Young students, for example, might notice that three and seven more is the same amount as seven and three more, or they may sort a collection of shapes according to how many sides the shapes have. Later, students will see 7 × 8 equals the well remembered 5 × 7 + 7, in preparation for learning about the distributive property. In the expression x² + 9x + 14, older students can see the 14 as 2 × 7 and the 9 as 2 + 7. They recognize the significance of an existing line in a geometric figure and can use the strategy of drawing an auxiliary line for solving problems. They also can step back for an overview and shift perspective. They can see complicated things, such as some algebraic expressions, as single objects or as being composed of several objects. For example, they can see 5 – 3(x – y)² as 5 minus a positive number times a square and use that to realize that its value cannot be more than 5 for any real numbers x and y.

**Standard Relation to Course: Supporting**

**Look for and express regularity in repeated reasoning.**

Mathematically proficient students notice if calculations are repeated, and look both for general methods and for shortcuts. Upper elementary students might notice when dividing 25 by 11 that they are repeating the same calculations over and over again, and conclude they have a repeating decimal. By paying attention to the calculation of slope as they repeatedly check whether points are on the line through (1, 2) with slope 3, middle school students might abstract the equation (y – 2)/(x – 1) = 3. Noticing the regularity in the way terms cancel when expanding (x – 1)(x² + x + 1), (x – 1)(x³ + x² + x + 1), and (x – 1)(x⁴ + x³ + x² + x + 1) might lead them to the general formula for the sum of a geometric series. As they work to solve a problem, mathematically proficient students maintain oversight of the process, while attending to the details. They continually evaluate the reasonableness of their intermediate results.

**Standard Relation to Course: Supporting**

**Participate in collaborative conversations with diverse partners about kindergarten topics and texts with peers in small and larger groups.**

- Follow agreed-upon rules for discussions (e.g., listening to others and taking turns speaking about the topics and texts under discussion).
- Continue a conversation through multiple exchanges.

**Standard Relation to Course: Supporting**

**With prompting and support, recall information from experiences or gather information from provided sources to answer a question.**

**Special Notes:**

**Instructional Practices**

Teaching from a range of complex text is optimized when teachers in all subject areas implement the following strategies on a routine basis:

1. Ensuring wide reading from complex text that varies in length.
2. Making close reading and rereading of texts central to lessons.
3. Emphasizing text-specific complex questions, and cognitively complex tasks, reinforce focus on the text and cultivate independence.

**General Course Information and Notes**
4. Emphasizing students supporting answers based upon evidence from the text.
5. Providing extensive research and writing opportunities (claims and evidence).

**Science and Engineering Practices** (NRC Framework for K-12 Science Education, 2010)

- Asking questions (for science) and defining problems (for engineering).
- Developing and using models.
- Planning and carrying out investigations.
- Analyzing and interpreting data.
- Using mathematics, information and computer technology, and computational thinking.
- Constructing explanations (for science) and designing solutions (for engineering).
- Engaging in argument from evidence.
- Obtaining, evaluating, and communicating information.

**English Language Development ELD Standards Special Notes Section:**

Teachers are required to provide listening, speaking, reading and writing instruction that allows English language learners (ELL) to communicate information, ideas and concepts for academic success in the content area of Science. For the given level of English language proficiency and with visual, graphic, or interactive support, students will interact with grade level words, expressions, sentences and discourse to process or produce language necessary for academic success. The ELD standard should specify a relevant content area concept or topic of study chosen by curriculum developers and teachers which maximizes an ELL's need for communication and social skills. To access an ELL supporting document which delineates performance definitions and descriptors, please click on the following link: https://cpalmsmediaprod.blob.core.windows.net/uploads/docs/standards/eld/sc.pdf

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**GENERAL INFORMATION**

**Course Number:** 5020010

**Course Path:** Section: Grades PreK to 12 Education
Courses > **Grade Group:** Grades PreK to 5 Education
Courses > **Subject:** Science > **SubSubject:** General Sciences

**Abbreviated Title:** SCIENCE GRADE K

**Course Length:** Year (Y)

**Course Attributes:**
- Class Size Core Required

**Course Type:** Core Academic Course

**Course Status:** Course Approved

**Grade Level(s):** K

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**Educator Certifications**

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<tr>
<td>Prekindergarten/Primary Education (Age 3 through Grade 3)</td>
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<tr>
<td>Early Childhood Education (Early Childhood)</td>
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#### Clarifications:

**Teachers who encourage students to participate actively in effortful learning both individually and with others:**
- Analyze the problem in a way that makes sense given the task.
- Ask questions that will help with solving the task.
- Build perseverance by modifying methods as needed while solving a challenging task.
- Stay engaged and maintain a positive mindset when working to solve tasks.
- Help and support each other when attempting a new method or approach.

**Mathematicians who participate in effortful learning both individually and with others:**
- Demonstrate understanding by representing problems in multiple ways.
- Mathematicians who demonstrate understanding by representing problems in multiple ways:
  - Build understanding through modeling and using manipulatives.
  - Represent solutions to problems in multiple ways using objects, drawings, tables, graphs and equations.
  - Progress from modeling problems with objects and drawings to using algorithms and equations.
  - Express connections between concepts and representations.
  - Choose a representation based on the given context or purpose.

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**Mathematicians who complete tasks with mathematical fluency:**
- Complete tasks with mathematical fluency:
  - Select efficient and appropriate methods for solving problems within the given context.
  - Maintain flexibility and accuracy while performing procedures and mental calculations.
  - Complete tasks accurately and with confidence.
  - Adapt procedures to apply them to a new context.
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Communicate mathematical ideas, vocabulary and methods effectively.
Analyze the mathematical thinking of others.
Compare the efficiency of a method to those expressed by others.
Recognize errors and suggest how to correctly solve the task.
Justify results by explaining methods and processes.
Construct possible arguments based on evidence.

Clarifications:
Teachers who encourage students to engage in discussions that reflect on the mathematical thinking of self and others:
- Establish a culture in which students ask questions of the teacher and their peers, and error is an opportunity for learning.
- Create opportunities for students to discuss their thinking with peers.
- Select, sequence and present student work to advance and deepen understanding of correct and increasingly efficient methods.
- Develop students’ ability to justify methods and compare their responses to the responses of their peers.

Use patterns and structure to help understand and connect mathematical concepts.
Mathematicians who use patterns and structure to help understand and connect mathematical concepts:
- Focus on relevant details within a problem.
- Create plans and procedures to logically order events, steps or ideas to solve problems.
- Decompose a complex problem into manageable parts.
- Relate previously learned concepts to new concepts.
- Look for similarities among problems.
- Connect solutions of problems to more complicated large-scale situations.

Clarifications:
Teachers who encourage students to use patterns and structure to help understand and connect mathematical concepts:
- Help students recognize the patterns in the world around them and connect these patterns to mathematical concepts.
- Support students to develop generalizations based on the similarities found among problems.
- Provide opportunities for students to create plans and procedures to solve problems.
- Develop students’ ability to construct relationships between their current understanding and more sophisticated ways of thinking.

Assess the reasonableness of solutions.
Mathematicians who assess the reasonableness of solutions:
- Estimate to discover possible solutions.
- Use benchmark quantities to determine if a solution makes sense.
- Check calculations when solving problems.
- Verify possible solutions by explaining the methods used.
- Evaluate results based on the given context.

Clarifications:
Teachers who encourage students to assess the reasonableness of solutions:
- Have students estimate or predict solutions prior to solving.
- Prompt students to continually ask, “Does this solution make sense? How do you know?”
- Reinforce that students check their work as they progress within and after a task.
- Strengthen students’ ability to verify solutions through justifications.

Apply mathematics to real-world contexts.
Mathematicians who apply mathematics to real-world contexts:
- Connect mathematical concepts to everyday experiences.
- Use models and methods to understand, represent and solve problems.
- Perform investigations to gather data or determine if a method is appropriate.
- Redesign models and methods to improve accuracy or efficiency.

Clarifications:
Teachers who encourage students to apply mathematics to real-world contexts:
- Provide opportunities for students to create models, both concrete and abstract, and perform investigations.
- Challenge students to question the accuracy of their models and methods.
- Support students as they validate conclusions by comparing them to the given situation.
- Indicate how various concepts can be applied to other disciplines.

Cite evidence to explain and justify reasoning.

Clarifications:
K-3 Students include textual evidence in their oral communication with guidance and support from adults. The evidence can consist of details from the text without naming the text. During 1st grade, students learn how to incorporate the evidence in their writing.
2-3 Students include relevant textual evidence in their written and oral communication. Students should name the text when they refer to it. In 3rd grade, students should use a combination of direct and indirect citations.
4-5 Students continue with previous skills and reference comments made by speakers and peers. Students cite texts that they’ve directly quoted, paraphrased, or used for information. When writing, students will use the form of citation dictated by the instructor or the style guide referenced by the instructor.
6-8 Students continue with previous skills and use a style guide to create a proper citation.
9-12 Students continue with previous skills and should be aware of existing style guides and the ways in which they differ.

Read and comprehend grade-level complex texts proficiently.

Clarifications:
<table>
<thead>
<tr>
<th>ELA.K12.EE.3.1:</th>
<th>Make inferences to support comprehension.</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Clarifications:</strong></td>
<td>Students will make inferences before the words infer or inference are introduced. Kindergarten students will answer questions like “Why is the girl smiling?” or make predictions about what will happen based on the title page. Students will use the terms and apply them in 2nd grade and beyond.</td>
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<table>
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<tr>
<th>ELA.K12.EE.4.1:</th>
<th>Use appropriate collaborative techniques and active listening skills when engaging in discussions in a variety of situations.</th>
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<tbody>
<tr>
<td><strong>Clarifications:</strong></td>
<td>In kindergarten, students learn to listen to one another respectfully. In grades 1-2, students build upon these skills by justifying what they are thinking. For example: “I think _____ because ______.” The collaborative conversations are becoming academic conversations. In grades 3-12, students engage in academic conversations discussing claims and justifying their reasoning, refining and applying skills. Students build on ideas, propel the conversation, and support claims and counterclaims with evidence.</td>
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<tr>
<th>ELA.K12.EE.5.1:</th>
<th>Use the accepted rules governing a specific format to create quality work.</th>
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<tr>
<td><strong>Clarifications:</strong></td>
<td>Students will incorporate skills learned into work products to produce quality work. For students to incorporate these skills appropriately, they must receive instruction. A 3rd grade student creating a poster board display must have instruction in how to effectively present information to do quality work.</td>
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<tr>
<th>ELA.K12.EE.6.1:</th>
<th>Use appropriate voice and tone when speaking or writing.</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Clarifications:</strong></td>
<td>In kindergarten and 1st grade, students learn the difference between formal and informal language. For example, the way we talk to our friends differs from the way we speak to our parents. In 2nd grade and beyond, students practice appropriate social and academic language to discuss texts.</td>
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<tr>
<th>ELD.K12.ELL.SC.1:</th>
<th>English language learners communicate information, ideas and concepts necessary for academic success in the content area of Science.</th>
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<td><strong>Clarifications:</strong></td>
<td>Recognize there are body parts inside and outside of the body.</td>
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<td>ELD.K12.ELL.SI.1:</td>
<td>English language learners communicate for social and instructional purposes within the school setting.</td>
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<tr>
<td><strong>Clarifications:</strong></td>
<td>Brain, muscles, and skin.</td>
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**General Course Information and Notes**

**GENERAL NOTES**

**Special Notes:**

**Instructional Practices**
Teaching from a range of complex text is optimized when teachers in all subject areas implement the following strategies on a routine basis:

1. Ensuring wide reading from complex text that varies in length.
2. Making close reading of texts central to lessons.
3. Emphasizing text-specific complex questions, and cognitively complex tasks, reinforce focus on the text and cultivate independence.
4. Emphasizing students supporting answers based upon evidence from the text.
5. Providing extensive research and writing opportunities (claims and evidence).

**Science and Engineering Practices** *(NRC Framework for K-12 Science Education, 2010)*

- Asking questions (for science) and defining problems (for engineering).
- Developing and using models.
- Planning and carrying out investigations.
- Analyzing and interpreting data.
- Using mathematics, information and computer technology, and computational thinking.
- Constructing explanations (for science) and designing solutions (for engineering).
- Engaging in argument from evidence.
- Obtaining, evaluating, and communicating information.

**Florida's Benchmarks for Excellent Student Thinking (B.E.S.T.) Standards**

This course includes Florida’s B.E.S.T. ELA Expectations (EE) and Mathematical Thinking and Reasoning Standards (MTRs) for students. Florida educators should intentionally embed these standards within the content and their instruction as applicable. For guidance on the implementation of the EE and MTRs, please visit https://www.cpalms.org/Standards/BEST_Standards.aspx and select the appropriate B.E.S.T. Standards package.

**English Language Development ELD Standards Special Notes Section:**

Teachers are required to provide listening, speaking, reading and writing instruction that allows English language learners (ELL) to communicate information, ideas and concepts for academic success in the content area of Science. For the given level of English language proficiency and with visual, graphic, or interactive support, students will interact with grade level words, expressions, sentences and discourse to process or produce language necessary for academic success. The ELD standard should specify a relevant content area concept or topic of study chosen by curriculum developers and teachers which maximizes an ELL’s need for communication and social skills.

To access an ELL supporting document which delineates performance definitions and descriptors, please click on the following link: https://cpalmsmediaprod.blob.core.windows.net/uploads/docs/standards/eld/sc.pdf
Educator Certifications

Primary Education (K-3)
Prekindergarten/Primary Education (Age 3 through Grade 3)
Early Childhood Education (Early Childhood)
Elementary Education (Elementary Grades 1-6)
Elementary Education (Grades K-6)
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<td>Using the five senses as tools, make careful observations, describe objects in terms of number, shape, texture, size, weight, color, and motion, and compare their observations with others.</td>
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<td>Ask “how do you know?” in appropriate situations.</td>
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<td>Understand how to use a ruler to measure length to the nearest inch.</td>
</tr>
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<td>Recognize that the ruler is a tool that can be used to measure the attribute of length.</td>
</tr>
<tr>
<td>b.</td>
<td>Understand the importance of the zero point and end point and that the length measure is the span between two points.</td>
</tr>
<tr>
<td>c.</td>
<td>Recognize that the units marked on a ruler have equal length intervals and fit together with no gaps or overlaps. These equal interval distances can be counted to determine the overall length of an object.</td>
</tr>
<tr>
<td>MAFS.1.MD.3.4.</td>
<td>Organize, represent, and interpret data with up to three categories; ask and answer questions about the total number of data points, how many in each category, and how many more or less are in one category than in another.</td>
</tr>
</tbody>
</table>

**Make sense of problems and persevere in solving them.**

Mathematically proficient students start by explaining to themselves the meaning of a problem and looking for entry points to its solution. They analyze givens, constraints, relationships, and goals. They make conjectures about the form and meaning of the solution and plan a solution pathway rather than simply jumping into a solution attempt. They consider analogous problems and try special cases and simpler forms of the original problem in order to gain insight into its solution. They monitor and evaluate their progress and change course if necessary. Older students might, depending on the context of the problem, transform algebraic expressions or change the viewing window on their graphing calculator to get the information they need. Mathematically proficient students can explain correspondences between equations, verbal descriptions, tables, and graphs or draw diagrams of important features and relationships, graph data, and search for regularity or trends. Younger students might rely on using concrete objects or pictures to help conceptualize and solve a problem. Mathematically proficient students check their answers to problems using a different method, and they continually ask themselves, “Does this make sense?” They can understand the approaches of others to solving complex problems and identify correspondences between different approaches.

**Standard Relation to Course: Supporting**

<table>
<thead>
<tr>
<th>MAFS.K12.MP.1.1.</th>
<th>Reason abstractly and quantitatively.</th>
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<td>Mathematically proficient students make sense of quantities and their relationships in problem situations. They bring two complementary abilities to bear on problems involving quantitative relationships: the ability to decontextualize—to abstract a given situation and represent it symbolically and manipulate the representing symbols as if they have a life of their own, without necessarily attending to their referents—and the ability to contextualize, to pause as needed during the manipulation process in order to probe into the referents for the symbols involved. Quantitative reasoning entails habits of creating a coherent representation of the problem at hand; considering the units involved; attending to the meaning of quantities, not just how to compute them; and knowing and flexibly using different properties of operations and objects.</td>
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<td>MAFS.K12.MP.2.1.</td>
<td>Construct viable arguments and critique the reasoning of others.</td>
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<td>Mathematically proficient students understand and use stated assumptions, definitions, and previously established results in constructing arguments. They make conjectures and build a logical progression of statements to explore the truth of their conjectures. They are able to analyze situations by breaking them into cases, and can recognize and use counterexamples. They justify their conclusions, communicate them to others, and respond to the arguments of others. They reason inductively about data, making plausible arguments that take into account the context from which the data arose. Mathematically proficient students are also able to compare the effectiveness of two plausible arguments, distinguish correct logic or reasoning from that which is flawed, and—if there is a flaw in an argument—explain what it is. Elementary students can construct arguments using concrete referents such as objects, drawings, diagrams, and actions. Such arguments can make sense and be correct, even though they are not generalized or made formal until later grades. Later, students learn to determine domains to which an argument applies.</td>
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**MAFS.K12.MP.4.1:**

Model with mathematics.

Mathematically proficient students can apply the mathematics they know to solve problems arising in everyday life, society, and the workplace. In early grades, this might be as simple as writing an equation addition to describe a situation. In middle grades, a student might apply proportional reasoning to plan a school event or analyze a problem in the community. By high school, a student might use geometry to solve a design problem or use a function to describe how one quantity of interest depends on another. Mathematically proficient students who can apply what they know are comfortable making assumptions and approximations to simplify a complicated situation, realizing that these may need revision later. They are able to identify important quantities in a practical situation and map their relationships using such tools as diagrams, two-way tables, graphs, flowcharts and formulas. They can analyze those relationships mathematically to draw conclusions. They routinely interpret their mathematical results in the context of the situation and reflect on whether the results make sense, possibly improving the model if it has not served its purpose.

**MAFS.K12.MP.5.1:**

Use appropriate tools strategically.

Mathematically proficient students consider the available tools when solving a mathematical problem. These tools might include pencil and paper, concrete models, a ruler, a protractor, a calculator, a spreadsheet, a computer algebra system, a statistical package, or dynamic geometry software. Proficient students are sufficiently familiar with tools appropriate for their grade or course to make sound decisions about when each of these tools might be helpful, recognizing both the insight to be gained and their limitations. For example, mathematically proficient high school students analyze graphs of functions and solutions generated using a graphing calculator. They detect possible errors by strategically using estimation and other mathematical knowledge. When making mathematical models, they know that technology can enable them to visualize the results of varying assumptions, explore consequences, and compare predictions with data. Mathematically proficient students at various grade levels are able to identify relevant external mathematical resources, such as digital content located on a website, and use them to pose or solve problems. They are able to use technological tools to explore and deepen their understanding of concepts.

**MAFS.K12.MP.6.1:**

Attend to precision.

Mathematically proficient students try to communicate precisely to others. They try to use clear definitions in discussion with others and in their own reasoning. They state the meaning of the symbols they choose, including using the equal sign consistently and appropriately. They are careful about specifying units of measure, and labeling axes to clarify the correspondence with quantities in a problem. They calculate accurately and efficiently, express numerical answers with a degree of precision appropriate for the problem context. In the elementary grades, students give carefully formulated explanations to each other. By the time they reach high school they have learned to examine claims and make explicit use of definitions.

**MAFS.K12.MP.7.1:**

Look for and make use of structure.

Mathematically proficient students look closely to discern a pattern or structure. Young students, for example, might notice that three and seven more is the same amount as seven and three more, or they may sort a collection of shapes according to how many sides the shapes have. Later, students will see 7 × 8 equals the well remembered 7 × 5 + 7. Older students might notice the significance of an existing line in a geometric figure and can use the strategy of drawing an auxiliary line for solving problems. They also can step back for an overview and shift perspective. They can see complicated things, such as some algebraic expressions, as single objects or as being composed of several objects. For example, they can see 5 – 3(x – y²) as 5 minus a positive number times a square and use that to realize that its value cannot be more than 5 for any real numbers x and y.

**MAFS.K12.MP.8.1:**

Look for and express regularity in repeated reasoning.

Mathematically proficient students notice if calculations are repeated, and look both for general methods and for shortcuts. Upper elementary students might notice when dividing 25 by 11 that they are repeating the same calculations over and over again, and conclude they have a repeating decimal. By paying attention to the calculation of slope as they repeatedly check whether points are on the line through (1, 2) with slope 3, older students will see 14 as 2 × 7 and the 9 as 2 + 7. They recognize the significance of an existing line in a geometric figure and can use the strategy of drawing an auxiliary line for solving problems. They also can step back for an overview and shift perspective. They see complicated things, such as some algebraic expressions, as single objects or as being composed of several objects. They can see 5 – 3(x – y²) as 5 minus a positive number times a square and use that to realize that its value cannot be more than 5 for any real numbers x and y.

**LAFS.1.RI.1.1:** Ask and answer questions about key details in a text.

**LAFS.1.RI.2.4:** Ask and answer questions to help determine or clarify the meaning of words and phrases in a text.

**LAFS.1.RI.4.10:** With prompting and support, read informational texts appropriately complex for grade 1.

**LAFS.1.SL.1.1:** Participate in collaborative conversations with diverse partners about grade 1 topics and texts with peers and adults in small and larger groups.

**LAFS.1.W.3.8:** With guidance and support from adults, recall information from experiences or gather information from provided sources to answer a question.

**ELD.K12.ELL.SC.1:** English language learners communicate information, ideas and concepts necessary for academic success in the content area of Science.

**ELD.K12.ELL.SI.1:** English language learners communicate for social and instructional purposes within the school setting.

**HE.1.C.I.5:** Clarifications: Stomach, intestines, heart, lungs, skin, muscles, and bones.
VERSION DESCRIPTION

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Teaching from a range of complex text is optimized when teachers in all subject areas implement the following strategies on a routine basis:

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For additional information on the development and implementation of the ELD standards, please contact the Bureau of Student Achievement through Language Acquisition at sala@fldoe.org.

GENERAL INFORMATION

Course Number: 5020020
Course Path: Section: Grades PreK to 12 Education
Course Path: Grade Group: Grades PreK to 5 Education
Course Path: Subject: Science
Course Path: SubSubject: General Sciences
Abbreviated Title: SCIENCE GRADE ONE
Course Length: Year (Y)
Course Attributes:
- Class Size Core Required

Course Type: Core Academic Course
Course Status: Course Approved
Grade Level(s): 1

Educator Certifications
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Science (Elementary Grades 1-6)
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<td>Sort objects by observable properties, such as size, shape, color, temperature (hot or cold), weight (heavy or light), texture, and whether objects sink or float.</td>
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<td>SC.P.12.1</td>
<td>Demonstrate and describe the various ways that objects can move, such as in a straight line, zigzag, back-and-forth, round-and-round, fast, and slow.</td>
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<td>Demonstrate that the way to change the motion of an object is by applying a push or a pull.</td>
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**MA.K12.MTR.1.1:**

Mathematicians who participate in effortful learning both individually and with others:

- Analyze the problem in a way that makes sense given the task.
- Ask questions that will help with solving the task.
- Build perseverance by modifying methods as needed while solving a challenging task.
- Stay engaged and maintain a positive mindset when working to solve tasks.
- Help and support each other when attempting a new method or approach.

**Clarifications:**

Teachers who encourage students to participate actively in effortful learning both individually and with others:

- Cultivate a community of growth mindset learners.
- Foster perseverance in students by choosing tasks that are challenging.
- Develop students' ability to analyze and problem solve.
- Recognize students' effort when solving challenging problems.

**MA.K12.MTR.2.1:**

Mathematicians who demonstrate understanding by representing problems in multiple ways:

- Build understanding through modeling and using manipulatives.
- Represent solutions to problems in multiple ways using objects, drawings, tables, graphs and equations.
- Progress from modeling problems with objects and drawings to using algorithms and equations.
- Express connections between concepts and representations.
- Choose a representation based on the given context or purpose.

**Clarifications:**

Teachers who encourage students to demonstrate understanding by representing problems in multiple ways:

- Help students make connections between concepts and representations.
- Provide opportunities for students to use manipulatives when investigating concepts.
- Guide students from concrete to pictorial to abstract representations as understanding progresses.
- Show students that various representations can have different purposes and can be useful in different situations.

**MA.K12.MTR.3.1:**

Mathematicians who complete tasks with mathematical fluency:

- Select efficient and appropriate methods for solving problems within the given context.
- Maintain flexibility and accuracy while performing procedures and mental calculations.
- Complete tasks accurately and with confidence.
- Adapt procedures to apply them to a new context.
- Use feedback to improve efficiency when performing calculations.

**Clarifications:**

Teachers who encourage students to complete tasks with mathematical fluency:

- Provide students with the flexibility to solve problems by selecting a procedure that allows them to solve efficiently and accurately.
Engage in discussions that reflect on the mathematical thinking of self and others.

Mathematicians who engage in discussions that reflect on the mathematical thinking of self and others:

- Communicate mathematical ideas, vocabulary and methods effectively.
- Analyze the mathematical thinking of others.
- Compare the efficiency of a method to those expressed by others.
- Recognize errors and suggest how to correctly solve the task.
- Justify results by explaining methods and processes.
- Construct possible arguments based on evidence.

Clarifications:
Teachers who encourage students to engage in discussions that reflect on the mathematical thinking of self and others:

- Establish a culture in which students ask questions of the teacher and their peers, and error is an opportunity for learning.
- Create opportunities for students to discuss their thinking with peers.
- Select, sequence and present student work to advance and deepen understanding of correct and increasingly efficient methods.
- Develop students' ability to justify methods and compare their responses to the responses of their peers.

Use patterns and structure to help understand and connect mathematical concepts.

Mathematicians who use patterns and structure to help understand and connect mathematical concepts:

- Focus on relevant details within a problem.
- Create plans and procedures to logically order events, steps or ideas to solve problems.
- Decompose a complex problem into manageable parts.
- Relate previously learned concepts to new concepts.
- Look for similarities among problems.
- Connect solutions of problems to more complicated large-scale situations.

Clarifications:
Teachers who encourage students to use patterns and structure to help understand and connect mathematical concepts:

- Help students recognize the patterns in the world around them and connect these patterns to mathematical concepts.
- Support students to develop generalizations based on the similarities found among problems.
- Provide opportunities for students to create plans and procedures to solve problems.
- Develop students' ability to construct relationships between their current understanding and more sophisticated ways of thinking.

Assess the reasonableness of solutions.

Mathematicians who assess the reasonableness of solutions:

- Estimate to discover possible solutions.
- Use benchmark quantities to determine if a solution makes sense.
- Check calculations when solving problems.
- Verify possible solutions by explaining the methods used.
- Evaluate results based on the given context.

Clarifications:
Teachers who encourage students to assess the reasonableness of solutions:

- Have students estimate or predict solutions prior to solving.
- Prompt students to continually ask, “Does this solution make sense? How do you know?”
- Reinforce that students check their work as they progress within and after a task.
- Strengthen students' ability to verify solutions through justifications.

Apply mathematics to real-world contexts.

Mathematicians who apply mathematics to real-world contexts:

- Connect mathematical concepts to everyday experiences.
- Use models and methods to understand, represent and solve problems.
- Perform investigations to gather data or determine if a method is appropriate. • Redesign models and methods to improve accuracy or efficiency.

Clarifications:
Teachers who encourage students to apply mathematics to real-world contexts:

- Provide opportunities for students to create models, both concrete and abstract, and perform investigations.
- Challenge students to question the accuracy of their models and methods.
- Support students as they validate conclusions by comparing them to the given situation.
- Indicate how various concepts can be applied to other disciplines.

Cite evidence to explain and justify reasoning.

Clarifications:

- K-1 Students include textual evidence in their oral communication with guidance and support from adults. The evidence can consist of details from the text without naming the text. During 1st grade, students learn how to incorporate the evidence in their writing.
- 2-3 Students include relevant textual evidence in their written and oral communication. Students should name the text when they refer to it. In 3rd grade, students should use a combination of direct and indirect citations.
- 4-5 Students continue with previous skills and reference comments made by speakers and peers. Students cite texts that they've directly quoted, paraphrased, or used for information. When writing, students will use the form of citation dictated by the instructor or the style guide referenced by the instructor.
- 6-8 Students continue with previous skills and use a style guide to create a proper citation.
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<th>ELA.K12.EE.2.1:</th>
<th>Read and comprehend grade-level complex texts proficiently.</th>
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<td><strong>Clarifications:</strong></td>
<td>See Text Complexity for grade-level complexity bands and a text complexity rubric.</td>
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<th>Make inferences to support comprehension.</th>
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<td><strong>Clarifications:</strong></td>
<td>Students will make inferences before the words infer or inference are introduced. Kindergarten students will answer questions like “Why is the girl smiling?” or make predictions about what will happen based on the title page. Students will use the terms and apply them in 2nd grade and beyond.</td>
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<td><strong>Clarifications:</strong></td>
<td>In kindergarten, students learn to listen to one another respectfully. In grades 1-2, students build upon these skills by justifying what they are thinking. For example: “I think _____ because _____.” The collaborative conversations are becoming academic conversations. In grades 3-12, students engage in academic conversations discussing claims and justifying their reasoning, refining and applying skills. Students build on ideas, propel the conversation, and support claims and counterclaims with evidence.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>ELA.K12.EE.5.1:</th>
<th>Use the accepted rules governing a specific format to create quality work.</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Clarifications:</strong></td>
<td>Students will incorporate skills learned into work products to produce quality work. For students to incorporate these skills appropriately, they must receive instruction. A 3rd grade student creating a poster board display must have instruction in how to effectively present information to do quality work.</td>
</tr>
</tbody>
</table>

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<tr>
<th>ELA.K12.EE.6.1:</th>
<th>Use appropriate voice and tone when speaking or writing.</th>
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<tr>
<td><strong>Clarifications:</strong></td>
<td>In kindergarten and 1st grade, students learn the difference between formal and informal language. For example, the way we talk to our friends differs from the way we speak to adults. In 2nd grade and beyond, students practice appropriate social and academic language to discuss texts.</td>
</tr>
</tbody>
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<th>ELD.K12.ELL.SC.1:</th>
<th>English language learners communicate information, ideas and concepts necessary for academic success in the content area of Science.</th>
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<td>ELD.K12.ELL.SI.1:</td>
<td>English language learners communicate for social and instructional purposes within the school setting.</td>
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<tr>
<th>HE.1.C.1.5:</th>
<th>Identify the correct names of human body parts.</th>
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<tr>
<td><strong>Clarifications:</strong></td>
<td>Stomach, intestines, heart, lungs, skin, muscles, and bones.</td>
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General Course Information and Notes

**VERSION DESCRIPTION**

**Instructional Practices**
Teaching from a range of complex text is optimized when teachers in all subject areas implement the following strategies on a routine basis:

1. Ensuring wide reading from complex text that varies in length.
2. Making close reading and rereading of texts central to lessons.
3. Emphasizing text-specific complex questions, and cognitively complex tasks, reinforce focus on the text and cultivate independence.
4. Emphasizing students supporting answers based upon evidence from the text.
5. Providing extensive research and writing opportunities (claims and evidence).

**Science and Engineering Practices**
- Asking questions (for science) and defining problems (for engineering).
- Developing and using models.
- Planning and carrying out investigations.
- Analyzing and interpreting data.
- Using mathematics, information and computer technology, and computational thinking.
- Constructing explanations (for science) and designing solutions (for engineering).
- Engaging in argument from evidence.
- Obtaining, evaluating, and communicating information.

**English Language Development (ELD) Standards Special Notes Section:**
Teachers are required to provide listening, speaking, reading and writing instruction that allows English language learners (ELL) to communicate information, ideas and concepts for academic success in the content area of Science. For the given level of English language proficiency and with visual, graphic, or interactive support, students will interact with grade level words, expressions, sentences and discourse to process or produce language necessary for academic success. The ELD standard should specify a relevant content area concept or topic of study chosen by curriculum developers and teachers which maximizes an ELL's need for communication and social skills. To access an ELL supporting document which delineates performance definitions and descriptors, please click on the following link: [https://cpalmsmediaprod.blob.core.windows.net/uploads/docs/standards/eld/sc.pdf](https://cpalmsmediaprod.blob.core.windows.net/uploads/docs/standards/eld/sc.pdf).

**GENERAL INFORMATION**
Course Number: 5020020
Course Type: Core Academic Course
Course Status: State Board Approved
Grade Level(s): 1

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<td>Describe how small pieces of rock and dead plant and animal parts can be the basis of soil and explain the process by which soil is formed.</td>
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<td>SC.2.E.6.3</td>
<td>Classify soil types based on color, texture (size of particles), the ability to retain water, and the ability to support the growth of plants.</td>
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<td>SC.2.E.7.1</td>
<td>Compare and describe changing patterns in nature that repeat themselves, such as weather conditions including temperature and precipitation, day to day and season to season.</td>
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<td>Investigate by observing and measuring, that the Sun's energy directly and indirectly warms the water, land, and air.</td>
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<td>Investigate, observe and describe how water left in an open container disappears (evaporates), but water in a closed container does not disappear (evaporate).</td>
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<td>State the importance of preparing for severe weather, lightning, and other weather related events.</td>
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<td>Distinguish human body parts (brain, heart, lungs, stomach, muscles, and skeleton) and their basic functions.</td>
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<td>Raise questions about the natural world, investigate them in teams through free exploration and systematic observations, and generate appropriate explanations based on those explorations.</td>
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<td>Compare the observations made by different groups using the same tools.</td>
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<td>Ask “how do you know?” in appropriate situations and attempt reasonable answers when asked the same question by others.</td>
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<td>Explain how scientists alone or in groups are always investigating new ways to solve problems.</td>
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<td>SC.2.P.8.1</td>
<td>Observe and measure objects in terms of their properties, including size, shape, color, temperature, weight, texture, sinking or floating in water, and attraction and repulsion of magnets.</td>
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<td>SC.2.P.8.2</td>
<td>Identify objects and materials as solid, liquid, or gas.</td>
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<td>Recognize that solids have a definite shape and that liquids and gases take the shape of their container.</td>
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<td>Observe and describe water in its solid, liquid, and gaseous states.</td>
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<td>Measure and compare temperatures taken every day at the same time.</td>
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<td>Measure and compare the volume of liquids using containers of various shapes and sizes.</td>
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<td>Investigate that materials can be altered to change some of their properties, but not all materials respond the same way to any one alteration.</td>
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<td>SC.2.P.10.1</td>
<td>Discuss that people use electricity or other forms of energy to cook their food, cool or warm their homes, and power their cars.</td>
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<td>SC.2.P.13.2</td>
<td>Demonstrate that magnets can be used to make some things move without touching them.</td>
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<td>SC.2.P.13.3</td>
<td>Recognize that objects are pulled toward the ground unless something holds them up.</td>
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<td>SC.2.P.13.4</td>
<td>Demonstrate that the greater the force (push or pull) applied to an object, the greater the change in motion of the object.</td>
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<td>MAFS.2.MD.4.9</td>
<td>Generate measurement data by measuring lengths of several objects to the nearest whole unit, or by making repeated measurements of the same object. Show the measurements by making a line plot, where the horizontal scale is marked off in whole-number units.</td>
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<td>MAFS.2.MD.4.10</td>
<td>Draw a picture graph and a bar graph (with single-unit scale) to represent a data set with up to four categories. Solve simple put-together, take-apart, and compare problems using information presented in a bar graph.</td>
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Mathematically proficient students can explain correspondences between equations, verbal descriptions, tables, and graphs or draw diagrams of important features and relationships, graph data, and search for regularity or trends. Younger students might rely on using concrete objects or pictures to help conceptualize and solve a problem. Mathematically proficient students use their knowledge of numbers and the number system in problem situations, including place value, arithmetic, and computation. They are able to conceptualize and solve a problem using a different method, and they continually ask themselves, “Does this make sense?” They can understand the approaches of others to solving complex problems and identify correspondences between different approaches.

**Standard Relation to Course: Supporting**

**MAFS.K12.MP.1.1:** Mathematically proficient students start by explaining to themselves the meaning of a problem and looking for entry points to its solution. They analyze givens, constraints, relationships, and goals. They make conjectures about the form and meaning of the solution and plan a solution pathway rather than simply jumping into a solution attempt. They consider analogous problems, and try special cases and simpler forms of the original problem in order to gain insight into its solution. They monitor and evaluate their progress and change course if necessary. Older students might, depending on the context of the problem, transform algebraic expressions or change the viewing window on their graphing calculator to get the information they need. Mathematically proficient students can explain correspondences between equations, verbal descriptions, tables, and graphs or draw diagrams of important features and relationships, graph data, and search for regularity or trends. Younger students might rely on using concrete objects or pictures to help conceptualize and solve a problem. Mathematically proficient students use their knowledge of numbers and the number system in problem situations, including place value, arithmetic, and computation. They are able to conceptualize and solve a problem using a different method, and they continually ask themselves, “Does this make sense?” They can understand the approaches of others to solving complex problems and identify correspondences between different approaches.

**Standard Relation to Course: Supporting**

**MAFS.K12.MP.2.1:** Mathematically proficient students make sense of quantities and their relationships in problem situations. They bring two complementary abilities to bear on problems involving quantitative relationships: the ability to decontextualize—to abstract a given situation and represent it symbolically and manipulate the representing symbols as if they have a life of their own, without necessarily attending to their referents—and the ability to contextualize, to pause as needed during the manipulation process in order to probe into the referents for the symbols involved. Quantitative reasoning entails habits of creating a coherent representation of the problem at hand; considering the units involved; attending to the meaning of quantities, not just how to compute them; and knowing and flexibly using different properties of operations and objects.
arguments. They make conjectures and build a logical progression of statements to explore the truth of their conjectures. They are able to analyze situations by breaking them into cases, and can recognize and use counterexamples. They justify their conclusions, communicate them to others, and respond to the arguments of others. They reason inductively about data, making plausible arguments that take into account the context from which the data arose. Mathematically proficient students are also able to compare the effectiveness of two plausible arguments, distinguish correct logic or reasoning from that which is flawed, and—if there is a flaw in an argument—explain what it is. Elementary students can construct arguments using concrete referents such as objects, drawings, diagrams, and actions. Such arguments can make sense and be correct, even though they are not generalized or made formal until later grades. Later, students learn to determine domains to which an argument applies. Students at all grades can listen or read the arguments of others, decide whether they make sense, and ask useful questions to clarify or improve the arguments.

Standard Relation to Course: Supporting

Model with mathematics.

Mathematically proficient students can apply the mathematics they know to solve problems arising in everyday life, society, and the workplace. In early grades, this might be as simple as writing an addition equation to describe a situation. In middle grades, a student might apply proportional reasoning to plan a school event or analyze a problem in the community. By high school, a student might use geometry to solve a design problem or use a function to describe how one quantity of interest depends on another. Mathematically proficient students who can apply what they know are comfortable making assumptions and approximations to simplify a complicated situation, realizing that these may need revision later. They are able to identify important quantities in a practical situation and map their relationships using such tools as diagrams, two-way tables, graphs, flowcharts and formulas. They can analyze those relationships mathematically to draw conclusions. They routinely interpret their mathematical results in the context of the situation and reflect on whether the results make sense, possibly improving the model if it has not served its purpose.

Standard Relation to Course: Supporting

Use appropriate tools strategically.

Mathematically proficient students consider the available tools when solving a mathematical problem. These tools might include pencil and paper, concrete models, a ruler, a protractor, a calculator, a spreadsheet, a computer algebra system, a statistical package, or dynamic geometry software. Proficient students are sufficiently familiar with tools appropriate for their grade or course to make sound decisions about when each of these tools might be helpful, recognizing both the insight to be gained and their limitations. For example, mathematically proficient high school students analyze graphs of functions and solutions generated using a graphing calculator. They detect possible errors by strategically using estimation and other mathematical knowledge. When making mathematical models, they know that technology can enable them to visualize the results of varying assumptions, explore consequences, and compare predictions with data. Mathematically proficient students at various grade levels are able to identify relevant external mathematical resources, such as digital content located on a website, and use them to pose or solve problems. They are able to use technological tools to explore and deepen their understanding of concepts.

Standard Relation to Course: Supporting

Attend to precision.

Mathematically proficient students try to communicate precisely to others. They try to use clear definitions in discussion with others and in their own reasoning. They state the meaning of the symbols they choose, including using the equal sign consistently and appropriately. They are careful about specifying units of measure, and labeling axes to clarify the correspondence with quantities in a problem. They calculate accurately and efficiently, express numerical answers with a degree of precision appropriate for the problem context. In the elementary grades, students givepertinent conclusions to each other. By the time they reach high school they have learned to examine claims and make explicit use of definitions.

Standard Relation to Course: Supporting

Look for and make use of structure.

Mathematically proficient students look closely to discern a pattern or structure. Young students, for example, might notice that three and seven are the same amount as seven and three, or they may sort a collection of shapes according to how many sides the shapes have. Later, students will see 7 × 8 equals the well remembered 7 × 5 + 7 × 3, in preparation for learning about the distributive property. In the expression x² + 9x + 14, older students can see the 14 as 2 × 7 and may sort a collection of shapes according to how many sides the shapes have. Later, students will see 7 × 8 equals the well remembered 7 × 5 + 7 × 3, in preparation for learning about the distributive property. In the expression x² + 9x + 14, older students can see the 14 as 2 × 7 and the 9 as 2 + 7. They recognize the significance of an existing line in a geometric figure and can use the strategy of drawing an auxiliary line for solving problems. They also can step back for an overview and shift perspective. They can see complicated things, such as some algebraic expressions, as single objects or as being composed of several objects. For example, they can see 5 – 3(x – y)² as 5 minus a positive number times a square and use that to realize that its value cannot be more than 5 for any real numbers x and y.

Standard Relation to Course: Supporting

Look for and express regularity in repeated reasoning.

Mathematically proficient students notice if calculations are repeated, and look both for general methods and for shortcuts. Upper elementary students might notice when dividing 25 by 11 that they are repeating the same calculations over and over again, and conclude they have a repeating decimal. By paying attention to the calculation of slope as they repeatedly check whether points are on the line through (1, 2) with slope 3, middle school students might abstract the equation y = 3x + 1. Noticing the regularity in the way terms cancel when expanding (x – 1)(x + 1), (x – 1)(x² + x + 1), and (x – 1)(x² + 1) might lead them to the general formula for the sum of a geometric series. As they work to solve a problem, mathematically proficient students maintain oversight of the process, while attending to the details. They continually evaluate the reasonableness of their intermediate results.

Standard Relation to Course: Supporting

LAFS.2.RI.1.3: Describe the connection between a series of historical events, scientific ideas or concepts, or steps in technical procedures in a text.

LAFS.2.RI.2.4: Determine the meaning of words and phrases in a text relevant to a grade 2 topic or subject area.

LAFS.2.RI.4.10: By the end of year, read and comprehend informational texts, including history/social studies, science, and technical texts, in the grades 2–3 text complexity band proficiently, with scaffolding as needed at the high end of the range.

LAFS.2.SL.1.1: Participate in collaborative conversations with diverse partners about grade 2 topics and texts with peers and adults in small and larger groups.
   a. Follow agreed-upon rules for discussions (e.g., gaining the floor in respectful ways, listening to others with care, speaking one at a time about the topics and texts under discussion).
   b. Build on others’ talk in conversations by linking their comments to the remarks of others.
   c. Ask for clarification and further explanation as needed about the topics and texts under discussion.

LAFS.2.W.3.7: Participate in shared research and writing projects (e.g., read a number of books on a single topic to produce a report; record science observations).

LAFS.2.W.3.8: Recall information from experiences or gather information from provided sources to answer a question.

ELD.K12.ELL.SC.1: English language learners communicate information, ideas and concepts necessary for academic success in the content area of Science.
### General Course Information and Notes

#### GENERAL NOTES

**Special Notes:**

**Instructional Practices**
Teaching from a range of complex text is optimized when teachers in all subject areas implement the following strategies on a routine basis:

1. Ensuring wide reading from complex text that varies in length.
2. Making close reading and rereading of texts central to lessons.
3. Emphasizing text-specific complex questions, and cognitively complex tasks, reinforce focus on the text and cultivate independence.
4. Emphasizing students supporting answers based upon evidence from the text.
5. Providing extensive research and writing opportunities (claims and evidence).

**Science and Engineering Practices** *(NRC Framework for K-12 Science Education, 2010)*

- Asking questions (for science) and defining problems (for engineering).
- Developing and using models.
- Planning and carrying out investigations.
- Analyzing and interpreting data.
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- Constructing explanations (for science) and designing solutions (for engineering).
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#### GENERAL INFORMATION

**Course Number:** 5020030  
**Course Path:** Grades PreK to 12 Education  
**Courses:** > **Grade Group:** Grades PreK to 5 Education  
**Courses:** > **Subject:** Science  
**SubSubject:** General Sciences  
**Abbreviated Title:** SCIENCE GRADE TWO  
**Course Length:** Year (Y)  
**Course Attributes:**  
- **Class Size Core Required**

**Course Type:** Core Academic Course  
**Course Status:** Course Approved  
**Grade Level(s):** 2

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<td>MA.K12.MTR.2.1</td>
<td>Clarifications: Teachers who encourage students to demonstrate understanding by representing problems in multiple ways:</td>
</tr>
</tbody>
</table>

Mathematicians who participate in effortful learning both individually and with others:
- Analyze the problem in a way that makes sense given the task.
- Ask questions that will help with solving the task.
- Build perseverance by modifying methods as needed while solving a challenging task.
- Stay engaged and maintain a positive mindset when working to solve tasks.
- Help and support each other when attempting a new method or approach.

Classifications: Teachers who encourage students to participate actively in effortful learning both individually and with others:
- Cultivate a community of growth mindset learners.
- Foster perseverance in students by choosing tasks that are challenging.
- Develop students’ ability to analyze and problem solve.
- Recognize students’ effort when solving challenging problems.

Classifications: Teachers who encourage students to demonstrate understanding by representing problems in multiple ways:
- Help students make connections between concepts and representations.
- Provide opportunities for students to use manipulatives when investigating concepts.
- Guide students from concrete to pictorial to abstract representations as understanding progresses.
- Show students that various representations can have different purposes and can be useful in different situations.
<table>
<thead>
<tr>
<th>MA.K12.MTR.3.1:</th>
<th>Complete tasks with mathematical fluency. Mathematicians who complete tasks with mathematical fluency:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>• Select efficient and appropriate methods for solving problems within the given context.</td>
</tr>
<tr>
<td></td>
<td>• Maintain flexibility and accuracy while performing procedures and mental calculations.</td>
</tr>
<tr>
<td></td>
<td>• Complete tasks accurately and with confidence.</td>
</tr>
<tr>
<td></td>
<td>• Adapt procedures to apply them to a new context.</td>
</tr>
<tr>
<td></td>
<td>• Use feedback to improve efficiency when performing calculations.</td>
</tr>
</tbody>
</table>

**Clarifications:**

Teachers who encourage students to complete tasks with mathematical fluency:

• Provide students with the flexibility to solve problems by selecting a procedure that allows them to solve efficiently and accurately.

• Offer multiple opportunities for students to practice efficient and generalizable methods.

• Provide opportunities for students to reflect on the method they used and determine if a more efficient method could have been used.

<table>
<thead>
<tr>
<th>MA.K12.MTR.4.1:</th>
<th>Engage in discussions that reflect on the mathematical thinking of self and others. Mathematicians who engage in discussions that reflect on the mathematical thinking of self and others:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>• Communicate mathematical ideas, vocabulary and methods effectively.</td>
</tr>
<tr>
<td></td>
<td>• Analyze the mathematical thinking of others.</td>
</tr>
<tr>
<td></td>
<td>• Compare the efficiency of a method to those expressed by others.</td>
</tr>
<tr>
<td></td>
<td>• Recognize errors and suggest how to correctly solve the task.</td>
</tr>
<tr>
<td></td>
<td>• Justify results by explaining methods and processes.</td>
</tr>
<tr>
<td></td>
<td>• Construct possible arguments based on evidence.</td>
</tr>
</tbody>
</table>

**Clarifications:**

Teachers who encourage students to engage in discussions that reflect on the mathematical thinking of self and others:

• Establish a culture in which students ask questions of the teacher and their peers, and error is an opportunity for learning.

• Create opportunities for students to discuss their thinking with peers.

• Select, sequence and present student work to advance and deepen understanding of correct and increasingly efficient methods.

• Develop students' ability to justify methods and compare their responses to the responses of their peers.

<table>
<thead>
<tr>
<th>MA.K12.MTR.5.1:</th>
<th>Use patterns and structure to help understand and connect mathematical concepts. Mathematicians who use patterns and structure to help understand and connect mathematical concepts:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>• Focus on relevant details within a problem.</td>
</tr>
<tr>
<td></td>
<td>• Create plans and procedures to logically order events, steps or ideas to solve problems.</td>
</tr>
<tr>
<td></td>
<td>• Decompose a complex problem into manageable parts.</td>
</tr>
<tr>
<td></td>
<td>• Relate previously learned concepts to new concepts.</td>
</tr>
<tr>
<td></td>
<td>• Look for similarities among problems.</td>
</tr>
<tr>
<td></td>
<td>• Connect solutions of problems to more complicated large-scale situations.</td>
</tr>
</tbody>
</table>

**Clarifications:**

Teachers who encourage students to use patterns and structure to help understand and connect mathematical concepts:

• Help students recognize the patterns in the world around them and connect these patterns to mathematical concepts.

• Support students to develop generalizations based on the similarities found among problems.

• Provide opportunities for students to create plans and procedures to solve problems.

• Develop students' ability to construct relationships between their current understanding and more sophisticated ways of thinking.

<table>
<thead>
<tr>
<th>MA.K12.MTR.6.1:</th>
<th>Assess the reasonableness of solutions. Mathematicians who assess the reasonableness of solutions:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>• Estimate to discover possible solutions.</td>
</tr>
<tr>
<td></td>
<td>• Use benchmark quantities to determine if a solution makes sense.</td>
</tr>
<tr>
<td></td>
<td>• Check calculations when solving problems.</td>
</tr>
<tr>
<td></td>
<td>• Verify possible solutions by explaining the methods used.</td>
</tr>
<tr>
<td></td>
<td>• Evaluate results based on the given context.</td>
</tr>
</tbody>
</table>

**Clarifications:**

Teachers who encourage students to assess the reasonableness of solutions:

• Have students estimate or predict solutions prior to solving.

• Prompt students to continually ask, "Does this solution make sense? How do you know?"

• Reinforce that students check their work as they progress within and after a task.

• Strengthen students' ability to verify solutions through justifications.

<table>
<thead>
<tr>
<th>MA.K12.MTR.7.1:</th>
<th>Apply mathematics to real-world contexts. Mathematicians who apply mathematics to real-world contexts:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>• Connect mathematical concepts to everyday experiences.</td>
</tr>
<tr>
<td></td>
<td>• Use models and methods to understand, represent and solve problems.</td>
</tr>
<tr>
<td></td>
<td>• Perform investigations to gather data or determine if a method is appropriate. • Redesign models and methods to improve accuracy or efficiency.</td>
</tr>
</tbody>
</table>

**Clarifications:**

Teachers who encourage students to apply mathematics to real-world contexts:

• Provide opportunities for students to create models, both concrete and abstract, and perform investigations.

• Challenge students to question the accuracy of their models and methods.

• Support students as they validate conclusions by comparing them to the given situation.

• Indicate how various concepts can be applied to other disciplines.
Cite evidence to explain and justify reasoning.

**Clarifications:**
- K-1 Students include textual evidence in their oral communication with guidance and support from adults. The evidence can consist of details from the text without naming the text. During 1st grade, students learn how to incorporate the evidence in their writing.
- 2-3 Students include relevant textual evidence in their written and oral communication. Students should name the text when they refer to it. In 3rd grade, students should use a combination of direct and indirect citations.
- 4-5 Students continue with previous skills and reference comments made by speakers and peers. Students cite texts that they've directly quoted, paraphrased, or used for information. When writing, students will use the form of citation dictated by the instructor or the style guide referenced by the instructor.
- 6-8 Students continue with previous skills and use a style guide to create a proper citation.
- 9-12 Students continue with previous skills and should be aware of existing style guides and the ways in which they differ.

**ELA.K12.EE.2.1:** Read and comprehend grade-level complex texts proficiently.

**Clarifications:**
See Text Complexity for grade-level complexity bands and a text complexity rubric.

**ELA.K12.EE.3.1:** Make inferences to support comprehension.

**Clarifications:**
Students will make inferences before the words infer or inference are introduced. Kindergarten students will answer questions like “Why is the girl smiling?” or make predictions about what will happen based on the title page. Students will use the terms and apply them in 2nd grade and beyond.

**ELA.K12.EE.4.1:** Use appropriate collaborative techniques and active listening skills when engaging in discussions in a variety of situations.

**Clarifications:**
- In kindergarten, students learn to listen to one another respectfully.
- In grades 1-2, students build on these skills by justifying what they are thinking. For example: “I think _____ because ______.” The collaborative conversations are becoming academic conversations.
- In grades 3-12, students engage in academic conversations discussing claims and justifying their reasoning, refining and applying skills.
- Students build on ideas, propel the conversation, and support claims and counterclaims with evidence.

**ELA.K12.EE.5.1:** Use the accepted rules governing a specific format to create quality work.

**Clarifications:**
Students will incorporate skills learned into work products to produce quality work. For students to incorporate these skills appropriately, they must receive instruction. A 3rd grade student creating a poster board display must have instruction in how to effectively present information to do quality work.

**ELA.K12.EE.6.1:** Use appropriate voice and tone when speaking or writing.

**ELD.K12.ELL.SC.1:** English language learners communicate information, ideas and concepts necessary for academic success in the content area of Science.

**ELD.K12.ELL.SI.1:** English language learners communicate for social and instructional purposes within the school setting.

**HE.2.B.5.2:** Name healthy options to health-related issues or problems.

**Clarifications:**
Safety equipment, peer cooperation, and communication.

**HE.2.C.1.5:** Recognize the locations and functions of major human organs.

**Clarifications:**
The functions of the heart, lungs, and muscles.

### General Course Information and Notes

#### GENERAL NOTES

**Special Notes:**

**Instructional Practices**
Teaching from a range of complex text is optimized when teachers in all subject areas implement the following strategies on a routine basis:

1. Ensuring wide reading from complex text that varies in length.
2. Making close reading and rereading of texts central to lessons.
3. Emphasizing text-specific complex questions, and cognitively complex tasks, reinforce focus on the text and cultivate independence.
4. Emphasizing students supporting answers based upon evidence from the text.
5. Providing extensive research and writing opportunities (claims and evidence).

**Science and Engineering Practices** *(NRC Framework for K-12 Science Education, 2010)*

- Asking questions (for science) and defining problems (for engineering).
- Developing and using models.
- Planning and carrying out investigations.
Florida's Benchmarks for Excellent Student Thinking (B.E.S.T.) Standards
This course includes Florida's B.E.S.T. ELA Expectations (EE) and Mathematical Thinking and Reasoning Standards (MTRs) for students. Florida educators should intentionally embed these standards within the content and their instruction as applicable. For guidance on the implementation of the EE and MTRs, please visit https://www.cpalms.org/Standards/BEST_Standards.aspx and select the appropriate B.E.S.T. Standards package.

English Language Development ELD Standards Special Notes Section:
Teachers are required to provide listening, speaking, reading and writing instruction that allows English language learners (ELL) to communicate information, ideas and concepts for academic success in the content area of Science. For the given level of English language proficiency and with visual, graphic, or interactive support, students will interact with grade level words, expressions, sentences and discourse to process or produce language necessary for academic success. The ELD standard should specify a relevant content area concept or topic of study chosen by curriculum developers and teachers which maximizes an ELL's need for communication and social skills. To access an ELL supporting document which delineates performance definitions and descriptors, please click on the following link: https://cpalmsmediaprod.blob.core.windows.net/uploads/docs/standards/eld/sc.pdf

GENERAL INFORMATION

Course Number: 5020030
Course Path: Section: Grades PreK to 12 Education
Courses > Grade Group: Grades PreK to 5 Education
Courses > Subject: Science > SubSubject: General Sciences >
Abbreviated Title: SCIENCE GRADE TWO
Course Length: Year (Y)
Course Attributes:
  - Class Size Core Required

Course Type: Core Academic Course
Course Status: State Board Approved
Grade Level(s): 2

Educator Certifications

<table>
<thead>
<tr>
<th>Certification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Elementary Education (Elementary Grades 1-6)</td>
</tr>
<tr>
<td>Science (Elementary Grades 1-6)</td>
</tr>
<tr>
<td>Primary Education (K-3)</td>
</tr>
<tr>
<td>Prekindergarten/Primary Education (Age 3 through Grade 3)</td>
</tr>
<tr>
<td>Elementary Education (Grades K-6)</td>
</tr>
</tbody>
</table>
### Course Standards

<table>
<thead>
<tr>
<th>Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>SC.3.E.5.1:</td>
<td>Explain that empirical evidence is information, such as observations or what it looks like points of light.</td>
</tr>
<tr>
<td>SC.3.E.5.2:</td>
<td>Identify the Sun as a star that emits energy; some of it in the form of light.</td>
</tr>
<tr>
<td>SC.3.E.5.3:</td>
<td>Recognize that the Sun appears large and bright because it is the closest star to Earth.</td>
</tr>
<tr>
<td>SC.3.E.5.4:</td>
<td>Explore the Law of Gravity by demonstrating that gravity is a force that can be overcome.</td>
</tr>
<tr>
<td>SC.3.E.5.5:</td>
<td>Investigate that the number of stars that can be seen through telescopes is dramatically greater than those seen by the unaided eye.</td>
</tr>
<tr>
<td>SC.3.E.6.1:</td>
<td>Demonstrate that radiant energy from the Sun can heat objects and when the Sun is not present, heat may be lost.</td>
</tr>
<tr>
<td>SC.3.L.14.1:</td>
<td>Describe structures in plants and their roles in food production, support, water and nutrient transport, and reproduction.</td>
</tr>
<tr>
<td>SC.3.L.14.2:</td>
<td>Investigate and describe how plants respond to stimuli (heat, light, gravity), such as the way plant stems grow toward light and their roots grow downward in response to gravity.</td>
</tr>
<tr>
<td>SC.3.L.15.1:</td>
<td>Classify animals into major groups (mammals, birds, reptiles, amphibians, fish, arthropods, vertebrates and invertebrates, those having live births and those which lay eggs) according to their physical characteristics and behaviors.</td>
</tr>
<tr>
<td>SC.3.L.15.2:</td>
<td>Classify flowering and nonflowering plants into major groups such as those that produce seeds, or those like ferns and mosses that produce spores, according to their physical characteristics.</td>
</tr>
<tr>
<td>SC.3.L.17.1:</td>
<td>Describe how animals and plants respond to changing seasons.</td>
</tr>
<tr>
<td>SC.3.L.17.2:</td>
<td>Recognize that plants use energy from the Sun, air, and water to make their own food.</td>
</tr>
<tr>
<td>SC.3.N.1.1:</td>
<td>Raise questions about the natural world, investigate them individually and in teams through free exploration and systematic investigations, and generate appropriate explanations based on those explorations.</td>
</tr>
<tr>
<td>SC.3.N.1.2:</td>
<td>Compare the observations made by different groups using the same tools and seek reasons to explain the differences across groups.</td>
</tr>
<tr>
<td>SC.3.N.1.3:</td>
<td>Keep records as appropriate, such as pictorial, written, or simple charts and graphs, of investigations conducted.</td>
</tr>
<tr>
<td>SC.3.N.1.4:</td>
<td>Recognize the importance of communication among scientists.</td>
</tr>
<tr>
<td>SC.3.N.1.5:</td>
<td>Recognize that scientists question, discuss, and check each other’s evidence and explanations.</td>
</tr>
<tr>
<td>SC.3.N.1.6:</td>
<td>Infer based on observation.</td>
</tr>
<tr>
<td>SC.3.N.3.1:</td>
<td>Recognize that words in science can have different or more specific meanings than their use in everyday language; for example, energy, cell, heat/cold, and evidence.</td>
</tr>
<tr>
<td>SC.3.N.3.2:</td>
<td>Recognize that scientists use models to help understand and explain how things work.</td>
</tr>
<tr>
<td>SC.3.N.3.3:</td>
<td>Recognize that all models are approximations of natural phenomena; as such, they do not perfectly account for all observations.</td>
</tr>
<tr>
<td>SC.3.P.8.1:</td>
<td>Measure and compare temperatures of various samples of solids and liquids.</td>
</tr>
<tr>
<td>SC.3.P.8.2:</td>
<td>Measure and compare the mass and volume of solids and liquids.</td>
</tr>
<tr>
<td>SC.3.P.8.3:</td>
<td>Compare materials and objects according to properties such as size, shape, color, texture, and hardness.</td>
</tr>
<tr>
<td>SC.3.P.9.1:</td>
<td>Describe the changes water undergoes when it changes state through heating and cooling by using familiar scientific terms such as melting, freezing, boiling, evaporation, and condensation.</td>
</tr>
<tr>
<td>SC.3.P.10.1:</td>
<td>Identify some basic forms of energy such as light, heat, sound, electrical, and mechanical.</td>
</tr>
<tr>
<td>SC.3.P.10.2:</td>
<td>Recognize that energy has the ability to cause motion or create change.</td>
</tr>
<tr>
<td>SC.3.P.10.3:</td>
<td>Demonstrate that light travels in a straight line until it strikes an object or travels from one medium to another.</td>
</tr>
<tr>
<td>SC.3.P.10.4:</td>
<td>Demonstrate that light can be refracted, reflected, and absorbed.</td>
</tr>
<tr>
<td>SC.3.P.11.1:</td>
<td>Investigate, observe, and explain that things that give off light often also give off heat.</td>
</tr>
<tr>
<td>SC.3.P.11.2:</td>
<td>Investigate, observe, and explain that heat is produced when one object rubs against another, such as rubbing one’s hands together.</td>
</tr>
</tbody>
</table>

**Clarifications:**

**Examples of Opportunities for In-Depth Focus**

Continuous measurement quantities such as liquid volume, mass, and so on are an important context for fraction arithmetic (cf. 4.NF.2.4c, 5.NF.2.7c, 5.NF.2.3). In grade 3, students begin to get a feel for continuous measurement quantities and solve whole-number problems involving such quantities.

**MAFS.3.MD.1.2:**

Measure and estimate liquid volumes and masses of objects using standard units of grams (g), kilograms (kg), and liters (l). Add, subtract, multiply, or divide to solve one-step word problems involving masses or volumes that are given in the same units.

**MAFS.3.MD.2.4:**

Generate measurement data by measuring lengths using rulers marked with halves and fourths of an inch. Show the data by making a line plot, where the horizontal scale is marked off in appropriate units—whole numbers, halves, or quarters.

**Make sense of problems and persevere in solving them.**

Mathematically proficient students start by explaining to themselves the meaning of a problem and looking for entry points to its solution. They analyze givens, constraints, relationships, and goals. They make conjectures about the form and meaning of the solution and plan a solution pathway rather than simply jumping into a solution attempt. They consider analogous problems, and try special cases and simpler forms of the original problem in order to gain insight into its solution. They monitor and evaluate their progress and change course if necessary. Older students might, depending on the context of the problem, transform algebraic expressions or change the viewing window on their graphing calculator to get the information they need. Mathematically proficient students can explain correspondences between equations, verbal descriptions, tables, and graphs or draw diagrams of important features and relationships, graph data, and search for regularity or trends. Younger students might rely on using concrete objects or pictures to help conceptualize and solve a problem. Mathematically proficient students check their answers to problems using a different method, and they continually ask themselves, “Does this make sense?” They can understand the approaches of others to solving complex problems and identify correspondences between different approaches.
Reason abstractly and quantitatively.

Mathematically proficient students make sense of quantities and their relationships in problem situations. They bring two complementary abilities to bear on problems involving quantitative relationships: the ability to decontextualize—to abstract a given situation and represent it symbolically and manipulate the representing symbols as if they have a life of their own, without necessarily attending to their referents—and the ability to contextualize, to pause as needed during the manipulation process in order to probe into the referents for the symbols involved. Quantitative reasoning entails habits of creating a coherent representation of the problem at hand; considering the units involved; attending to the meaning of quantities, not just how to compute them; and knowing and flexibly using different forms of operations and objects.

Standard Relation to Course: Supporting

Construct viable arguments and critique the reasoning of others.

Mathematically proficient students understand and use stated assumptions, definitions, and previously established results in constructing arguments. They make conjectures and build a logical progression of statements to explore the truth of their conjectures. They are able to analyze situations by breaking them into cases, and can recognize and use counterexamples. They justify their conclusions, communicate them to others, and respond to the arguments of others. They reason inductively about data, making plausible arguments that take into account the context from which the data arose. Mathematically proficient students are also able to compare the effectiveness of two plausible arguments, distinguish correct logic or reasoning from that which is flawed, and—if there is a flaw in an argument—explain what it is. Elementary students can construct arguments using concrete referents such as objects, drawings, diagrams, and actions. Such arguments can make sense and be correct, even though they are not generalized or made formal until later grades. Later, students learn to determine domains to which an argument applies. Students at all grades can listen or read the arguments of others, decide whether they make sense, and ask useful questions to clarify or improve the arguments.

Model with mathematics.

Mathematically proficient students can apply the mathematics they know to solve problems arising in everyday life, society, and the workplace. In early grades, this might be as simple as writing an addition equation to describe a situation. In middle grades, a student might apply proportional reasoning to plan a school event or analyze a problem in the community. By high school, a student might use geometry to solve a design problem or use a function to describe how one quantity of interest depends on another. Mathematically proficient students who can apply what they know are comfortable making assumptions and approximations to simplify a complicated situation, realizing that these may need revision later. They are able to identify important quantities in a practical situation and map their relationships using such tools as diagrams, two-way tables, graphs, flowcharts, and formulas. They can analyze those relationships mathematically to draw conclusions. They routinely interpret their mathematical results in the context of the situation and reflect on whether the results make sense, possibly improving the model if it has not served its purpose.

Use appropriate tools strategically.

Mathematically proficient students consider the available tools when solving a mathematical problem. These tools might include pencil and paper, concrete models, a ruler, a protractor, a calculator, a spreadsheet, a computer algebra system, a statistical package, or dynamic geometry software. Proficient students are sufficiently familiar with tools appropriate for their grade or course to make sound decisions about when each of these tools might be helpful, recognizing both the insight to be gained and their limitations. For example, mathematically proficient high school students analyze graphs of functions and solutions generated using a graphing calculator. They detect possible errors by strategically choosing and using other mathematical knowledge. When making mathematical models, they know that technology can enable them to visualize the results of varying assumptions, explore consequences, and compare predictions with data. Mathematically proficient students at various grade levels are able to identify relevant external mathematical resources, such as digital content located on a website, and use them to pose or solve problems. They are able to use technological tools to explore and deepen their understanding of concepts.

Attend to precision.

Mathematically proficient students try to communicate precisely to others. They try to use clear definitions in discussion with others and in their own reasoning. They state the meaning of the symbols they choose, including using the equal sign consistently and appropriately. They are careful about specifying units of measure, and labeling axes to clarify the correspondence with quantities in a problem. They calculate accurately and efficiently, express numerical answers with a degree of precision appropriate for the problem context. In the elementary grades, students give carefully formulated explanations to each other. By the time they reach high school they have learned to examine claims and make explicit use of definitions.

Look for and make use of structure.

Mathematically proficient students look closely to discern a pattern or structure. Young students, for example, might notice that three and seven more is the same amount as seven and three more, or they may sort a collection of shapes according to how many sides the shapes have. Later, students will see 7 + 8 equals the well remembered 5 + 7 + 3, in preparation for learning about the distributive property. In the expression 2 × 9 + 3, older students can see the 12 as 2 × 7 and the 9 as 2 × 4. They recognize the significance of an existing line in a geometric figure and can use the strategy of drawing an auxiliary line or other geometricauxiliary line for solving problems. They also can step back for an overview and shift perspective. They can see complicated things, such as some algebraic expressions, as single objects or as being composed of several objects. For example, they can see 5 + 3(x - y)² as 5 minus a positive number times a square and use that to realize that its value cannot be more than 5 for any real numbers x and y.

Look for and express regularity in repeated reasoning.

Mathematically proficient students notice if calculations are repeated, and look both for general methods and for shortcuts. Upper elementary students might notice when dividing 25 by 11 that they are repeating the same calculations over and over again, and conclude they have a repeating decimal. By paying attention to the calculation of slope as they repeatedly check whether points are on the line through (1, 2) with slope 3, middle school students might abstract the equation (y - 2) / (x - 1) = 3. Noticing the regularity in the way terms cancel when expanding (x - 1)(x + 1), (x - 1)(x² + x + 1), and (x - 1)(x³ + x² + x + 1) might lead them to the general formula for the sum of a geometric series. As they work to solve a problem, mathematically proficient students maintain oversight of the process, while attending to the details. They continually evaluate the reasonableness of their intermediate results.
Describe the relationship between a series of historical events, scientific ideas or concepts, or steps in technical procedures in a text, using language that pertains to time, sequence, and cause/effect.

Determine the meaning of general academic and domain-specific words and phrases in a text relevant to a grade 3 topic or subject area.

By the end of the year, read and comprehend informational texts, including history/social studies, science, and technical texts, at the high end of the grades 2–3 text complexity band independently and proficiently.

Engage effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grade 3 topics and texts, building on others' ideas and expressing their own clearly.
   a. Come to discussions prepared, having read or studied required material; explicitly draw on that preparation and other information known about the topic to explore ideas under discussion.
   b. Follow agreed-upon rules for discussions (e.g., gaining the floor in respectful ways, listening to others with care, speaking one at a time about the topics and texts under discussion).
   c. Ask questions to check understanding of information presented, stay on topic, and link their comments to the remarks of others.
   d. Explain their own ideas and understanding in light of the discussion.

Recall information from experiences or gather information from print and digital sources; take brief notes on sources and sort evidence into provided categories.

English language learners communicate information, ideas and concepts necessary for academic success in the content area of Science.

English language learners communicate for social and instructional purposes within the school setting.

Recognize common childhood health conditions.

Clarifications:
- Asthma, diabetes, food allergies, dental cavities, and colds.

Recognize that body parts and organs work together to form human body systems.

Clarifications:
- Circulatory system, digestive system, nervous system, reproductive system, and other body systems.

**GENERAL NOTES**

**Special Notes:**

**Instructional Practices**
Teaching from a range of complex text is optimized when teachers in all subject areas implement the following strategies on a routine basis:

1. Ensuring wide reading from complex text that varies in length.
2. Making close reading and rereading of text central to lessons.
3. Emphasizing text-specific complex questions, and cognitively complex tasks, reinforce focus on the text and cultivate independence.
4. Emphasizing students supporting answers based upon evidence from the text.
5. Providing extensive research and writing opportunities (claims and evidence).

**Science and Engineering Practices** (NRC Framework for K-12 Science Education, 2010)

- Asking questions (for science) and defining problems (for engineering).
- Developing and using models.
- Planning and carrying out investigations.
- Analyzing and interpreting data.
- Using mathematics, information and computer technology, and computational thinking.
- Constructing explanations (for science) and designing solutions (for engineering).
- Engaging in argument from evidence.
- Obtaining, evaluating, and communicating information.

**English Language Development ELD Standards Special Notes Section:**

Teachers are required to provide listening, speaking, reading and writing instruction that allows English language learners (ELL) to communicate information, ideas and concepts for academic success in the content area of Science. For the given level of English language proficiency and with visual, graphic, or interactive support, students will interact with grade level words, expressions, sentences and discourse to process or produce language necessary for academic success. The ELD standard should specify a relevant content area concept or topic of study chosen by curriculum developers and teachers which maximizes an ELL's need for communication and social skills.

To access an ELL supporting document which delineates performance definitions and descriptors, please click on the following link:
https://cpalmsmediaprod.blob.core.windows.net/uploads/docs/standards/eld/sc.pdf

**GENERAL INFORMATION**

**Course Number:** 5020040

**Course Path:** Section: Grades PreK to 12 Education
Courses > Grade Group: Grades PreK to 5 Education
Courses > Subject: Science > SubSubject: General
Sciences >
**Abbreviated Title:** SCIENCE GRADE THREE
**Course Length:** Year (Y)
### Educator Certifications

<table>
<thead>
<tr>
<th>Certification</th>
<th>Grade Level(s)</th>
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</thead>
<tbody>
<tr>
<td>Elementary Education (Elementary Grades 1-6)</td>
<td>1-6</td>
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<tr>
<td>Primary Education (K-3)</td>
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<tr>
<td>Science (Elementary Grades 1-6)</td>
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<tr>
<td>Prekindergarten/Primary Education (Age 3 through Grade 3)</td>
<td>3 through 3</td>
</tr>
<tr>
<td>Elementary Education (Grades K-6)</td>
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</tbody>
</table>

**Course Attributes:**
- Class Size Core Required

**Course Type:** Core Academic Course

**Course Status:** Course Approved

**Grade Level(s):** 3
### Course Standards

<table>
<thead>
<tr>
<th>Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>SC.3.E.5.1:</td>
<td>Explain that stars can be different; some are smaller, some are larger, and some appear brighter than others; all except the Sun are so far away that they look like points of light.</td>
</tr>
<tr>
<td>SC.3.E.5.2:</td>
<td>Identify the Sun as a star that emits energy; some of it in the form of light.</td>
</tr>
<tr>
<td>SC.3.E.5.3:</td>
<td>Recognize that the Sun appears large and bright because it is the closest star to Earth.</td>
</tr>
<tr>
<td>SC.3.E.5.4:</td>
<td>Explore the Law of Gravity by demonstrating that gravity is a force that can be overcome.</td>
</tr>
<tr>
<td>SC.3.E.5.5:</td>
<td>Investigate that the number of stars that can be seen through telescopes is dramatically greater than those seen by the unaided eye.</td>
</tr>
<tr>
<td>SC.3.E.6.1:</td>
<td>Demonstrate that radiant energy from the Sun can heat objects and when the Sun is not present, heat may be lost.</td>
</tr>
<tr>
<td>SC.3.L.14.1:</td>
<td>Describe structures in plants and their roles in food production, support, water and nutrient transport, and reproduction.</td>
</tr>
<tr>
<td>SC.3.L.14.2:</td>
<td>Investigate and describe how plants respond to stimuli (heat, light, gravity), such as the way plant stems grow toward light and their roots grow downward in response to gravity.</td>
</tr>
<tr>
<td>SC.3.L.15.1:</td>
<td>Classify animals into major groups (mammals, birds, reptiles, amphibians, fish, arthropods, vertebrates and invertebrates, those having live births and those which lay eggs) according to their physical characteristics and behaviors.</td>
</tr>
<tr>
<td>SC.3.L.15.2:</td>
<td>Classify flowering and nonflowering plants into major groups such as those that produce seeds, or those like ferns and mosses that produce spores, according to their physical characteristics.</td>
</tr>
<tr>
<td>SC.3.L.17.1:</td>
<td>Describe how animals and plants respond to changing seasons.</td>
</tr>
<tr>
<td>SC.3.L.17.2:</td>
<td>Recognize that plants use energy from the Sun, air, and water to make their own food.</td>
</tr>
<tr>
<td>SC.3.N.1.1:</td>
<td>Raise questions about the natural world, investigate them individually and in teams through free exploration and systematic investigations, and generate appropriate explanations based on those explorations.</td>
</tr>
<tr>
<td>SC.3.N.1.2:</td>
<td>Compare the observations made by different groups using the same tools and seek reasons to explain the differences across groups.</td>
</tr>
<tr>
<td>SC.3.N.1.3:</td>
<td>Keep records as appropriate, such as pictorial, written, or simple charts and graphs, of investigations conducted.</td>
</tr>
<tr>
<td>SC.3.N.1.4:</td>
<td>Recognize the importance of communication among scientists.</td>
</tr>
<tr>
<td>SC.3.N.1.5:</td>
<td>Recognize that scientists question, discuss, and check each other’s evidence and explanations.</td>
</tr>
<tr>
<td>SC.3.N.1.6:</td>
<td>Infer based on observation.</td>
</tr>
<tr>
<td>SC.3.N.1.7:</td>
<td>Explain that empirical evidence is information, such as observations or measurements, that is used to help validate explanations of natural phenomena.</td>
</tr>
<tr>
<td>SC.3.N.3.1:</td>
<td>Recognize that words in science have different or more specific meanings than their use in everyday language; for example, energy, cell, heat/cold, and evidence.</td>
</tr>
<tr>
<td>SC.3.N.3.2:</td>
<td>Recognize that scientists use models to help understand and explain how things work.</td>
</tr>
<tr>
<td>SC.3.N.3.3:</td>
<td>Recognize that all models are approximations of natural phenomena; as such, they do not perfectly account for all observations.</td>
</tr>
<tr>
<td>SC.3.P.8.1:</td>
<td>Measure and compare temperatures of various samples of solids and liquids.</td>
</tr>
<tr>
<td>SC.3.P.8.2:</td>
<td>Measure and compare the mass and volume of solids and liquids.</td>
</tr>
<tr>
<td>SC.3.P.8.3:</td>
<td>Compare materials and objects according to properties such as size, shape, color, texture, and hardness.</td>
</tr>
<tr>
<td>SC.3.P.9.1:</td>
<td>Describe the changes water undergoes when it changes state through heating and cooling by using familiar scientific terms such as melting, freezing, boiling, evaporation, and condensation.</td>
</tr>
<tr>
<td>SC.3.P.10.1:</td>
<td>Identify some basic forms of energy such as light, heat, sound, electrical, and mechanical.</td>
</tr>
<tr>
<td>SC.3.P.10.2:</td>
<td>Recognize that energy has the ability to cause motion or create change.</td>
</tr>
<tr>
<td>SC.3.P.10.3:</td>
<td>Demonstrate that light travels in a straight line until it strikes an object or travels from one medium to another.</td>
</tr>
<tr>
<td>SC.3.P.10.4:</td>
<td>Demonstrate that light can be reflected, refracted, and absorbed.</td>
</tr>
<tr>
<td>SC.3.P.11.1:</td>
<td>Investigate, observe, and explain that things that give off light often also give off heat.</td>
</tr>
<tr>
<td>SC.3.P.11.2:</td>
<td>Investigate, observe, and explain that heat is produced when one object rubs against another, such as rubbing one's hands together.</td>
</tr>
</tbody>
</table>

#### Clarifications:

Teachers who encourage students to participate actively in effortful learning both individually and with others:
- Cultivate a community of growth mindset learners.
- Foster perseverance in students by choosing tasks that are challenging.
- Develop students' ability to analyze and problem solve.
- Recognize students' effort when solving challenging problems.

Mathematicians who demonstrate understanding by representing problems in multiple ways:
- Build understanding through modeling and using manipulatives.
- Represent solutions to problems in multiple ways using objects, drawings, tables, graphs and equations.
- Progress from modeling problems with objects and drawings to using algorithms and equations.
- Express connections between concepts and representations.
- Choose a representation based on the given context or purpose.

Mathematicians who participate in effortful learning both individually and with others:
- Analyze the problem in a way that makes sense given the task.
- Ask questions that will help with solving the task.
- Build perseverance by modifying methods as needed while solving a challenging task.
- Stay engaged and maintain a positive mindset when working to solve tasks.
- Help and support each other when attempting a new method or approach.
Teachers who encourage students to demonstrate understanding by representing problems in multiple ways:
- Help students make connections between concepts and representations.
- Provide opportunities for students to use manipulatives when investigating concepts.
- Guide students from concrete to pictorial to abstract representations as understanding progresses.
- Show students that various representations can have different purposes and can be useful in different situations.

Complete tasks with mathematical fluency.
Mathematicians who complete tasks with mathematical fluency:
- Select efficient and appropriate methods for solving problems within the given context.
- Maintain flexibility and accuracy while performing procedures and mental calculations.
- Complete tasks accurately and with confidence.
- Adapt procedures to apply them to a new context.
- Use feedback to improve efficiency when performing calculations.

Clarifications:
Teachers who encourage students to complete tasks with mathematical fluency:
- Provide students with the flexibility to solve problems by selecting a procedure that allows them to solve efficiently and accurately.
- Offer multiple opportunities for students to practice efficient and generalizable methods.
- Provide opportunities for students to reflect on the methods they used and determine if a more efficient method could have been used.

Engage in discussions that reflect on the mathematical thinking of self and others.
Mathematicians who engage in discussions that reflect on the mathematical thinking of self and others:
- Communicate mathematical ideas, vocabulary and methods effectively.
- Analyze the mathematical thinking of others.
- Compare the efficiency of a method to those expressed by others.
- Recognize errors and suggest how to correctly solve the task.
- Justify results by explaining methods and processes.
- Construct possible arguments based on evidence.

Clarifications:
Teachers who encourage students to engage in discussions that reflect on the mathematical thinking of self and others:
- Establish a culture in which students ask questions of the teacher and their peers, and error is an opportunity for learning.
- Create opportunities for students to discuss their thinking with peers.
- Select, sequence and present student work to advance and deepen understanding of correct and increasingly efficient methods.
- Develop students' ability to justify methods and compare their responses to the responses of their peers.

Use patterns and structure to help understand and connect mathematical concepts.
Mathematicians who use patterns and structure to help understand and connect mathematical concepts:
- Focus on relevant details within a problem.
- Create plans and procedures to logically order events, steps or ideas to solve problems.
- Decompose a complex problem into manageable parts.
- Relate previously learned concepts to new concepts.
- Look for similarities among problems.
- Connect solutions of problems to more complicated large-scale situations.

Clarifications:
Teachers who encourage students to use patterns and structure to help understand and connect mathematical concepts:
- Help students recognize the patterns in the world around them and connect these patterns to mathematical concepts.
- Support students to develop generalizations based on the similarities found among problems.
- Provide opportunities for students to create plans and procedures to solve problems.
- Develop students' ability to construct relationships between their current understanding and more sophisticated ways of thinking.

Assess the reasonableness of solutions.
Mathematicians who assess the reasonableness of solutions:
- Estimate to discover possible solutions.
- Use benchmark quantities to determine if a solution makes sense.
- Check calculations when solving problems.
- Verify possible solutions by explaining the methods used.
- Evaluate results based on the given context.

Clarifications:
Teachers who encourage students to assess the reasonableness of solutions:
- Have students estimate or predict solutions prior to solving.
- Prompt students to continually ask, “Does this solution make sense? How do you know?”
- Reinforce that students check their work as they progress within and after a task.
- Strengthen students' ability to verify solutions through justifications.

Apply mathematics to real-world contexts.
Mathematicians who apply mathematics to real-world contexts:
- Connect mathematical concepts to everyday experiences.
- Use models and methods to understand, represent and solve problems.
- Perform investigations to gather data or determine if a method is appropriate. • Redesign models and methods to improve accuracy or
**MA.K12.MTR.7.1:**

**Clarifications:**
Teachers who encourage students to apply mathematics to real-world contexts:
- Provide opportunities for students to create models, both concrete and abstract, and perform investigations.
- Challenge students to question the accuracy of their models and methods.
- Support students as they validate conclusions by comparing them to the given situation.
- Indicate how various concepts can be applied to other disciplines.

**Clarity:**

Cite evidence to explain and justify reasoning.

**Clarifications:**
- K-1 Students include textual evidence in their oral communication with guidance and support from adults. The evidence can consist of details from the text without naming the text. During 1st grade, students learn how to incorporate the evidence in their writing.
- 2-3 Students include relevant textual evidence in their written and oral communication. Students should name the text when they refer to it. In 3rd grade, students should use a combination of direct and indirect citations.
- 4-5 Students continue with previous skills and reference comments made by speakers and peers. Students cite texts that they've directly quoted, paraphrased, or used for information. When writing, students will use the form of citation dictated by the instructor or the style guide referenced by the instructor.
- 6-8 Students continue with previous skills and use a style guide to create a proper citation.
- 9-12 Students continue with previous skills and should be aware of existing style guides and the ways in which they differ.

**ELA.K12.EE.1.1:**

**Clarifications:**
- Read and comprehend grade-level complex texts proficiently.

**ELA.K12.EE.2.1:**

**Clarifications:**
- See Text Complexity for grade-level complexity bands and a text complexity rubric.

**ELA.K12.EE.3.1:**

**Clarifications:**
- Students will make inferences before the words infer or inference are introduced. Kindergarten students will answer questions like "Why is the girl smiling?" or make predictions about what will happen based on the title page. Students will use the terms and apply them in 2nd grade and beyond.

**ELA.K12.EE.4.1:**

**Clarifications:**
- In kindergarten, students learn to listen to one another respectfully.
- In grades 1-2, students build upon these skills by justifying what they are thinking. For example: "I think ______ because ______." The collaborative conversations are becoming academic conversations.
- In grades 3-12, students engage in academic conversations discussing claims and justifying their reasoning, refining and applying skills. Students build on ideas, propel the conversation, and support claims and counterclaims with evidence.

**ELA.K12.EE.5.1:**

**Clarifications:**
- Students will incorporate skills learned into work products to produce quality work. For students to incorporate these skills appropriately, they must receive instruction. A 3rd grade student creating a poster board display must have instruction in how to effectively present information to do quality work.

**ELA.K12.EE.6.1:**

**Clarifications:**
- Use appropriate voice and tone when speaking or writing.

**ELD.K12.ELL.SC.1:**

**Clarifications:**
- English language learners communicate information, ideas and concepts necessary for academic success in the content area of Science.

**ELD.K12.ELL.SL.1:**

**Clarifications:**
- English language learners communicate for social and instructional purposes within the school setting.

**HE.3.C.1.4:**

**Clarifications:**
- Recognize common childhood health conditions.
- Asthma, diabetes, food allergies, dental cavities, and colds.

**HE.3.C.1.5:**

**Clarifications:**
- Circulatory system, digestive system, nervous system, reproductive system, and other body systems.

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**General Course Information and Notes**

**Special Notes:**

**Instructional Practices**

Teaching from a range of complex text is optimized when teachers in all subject areas implement the following strategies on a routine basis:

1. Ensuring wide reading from complex text that varies in length.
2. Making close reading and rereading of texts central to lessons.
3. Emphasizing text-specific complex questions, and cognitively complex tasks, reinforce focus on the text and cultivate independence.
4. Emphasizing students supporting answers based upon evidence from the text.
5. Providing extensive research and writing opportunities (claims and evidence).


- Asking questions (for science) and defining problems (for engineering).
- Developing and using models.
- Planning and carrying out investigations.
- Analyzing and interpreting data.
- Using mathematics, information and computer technology, and computational thinking.
- Constructing explanations (for science) and designing solutions (for engineering).
- Engaging in argument from evidence.
- Obtaining, evaluating, and communicating information.

Florida's Benchmarks for Excellent Student Thinking (B.E.S.T.) Standards
This course includes Florida's B.E.S.T. ELA Expectations (EE) and Mathematical Thinking and Reasoning Standards (MTRs) for students. Florida educators should intentionally embed these standards within the content and their instruction as applicable. For guidance on the implementation of the EEs and MTRs, please visit https://www.cpalms.org/Standards/BEST_Standards.aspx and select the appropriate B.E.S.T. Standards package.

English Language Development ELD Standards Special Notes Section:
Teachers are required to provide listening, speaking, reading and writing instruction that allows English language learners (ELL) to communicate information, ideas and concepts for academic success in the content area of Science. For the given level of English language proficiency and with visual, graphic, or interactive support, students will interact with grade level words, expressions, sentences and discourse to process or produce language necessary for academic success The ELD standard should specify a relevant content area concept or topic of study chosen by curriculum developers and teachers which maximizes an ELL's need for communication and social skills.
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GENERAL INFORMATION

Course Number: 5020040
Course Path: Grades PreK to 12 Education
Courses -> Grade Group: Grades PreK to 5 Education
Courses -> Subject: Science -> SubSubject: General Sciences
Abbreviated Title: SCIENCE GRADE THREE
Course Length: Year (Y)
Course Attributes:
- Class Size Core Required

Course Type: Core Academic Course
Course Status: State Board Approved
Grade Level(s): 3

Educator Certifications

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Course Standards

**SC.4.E.5.1:** Observe that the patterns of stars in the sky stay the same although they appear to shift across the sky nightly, and different stars can be seen in different seasons.

**SC.4.E.5.2:** Describe the changes in the observable shape of the moon over the course of about a month.

**SC.4.E.5.3:** Recognize that Earth revolves around the Sun in a year and rotates on its axis in a 24-hour day.

**SC.4.E.5.4:** Relate that the rotation of Earth (day and night) and apparent movements of the Sun, Moon, and stars are connected.

**SC.4.E.5.5:** Investigate and report the effects of space research and exploration on the economy and culture of Florida.

**SC.4.E.6.1:** Identify the three categories of rocks: igneous (formed from molten rock); sedimentary (pieces of other rocks and fossilized organisms); and metamorphic (formed from heat and pressure).

**SC.4.E.6.2:** Identify the physical properties of common earth-forming minerals, including hardness, color, luster, cleavage, and streak color, and recognize the role of minerals in the formation of rocks.

**SC.4.E.6.3:** Recognize that humans need resources found on Earth and that these are either renewable or nonrenewable.

**SC.4.E.6.4:** Describe the basic differences between physical weathering (breaking down of rock by wind, water, ice, temperature change, and plants) and erosion (movement of rock by gravity, wind, water, and ice).

**SC.4.E.6.5:** Investigate how technology and tools help to extend the ability of humans to observe very small things and very large things.

**SC.4.E.6.6:** Identify resources available in Florida (water, phosphate, oil, limestone, silicon, wind, and solar energy).

**SC.4.L.16.1:** Identify processes of sexual reproduction in flowering plants, including pollination, fertilization (seed production), seed dispersal, and germination.

**SC.4.L.16.2:** Explain that although characteristics of plants and animals are inherited, some characteristics can be affected by the environment.

**SC.4.L.16.3:** Recognize that animal behaviors may be shaped by heredity and learning.

**SC.4.L.16.4:** Compare and contrast the major stages in the life cycles of Florida plants and animals, such as those that undergo incomplete and complete metamorphosis, and flowering and nonflowering seed-bearing plants.

**SC.4.L.17.1:** Compare the seasonal changes in Florida plants and animals to those in other regions of the country.

**SC.4.L.17.2:** Explain that animals, including humans, cannot make their own food and that when animals eat plants or other animals, the energy stored in the food source is passed to them.

**SC.4.L.17.3:** Trace the flow of energy from the Sun as it is transferred along the food chain through the producers to the consumers.

**SC.4.L.17.4:** Recognize the ways plants and animals, including humans, can impact the environment.

**SC.4.N.1.1:** Raise questions about the natural world, use appropriate reference materials that support understanding to obtain information (identifying the source), conduct both individual and team investigations through free exploration and systematic investigations, and generate appropriate explanations based on those explorations.

**SC.4.N.1.2:** Compare the observations made by different groups using multiple tools and seek reasons to explain the differences across groups.

**SC.4.N.1.3:** Explain that science does not always follow a rigidly defined method ("the scientific method") but that science does involve the use of observations and empirical evidence.

**SC.4.N.1.4:** Attempt reasonable answers to scientific questions and cite evidence in support.

**SC.4.N.1.5:** Compare the methods and results of investigations done by other classmates.

**SC.4.N.1.6:** Keep records that describe observations made, carefully distinguishing actual observations from ideas and inferences about the observations.

**SC.4.N.1.7:** Recognize and explain that scientists base their explanations on evidence.

**SC.4.N.1.8:** Recognize that science involves creativity in designing experiments.

**SC.4.N.2.1:** Explain that science focuses solely on the natural world.

**SC.4.N.3.1:** Explain that models can be three dimensional, two dimensional, an explanation in your mind, or a computer model.

**SC.4.P.8.1:** Measure and compare objects and materials based on their physical properties including: mass, shape, volume, color, hardness, texture, odor, taste, attraction to magnets.

**SC.4.P.8.2:** Identify properties and common uses of water in each of its states.

**SC.4.P.8.3:** Explore the Law of Conservation of Mass by demonstrating that the mass of a whole object is always the same as the sum of the masses of its parts.

**SC.4.P.8.4:** Investigate and describe that magnets can attract magnetic materials and attract and repel other magnets.

**SC.4.P.9.1:** Identify some familiar changes in materials that result in other materials with different characteristics, such as decaying animal or plant matter, burning, rusting, and cooking.

**SC.4.P.10.1:** Observe and describe some basic forms of energy, including light, heat, sound, electrical, and the energy of motion.

**SC.4.P.10.2:** Investigate and describe that energy has the ability to cause motion or create change.

**SC.4.P.10.3:** Investigate and explain that sound is produced by vibrating objects and that pitch depends on how fast or slow the object vibrates.

**SC.4.P.10.4:** Describe how moving water and air are sources of energy and can be used to move things.

**SC.4.P.11.1:** Recognize that heat flows from a hot object to a cold object and that heat flow may cause materials to change temperature.

**SC.4.P.11.2:** Identify common materials that conduct heat well or poorly.

**SC.4.P.12.1:** Recognize that an object in motion always changes its position and may change its direction.

**SC.4.P.12.2:** Investigate and describe that the speed of an object is determined by the distance it travels in a unit of time and that objects can move at different speeds.

**MPS.F.4.D.1.1:** Know relative sizes of measurement units within one system of units including km, m, mm; kg, g; lb, oz.; l, ml; hr, min, sec. Within a single system of measurement, express measurements in a larger unit in terms of a smaller unit. Record measurement equivalents in a two-column table. For example, know that 1 ft is 12 times as long as 1 in. Express the length of a 4 ft snake as 48 in. Generate a conversion table for feet and inches listing the number pairs (1, 12), (2, 24), (3, 36), ...

**MPS.F.4.D.2.4:** Make a line plot to display a data set of measurements in fractions of a unit (1/2, 1/4, 1/8). Solve problems involving addition and subtraction of fractions by using information presented in line plots. For example, from a line plot find and interpret the difference in length between the longest and shortest specimens in an insect collection.
Make sense of problems and persevere in solving them.

Mathematically proficient students start by explaining to themselves the meaning of a problem and looking for entry points to its solution. They analyze given, constraints, relationships, and goals. They make conjectures about the form and meaning of the solution and plan a solution pathway rather than simply jumping into a solution attempt. They consider analogous problems, and try special cases and simpler forms of the original problem in order to gain insight into its solution. They monitor and evaluate their progress and change course if necessary. Older students might, depending on the context of the problem, transform algebraic expressions or change the viewing window on their graphing calculator to get the information they need. Mathematically proficient students can explain correspondences between equations, verbal descriptions, tables, and graphs or draw diagrams of important features and relationships, graph data, and search for regularity or trends. Younger students might rely on using concrete objects or pictures to help conceptualize and solve a problem. Mathematically proficient students check their answers to problems using a different method, and they continually ask themselves, "Does this make sense?" They can understand the approaches of others to solving complex problems and identify correspondences between different approaches.

Standard Relation to Course: Supporting

Reason abstractly and quantitatively.

Mathematically proficient students make sense of quantities and their relationships in problem situations. They bring two complementary abilities to bear on problems involving quantitative relationships: the ability to decontextualize—to abstract a given situation and represent it symbolically and manipulate the representing symbols as if they have a life of their own, without necessarily attending to their referents—and the ability to contextualize, to pause as needed during the manipulation process in order to probe into the referents for the symbols involved. Quantitative reasoning entails habits of creating a coherent representation of the problem at hand; considering the units involved; attending to the meaning of quantities, not just how to compute them; and knowing and flexibly using different properties of operations and objects.

Standard Relation to Course: Supporting

Construct viable arguments and critique the reasoning of others.

Mathematically proficient students understand and use stated assumptions, definitions, and previously established results in constructing arguments. They make conjectures and build a logical progression of statements to explore the truth of their conjectures. They are able to analyze situations by breaking them into cases, and can recognize and use counterexamples. They justify their conclusions, communicate them to others, and respond to the arguments of others. They reason inductively about data, making plausible arguments that take into account the context from which the data arose. Mathematically proficient students are also able to compare the effectiveness of two plausible arguments, distinguish correct logic or reasoning from that which is flawed, and—if there is a flaw in an argument—explain what it is. Elementary students can construct arguments using concrete referents such as objects, drawings, diagrams, and actions. Such arguments can make sense and be correct even though they are not generalized or made formal until later grades. Later, students learn to determine domains to which an argument applies. Students at all grades can listen or read the arguments of others, decide whether they make sense, and ask useful questions to clarify or improve the arguments.

Standard Relation to Course: Supporting

Model with mathematics.

Mathematically proficient students can apply the mathematics they know to solve problems arising in everyday life, society, and the workplace. In early grades, this might be as simple as writing an addition equation to describe a situation. In middle grades, a student might apply proportional reasoning to plan a school event or analyze a problem in the community. By high school, a student might use geometry to solve a design problem or use a function to describe how one quantity of interest depends on another. Mathematically proficient students who can apply what they know are comfortable making assumptions and approximations to simplify a complicated situation, realizing that these may need revision later. They are able to identify important quantities in a practical situation and map their relationships using such tools as diagrams, two-way tables, graphs, flowcharts and formulas. They can analyze those relationships mathematically to draw conclusions. They routinely interpret their mathematical results in the context of the situation and reflect on whether the results make sense, possibly improving the model if it has not served its purpose.

Standard Relation to Course: Supporting

Use appropriate tools strategically.

Mathematically proficient students consider the available tools when solving a mathematical problem. These tools might include pencil and paper, concrete models, a ruler, a protractor, a calculator, a spreadsheet, a computer algebra system, a statistical package, or dynamic geometry software. Proficient students are sufficiently familiar with tools appropriate for their grade or course to make sound decisions about when each of these tools might be helpful, recognizing both the insight to be gained and their limitations. For example, mathematically proficient high school students analyze graphs of functions and solutions generated using a graphing calculator. They detect possible errors by strategically using estimation and other mathematical knowledge. When making mathematical models, they know that technology can enable them to visualize the results of varying assumptions, explore consequences, and compare predictions with data. Mathematically proficient students at various grade levels are able to identify relevant external mathematical resources, such as digital content located on a website, and use them to pose or solve problems. They are able to use technological tools to explore and deepen their understanding of concepts.

Standard Relation to Course: Supporting

Attend to precision.

Mathematically proficient students try to communicate precisely to others. They try to use clear definitions in discussion with others and in their own reasoning. They state the meaning of the symbols they choose, including using the equal sign consistently and appropriately. They are careful about specifying units of measure, and labeling axes to clarify the correspondence with quantities in a problem. They calculate accurately and efficiently, express numerical answers with a degree of precision appropriate for the problem context. In the elementary grades, students give carefully formulated explanations to each other. By the time they reach high school they have learned to examine claims and make explicit use of definitions.

Standard Relation to Course: Supporting

Look for and make use of structure.

Mathematically proficient students look closely to discern a pattern or structure. Young students, for example, might notice that three and seven more is the same amount as seven and three more, or they may sort a collection of shapes according to how many sides the shapes have. Later, students will see 7 × 8 equals the well remembered 7 × 5 + 7 × 3, in preparation for learning about the distributive property. In the expression x² + 9x + 14, older students can see the 14 as 2 × 7 and the 9 as 2 × 7. They recognize the significance of an existing line in a geometric figure and can use the strategy of drawing an auxiliary line for solving problems. They also can step back for an overview and shift perspective. They can see complicated things, such as some algebraic expressions, as single objects or as being composed of several objects. For example, they can see 5 – 3(x – y)² as 5 minus a positive number times a square and use that to realize that its value cannot be more than 5 for any real numbers x and y.
General Course Information and Notes

GENERAL NOTES

Special Notes:

Instructional Practices
Teaching from a range of complex text is optimized when teachers in all subject areas implement the following strategies on a routine basis:

1. Ensuring wide reading from complex text that varies in length.
2. Making close reading and rereading of texts central to lessons.
3. Emphasizing text-specific complex questions, and cognitively complex tasks, reinforce focus on the text and cultivate independence.
4. Emphasizing students supporting answers based upon evidence from the text.
5. Providing extensive research and writing opportunities (claims and evidence).


- Asking questions (for science) and defining problems (for engineering).
- Developing and using models.
- Planning and carrying out investigations.
- Analyzing and interpreting data.
- Using mathematics, information and computer technology, and computational thinking.
- Constructing explanations (for science) and designing solutions (for engineering).
- Engaging in argument from evidence.
- Obtaining, evaluating, and communicating information.

Additional content addressed on the Grade 4 NAEP Science assessment includes:

- Earth materials have properties that make them useful in solving human problems and enhancing the quality of life. (SC.6.E.6.2)
- The Sun warms the land, air, and water and helps plants grow. (SC.3.E.6.1; SC.3.L.17.2)
- Weather changes from day to day and during the seasons. (SC.2.E.7.1)
- Scientists use tools for observing, recording, and predicting weather changes. (SC.5.E.7.3; SC.5.E.7.4)
Plants and animals have life cycles. (SC.2.L.16.1)
Environment changes impact organism survival and reproduction. (SC.5.L.15.1)
Organisms need food, water, air, and shelter. (SC.1.L.17.1)
Some objects are composed of a single substance; others are composed of more than one substance. (SC.5.P.8.3)
Heat (thermal energy) results when substances burn, materials rub against each other, and electricity flows though wires. (SC.3.P.11.2)
Metals are conductors of heat and electricity. (SC.3.P.11.2)
Increasing the temperature of any substance requires the addition of energy.
Electricity flowing through an electrical circuit produces magnetic effects in the wires. Energy is transferred to the surroundings as light, sound, and heat (thermal energy). (SC.5.P.11.1; SC.5.P.11.2)
The NAEP frameworks for Science may be accessed at http://www.nagb.org/publications/frameworks/science-09.pdf

English Language Development ELD Standards Special Notes Section:
Teachers are required to provide listening, speaking, reading and writing instruction that allows English language learners (ELL) to communicate information, ideas and concepts for academic success in the content area of Science. For the given level of English language proficiency and with visual, graphic, or interactive support, students will interact with grade level words, expressions, sentences and discourse to process or produce language necessary for academic success. The ELD standard should specify a relevant content area concept or topic of study chosen by curriculum developers and teachers which maximizes an ELL's need for communication and social skills. To access an ELL supporting document which delineates performance definitions and descriptors, please click on the following link: https://cpalmsmediaprod.blob.core.windows.net/uploads/docs/standards/eld/sc.pdf

GENERAL INFORMATION

Course Number: 5020050
Course Status: Course Approved
Grade Level(s): 4

Course Path: Section: Grades PreK to 12 Education
Courses > Grade Group: Grades PreK to 5 Education
Courses > Subject: Science > SubSubject: General Sciences
Abbreviated Title: SCIENCE GRADE FOUR
Course Length: Year (Y)
Course Attributes:
  - Class Size Core Required

Educator Certifications

<table>
<thead>
<tr>
<th>Elementary Education</th>
<th>(Elementary Grades 1-6)</th>
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<tbody>
<tr>
<td>Science</td>
<td>(Elementary Grades 1-6)</td>
</tr>
<tr>
<td>Elementary Education</td>
<td>(Grades K-6)</td>
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</tbody>
</table>
### Course Standards

<table>
<thead>
<tr>
<th>Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>SC.4.E.5.1</td>
<td>Observe that the patterns of stars in the sky stay the same although they appear to shift across the sky nightly, and different stars can be seen in different seasons.</td>
</tr>
<tr>
<td>SC.4.E.5.2</td>
<td>Describe the changes in the observable shape of the moon over the course of about a month.</td>
</tr>
<tr>
<td>SC.4.E.5.3</td>
<td>Recognize that Earth revolves around the Sun in a year and rotates on its axis in a 24-hour day.</td>
</tr>
<tr>
<td>SC.4.E.5.4</td>
<td>Relate that the rotation of Earth (day and night) and apparent movements of the Sun, Moon, and stars are connected.</td>
</tr>
<tr>
<td>SC.4.E.5.5</td>
<td>Investigate and report the effects of space research and exploration on the economy and culture of Florida.</td>
</tr>
<tr>
<td>SC.4.E.6.1</td>
<td>Identify the three categories of rocks: igneous (formed from molten rock); sedimentary (pieces of other rocks and fossilized organisms); and metamorphic (formed from heat and pressure).</td>
</tr>
<tr>
<td>SC.4.E.6.2</td>
<td>Identify the physical properties of common earth-forming minerals, including hardness, color, luster, cleavage, and streak color, and recognize the role of minerals in the formation of rocks.</td>
</tr>
<tr>
<td>SC.4.E.6.3</td>
<td>Recognize that humans need resources found on Earth and that these are either renewable or nonrenewable.</td>
</tr>
<tr>
<td>SC.4.E.6.4</td>
<td>Describe the basic differences between physical weathering (breaking down of rock by wind, water, ice, temperature change, and plants) and erosion (movement of rock by gravity, water, ice, wind, water, and ice).</td>
</tr>
<tr>
<td>SC.4.E.6.5</td>
<td>Investigate how technology and tools help to extend the ability of humans to observe very small things and very large things.</td>
</tr>
<tr>
<td>SC.4.E.6.6</td>
<td>Identify resources available in Florida (water, phosphate, oil, limestone, silicon, wind, and solar energy).</td>
</tr>
<tr>
<td>SC.4.L16.1</td>
<td>Identify processes of sexual reproduction in flowering plants, including pollination, fertilization (seed production), seed dispersal, and germination.</td>
</tr>
<tr>
<td>SC.4.L16.2</td>
<td>Explain that although characteristics of plants and animals are inherited, some characteristics can be affected by the environment.</td>
</tr>
<tr>
<td>SC.4.L16.3</td>
<td>Recognize that animal behaviors may be shaped by heredity and learning.</td>
</tr>
<tr>
<td>SC.4.L16.4</td>
<td>Compare and contrast the major stages in the life cycles of Florida plants and animals, such as those that undergo incomplete and complete metamorphosis, and flowering and nonflowering seed-bearing plants.</td>
</tr>
<tr>
<td>SC.4.L17.1</td>
<td>Compare the seasonal changes in Florida plants and animals to those in other regions of the country.</td>
</tr>
<tr>
<td>SC.4.L17.2</td>
<td>Explain that animals, including humans, cannot make their own food and that when animals eat plants or other animals, the energy stored in the food source is passed to them.</td>
</tr>
<tr>
<td>SC.4.L17.3</td>
<td>Trace the flow of energy from the Sun as it is transferred along the food chain through the producers to the consumers.</td>
</tr>
<tr>
<td>SC.4.L17.4</td>
<td>Recognize the ways plants and animals, including humans, can impact the environment.</td>
</tr>
<tr>
<td>SC.A.N.1.1</td>
<td>Raise questions about the natural world, use appropriate reference materials that support understanding to obtain information (identifying the source), conduct both individual and team investigations through free exploration and systematic investigations, and generate appropriate explanations based on those explorations.</td>
</tr>
<tr>
<td>SC.A.N.1.2</td>
<td>Compare the observations made by different groups using multiple tools and seek reasons to explain the differences across groups.</td>
</tr>
<tr>
<td>SC.A.N.1.3</td>
<td>Explain that science does not always follow a rigidly defined method (&quot;the scientific method&quot;) but that science does involve the use of observations and empirical evidence.</td>
</tr>
<tr>
<td>SC.A.N.1.4</td>
<td>Attempt reasonable answers to scientific questions and cite evidence in support.</td>
</tr>
<tr>
<td>SC.A.N.1.5</td>
<td>Compare the methods and results of investigations done by other classmates.</td>
</tr>
<tr>
<td>SC.A.N.1.6</td>
<td>Keep records that describe observations made, carefully distinguishing actual observations from ideas and inferences about the observations.</td>
</tr>
<tr>
<td>SC.A.N.1.7</td>
<td>Recognize and explain that scientists base their explanations on evidence.</td>
</tr>
<tr>
<td>SC.A.N.1.8</td>
<td>Recognize that science involves creativity in designing experiments.</td>
</tr>
<tr>
<td>SC.A.N.2.1</td>
<td>Explain that science focuses solely on the natural world.</td>
</tr>
<tr>
<td>SC.A.N.3.1</td>
<td>Explain that models can be three dimensional, two dimensional, an explanation in your mind, or a computer model.</td>
</tr>
<tr>
<td>SC.A.P.8.1</td>
<td>Measure and compare objects and materials based on their physical properties including: mass, shape, volume, color, hardness, texture, odor, taste, attraction to magnets.</td>
</tr>
<tr>
<td>SC.A.P.8.2</td>
<td>Identify properties and common uses of water in each of its states.</td>
</tr>
<tr>
<td>SC.A.P.8.3</td>
<td>Explore the Law of Conservation of Mass by demonstrating that the mass of a whole object is always the same as the sum of the masses of its parts.</td>
</tr>
<tr>
<td>SC.A.P.8.4</td>
<td>Investigate and describe that magnets can attract magnetic materials and attract and repel other magnets.</td>
</tr>
<tr>
<td>SC.A.P.9.1</td>
<td>Identify some familiar changes in materials that result in other materials with different characteristics, such as decaying animal or plant matter, burning, rusting, and cooking.</td>
</tr>
<tr>
<td>SC.A.P.10.1</td>
<td>Observe and describe some basic forms of energy, including light, heat, sound, electrical, and the energy of motion.</td>
</tr>
<tr>
<td>SC.A.P.10.2</td>
<td>Investigate and describe that energy has the ability to cause motion or create change.</td>
</tr>
<tr>
<td>SC.A.P.10.3</td>
<td>Investigate and explain that sound is produced by vibrating objects and that pitch depends on how fast or slow the object vibrates.</td>
</tr>
<tr>
<td>SC.A.P.10.4</td>
<td>Describe how moving water and air are sources of energy and can be used to move things.</td>
</tr>
<tr>
<td>SC.A.P.11.1</td>
<td>Recognize that heat flows from a hot object to a cold object and that heat flow may cause materials to change temperature.</td>
</tr>
<tr>
<td>SC.A.P.11.2</td>
<td>Identify common materials that conduct heat well or poorly.</td>
</tr>
<tr>
<td>SC.A.P.12.1</td>
<td>Recognize that an object in motion always changes its position and may change its direction.</td>
</tr>
<tr>
<td>SC.A.P.12.2</td>
<td>Investigate and describe that the speed of an object is determined by the distance it travels in a unit of time and that objects can move at different speeds.</td>
</tr>
</tbody>
</table>
Teachers who encourage students to participate actively in effortful learning both individually and with others:
- Cultivate a community of growth mindset learners.
- Foster perseverance in students by choosing tasks that are challenging.
- Develop students' ability to analyze and problem solve.
- Recognize students' effort when solving challenging problems.

Demonstrate understanding by representing problems in multiple ways.
Mathematicians who demonstrate understanding by representing problems in multiple ways:
- Build understanding through modeling and using manipulatives.
- Represent solutions to problems in multiple ways using objects, drawings, tables, graphs and equations.
- Progress from modeling problems with objects and drawings to using algorithms and equations.
- Express connections between concepts and representations.
- Choose a representation based on the given context or purpose.

Clarifications:
Teachers who encourage students to demonstrate understanding by representing problems in multiple ways:
- Help students make connections between concepts and representations.
- Provide opportunities for students to use manipulatives when investigating concepts.
- Guide students from concrete to pictorial to abstract representations as understanding progresses.
- Show students that various representations can have different purposes and can be useful in different situations.

Complete tasks with mathematical fluency.
Mathematicians who complete tasks with mathematical fluency:
- Select efficient and appropriate methods for solving problems within the given context.
- Maintain flexibility and accuracy while performing procedures and mental calculations.
- Complete tasks accurately and with confidence.
- Adapt procedures to apply them to a new context.
- Use feedback to improve efficiency when performing calculations.

Clarifications:
Teachers who encourage students to complete tasks with mathematical fluency:
- Provide students with the flexibility to solve problems by selecting a procedure that allows them to solve efficiently and accurately.
- Offer multiple opportunities for students to practice efficient and generalizable methods.
- Provide opportunities for students to reflect on the method they used and determine if a more efficient method could have been used.

Engage in discussions that reflect on the mathematical thinking of self and others.
Mathematicians who engage in discussions that reflect on the mathematical thinking of self and others:
- Communicate mathematical ideas, vocabulary and methods effectively.
- Analyze the mathematical thinking of others.
- Compare the efficiency of a method to those expressed by others.
- Recognize errors and suggest how to correctly solve the task.
- Justify results by explaining methods and processes.
- Construct possible arguments based on evidence.

Clarifications:
Teachers who encourage students to engage in discussions that reflect on the mathematical thinking of self and others:
- Establish a culture in which students ask questions of the teacher and their peers, and error is an opportunity for learning.
- Create opportunities for students to discuss their thinking with peers.
- Select, sequence and present student work to advance and deepen understanding of correct and increasingly efficient methods.
- Develop students' ability to justify methods and compare their responses to the responses of their peers.

Use patterns and structure to help understand and connect mathematical concepts.
Mathematicians who use patterns and structure to help understand and connect mathematical concepts:
- Focus on relevant details within a problem.
- Create plans and procedures to logically order events, steps or ideas to solve problems.
- Decompose a complex problem into manageable parts.
- Relate previously learned concepts to new concepts.
- Look for similarities among problems.
- Connect solutions of problems to more complicated large-scale situations.

Clarifications:
Teachers who encourage students to use patterns and structure to help understand and connect mathematical concepts:
- Help students recognize the patterns in the world around them and connect these patterns to mathematical concepts.
- Support students to develop generalizations based on the similarities found among problems.
- Provide opportunities for students to create plans and procedures to solve problems.
- Develop students' ability to construct relationships between their current understanding and more sophisticated ways of thinking.

Assess the reasonableness of solutions.
Mathematicians who assess the reasonableness of solutions:
- Estimate to discover possible solutions.
- Use benchmark quantities to determine if a solution makes sense.
- Check calculations when solving problems.
- Verify possible solutions by explaining the methods used.
- Evaluate results based on the given context.
### English Language Learners

**Connect mathematical concepts to everyday experiences.**

- Use models and methods to understand, represent, and solve problems.
- Perform investigations to gather data or determine if a method is appropriate. • Redesign models and methods to improve accuracy or efficiency.

### Math K12.MTR.7.1:

- Perform investigations to gather data or determine if a method is appropriate. • Redesign models and methods to improve accuracy or efficiency.

### ELA.K12.EE.1.1:

- K-1 Students include textual evidence in their oral communication with guidance and support from adults.
- 2-3 Students include textual evidence in their written and oral communication. Students should name the text when they refer to it. In 3rd grade, students should use a combination of direct and indirect citations.
- 4-5 Students continue with previous skills and reference comments made by speakers and peers. Students cite texts that they've directly quoted, paraphrased, or used for information. When writing, students will use the form of citation dictated by the instructor or the style guide referenced by the instructor.
- 6-8 Students continue with previous skills and use a style guide to create a proper citation.
- 9-12 Students continue with previous skills and should be aware of existing style guides and the ways in which they differ.

### ELA.K12.EE.2.1:

- Read and comprehend grade-level complex texts proficiently.

### ELA.K12.EE.3.1:

- Students will make inferences before the words infer or inference are introduced. Kindergarten students will answer questions like "Why is the girl smiling?" or make predictions about what will happen based on the title page. Students will use the terms and apply them in 2nd grade and beyond.

### ELA.K12.EE.4.1:

- Use appropriate collaborative techniques and active listening skills when engaging in discussions in a variety of situations.

### ELA.K12.EE.5.1:

- Use the accepted rules governing a specific format to create quality work.

### ELA.K12.EE.6.1:

- Use appropriate voice and tone when speaking or writing.

### ELD.K12.ELL.SI.1:

- Identify the human body parts and organs that work together to form healthy body systems.

### HE.4.C.1.5:

- Muscular and skeletal systems, circulatory and respiratory systems, and endocrine and reproductive systems.

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**General Course Information and Notes**

**GENERAL NOTES**

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**Cite evidence to explain and justify reasoning.**

**Clarifications:**

- K-1 Students include textual evidence in their oral communication with guidance and support from adults. The evidence can consist of details from the text without naming the text. During 1st grade, students learn how to incorporate the evidence in their writing.
- 2-3 Students include relevant textual evidence in their written and oral communication. Students should name the text when they refer to it. In 3rd grade, students should use a combination of direct and indirect citations.
- 4-5 Students continue with previous skills and reference comments made by speakers and peers. Students cite texts that they've directly quoted, paraphrased, or used for information. When writing, students will use the form of citation dictated by the instructor or the style guide referenced by the instructor.
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**Context:**

- Identifying body parts and organs.

**Clarifications:**

- Muscular and skeletal systems, circulatory and respiratory systems, and endocrine and reproductive systems.

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**Teachers who encourage students to assess the reasonableness of solutions:**

- Have students estimate or predict solutions prior to solving.
- Prompt students to continually ask, "Does this solution make sense? How do you know?"
- Reinforce that students check their work as they progress within and after a task.
- Strengthen students' ability to verify solutions through justifications.

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**Teachers who encourage students to apply mathematics to real-world contexts:**

- Provide opportunities for students to create models, both concrete and abstract, and perform investigations.
- Challenge students to question the accuracy of their models and methods.
- Support students as they validate conclusions by comparing them to the given situation.
- Indicate how various concepts can be applied to other disciplines.
**Special Notes:**

**Instructional Practices**
Teaching from a range of complex text is optimized when teachers in all subject areas implement the following strategies on a routine basis:

1. Ensuring wide reading from complex text that varies in length.
2. Making close reading and rereading of texts central to lessons.
3. Emphasizing text-specific complex questions, and cognitively complex tasks, reinforce focus on the text and cultivate independence.
4. Emphasizing students supporting answers based upon evidence from the text.
5. Providing extensive research and writing opportunities (claims and evidence).

**Science and Engineering Practices (NRC Framework for K-12 Science Education, 2010)**
- Asking questions (for science) and defining problems (for engineering).
- Developing and using models.
- Planning and carrying out investigations.
- Analyzing and interpreting data.
- Using mathematics, information and computer technology, and computational thinking.
- Constructing explanations (for science) and designing solutions (for engineering).
- Engaging in argument from evidence.
- Obtaining, evaluating, and communicating information.

Additional content addressed on the Grade 4 NAEP Science assessment includes:

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The NAEP frameworks for Science may be accessed at http://www.nagb.org/publications/frameworks/science-09.pdf

**Florida's Benchmarks for Excellent Student Thinking (B.E.S.T.) Standards**
This course includes Florida's B.E.S.T. ELA Expectations (EE) and Mathematical Thinking and Reasoning Standards (MTRs) for students. Florida educators should intentionally embed these standards within the content and their instruction as applicable. For guidance on the implementation of the EEs and MTRs, please visit https://www.cpalms.org/Standards/BEST_Standards.aspx and select the appropriate B.E.S.T. Standards package.

**English Language Development ELD Standards Special Notes Section:**
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**GENERAL INFORMATION**

**Course Number:** 5020050

**Course Type:** Core Academic Course

**Course Status:** State Board Approved

**Grade Level(s):** 4

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**Educator Certifications**
Recognize and explain that science is grounded in empirical evidence.

Investigate and explain that electrical energy can be transformed into other forms of energy.

Investigate and explain that when a force is applied to an object but it does not move, the evidence produced by those investigations should be replicable by others.

Recognize and explain the need for repeated experimental trials.

Distinguish among the following objects of the Solar System -- Sun, planets, moons, asteroids, comets -- and identify Earth's position in it.

Recognize that the ocean is an integral part of the water cycle and is connected to all of Earth's water reservoirs via evaporation and precipitation processes.

Recognize how air temperature, barometric pressure, humidity, wind speed and direction, and precipitation determine the weather in a particular place and time.

Investigate and describe that many physical and chemical changes are affected by temperature.

Recognize that a galaxy consists of gas, dust, and many stars, including any objects orbiting the stars. Identify our home galaxy as the Milky Way.

Identify the organs in the human body and describe their functions, including the skin, brain, heart, lungs, stomach, liver, intestines, pancreas, muscles and skeleton, reproductive organs, kidneys, bladder, and sensory organs.

Compare and contrast the function of organs and other physical structures of plants and animals, including humans, for example: some animals have skeletons for support -- some with internal skeletons others with exoskeletons -- while some plants have stems for support.

Describe how, when the environment changes, differences between individuals allow some plants and animals to survive and reproduce while others die or move to new locations.

Design a family preparedness plan for natural disasters and identify the reasons for having such a plan.

Compare and contrast adaptations displayed by animals and plants that enable them to survive in different environments such as life cycles variations, animal behaviors and physical characteristics.

Explain the difference between an experiment and other types of scientific investigation.

Identify the skin, brain, heart, lungs, stomach, liver, intestines, pancreas, muscles and skeleton, reproductive organs, kidneys, bladder, and sensory organs.

Describe how, when the environment changes, differences between individuals allow some plants and animals to survive and reproduce while others die or move to new locations.

Compare and contrast adaptations displayed by animals and plants that enable them to survive in different environments such as life cycles variations, animal behaviors and physical characteristics.

Define a problem, use appropriate reference materials to support scientific understanding, plan and carry out scientific investigations of various types such as: systematic observations, experiments requiring the identification of variables, collecting and organizing data, interpreting data in charts, tables, and graphs, analyze information, make predictions, and defend conclusions.

Recognize and explain that a galaxy consists of gas, dust, and many stars, including any objects orbiting the stars. Identify our home galaxy as the Milky Way.

Investigate and identify materials that will dissolve in water and those that will not and identify the conditions that will speed up or slow down the dissolving process.

Compare and contrast the basic properties of solids, liquids, and gases, such as mass, volume, color, texture, and temperature.

Investigate and identify materials that will dissolve in water and those that will not and identify the conditions that will speed up or slow down the dissolving process.

Demonstrate and explain that mixtures of solids can be separated based on observable properties of their parts such as particle size, shape, color, and magnetic attraction.

Explore the scientific theory of atoms (also called atomic theory) by recognizing that all matter is composed of parts that are too small to be seen without magnification.

Investigate and describe that many physical and chemical changes are affected by temperature.

Investigate and describe some basic forms of energy, including light, heat, sound, electrical, chemical, and mechanical.

Investigate and explain that energy has the ability to cause motion or create change.

Investigate and explain that an electrically-charged object can attract an uncharged object and can either attract or repel another charged object without any contact between the objects.

Investigate and explain that electrical energy can be transformed into heat, light, and sound energy, as well as the energy of motion.

Investigate and illustrate the fact that the flow of electricity requires a closed circuit (a complete loop).

Identify and classify materials that conduct electricity and materials that do not.

Identify familiar forces that cause objects to move, such as pushes or pulls, including gravity acting on falling objects.

Investigate and describe that the greater the force applied to it, the greater the change in motion of a given object.

Investigate and describe that the more mass an object has, the less effect a given force will have on the object's motion.

Investigate and explain that when a force is applied to an object but it does not move, it is because another opposing force is being applied by something in the environment so that the forces are balanced.

Use a pair of perpendicular number lines, called axes, to define a coordinate system, with the intersection of the lines (the origin) arranged to coincide with the 0 on each line and a given point in the plane located by using an ordered pair of numbers, called its coordinates. Understand that the first number indicates how far to travel from the origin in the direction of one axis, and the second number indicates how far to travel in the direction of the second axis, with the convention that the names of the two axes and the coordinates correspond (e.g., x-axis and y-coordinate, y-axis and x-coordinate).

Make a line plot to display a data set of measurements in fractions of a unit (1/2, 1/4, 1/8). Use operations on fractions for this grade to solve problems involving information presented in line plots. For example, given different measurements of liquid in identical beakers, find the amount of liquid in each beaker would contain if the total amount in all the beakers was redistributed equally.

Make sense of problems and persevere in solving them.
Mathematically proficient students start by explaining to themselves the meaning of a problem and looking for entry points to its solution. They analyze given conditions, constraints, relationships, and goals. They make conjectures about the form and meaning of the solution and plan a solution pathway rather than simply jumping into a solution attempt. They consider analogous problems, and try special cases and simpler forms of the original problem in order to gain insight into its solution. They monitor and evaluate their progress and change course if necessary. Older students might, depending on the context of the problem, transform algebraic expressions or change the viewing window on their graphing calculator to get a relevant perspective. Younger students might rely on using concrete objects or pictures to help conceptualize and solve a problem. Mathematically proficient students check their answers to problems using a different method, and they continually ask themselves, “Does this make sense?” They can understand the approaches of others to solving complex problems and identify correspondences between different approaches.

**Standard Relation to Course: Supporting**

**MAFS.K12.MP.1.1:**

- Reason abstractly and quantitatively.
- Mathematically proficient students make sense of quantities and their relationships in problem situations. They bring two complimentary abilities to problems involving quantitative relationships: the ability to decontextualize—to abstract a given situation and represent it symbolically and manipulate the representing symbols as if they have a life of their own, without necessarily attending to their referents—and the ability to contextualize, to pause as needed during the manipulation process in order to probe into the referents for the symbols involved. Quantitative reasoning entails habits of creating a coherent representation of the problem at hand; considering the units involved; attending to the meaning of quantities, not just how to compute them; and knowing and flexibly using different properties of operations and objects.

**MAFS.K12.MP.2.1:**

- Construct viable arguments and critique the reasoning of others.
- Mathematically proficient students understand and use stated assumptions, definitions, and previously established results in constructing arguments. They make conjectures and build a logical progression of statements to explore the truth of their conjectures. They are able to analyze situations by breaking them into cases, and can recognize and use counterexamples. They justify their conclusions, communicate them to others, and respond to the arguments of others. They reason inductively about data, make plausible arguments that take into account the context from which the data arose. Mathematically proficient students are also able to compare the effectiveness of two plausible arguments, distinguish correct logic or reasoning from that which is flawed, and—if there is a flaw in an argument—explain what it is. Elementary students can construct arguments using concrete referents such as objects, drawings, diagrams, and actions. Such arguments can make sense and be correct, even though they are not generalized or made formal until later grades. Later, students learn to determine domains to which an argument applies. Students at all grades can listen or read the arguments of others, decide whether they make sense, and ask useful questions to clarify or improve the arguments.

**MAFS.K12.MP.3.1:**

- Model with mathematics.
- Mathematically proficient students can apply the mathematics they know to solve problems arising in everyday life, society, and the workplace. In early grades, this might be as simple as writing an addition equation to describe a situation. In middle grades, a student might apply proportional reasoning to plan a school event or analyze a problem in a community. By high school, a student might use geometry to solve a design problem or use a function to describe how one quantity of interest depends on another. Mathematically proficient students who can apply what they know are comfortable making assumptions and approximations to simplify a complicated situation, realizing that these may need revision later. They are able to identify important quantities in a practical situation and map their relationships using such tools as diagrams, two-way tables, graphs, flowcharts and formulas. They can analyze those relationships mathematically to draw conclusions. They routinely interpret their mathematical results in the context of the situation and reflect on whether the results make sense, possibly improving the model if it has not served its purpose.

**MAFS.K12.MP.4.1:**

- Use appropriate tools strategically.
- Mathematically proficient students consider the available tools when solving a mathematical problem. These tools might include pencil and paper, concrete models, a ruler, a protractor, a calculator, a spreadsheet, a computer algebra system, a statistical package, or dynamic geometry software. Proficient students are sufficiently familiar with tools appropriate for their grade or course to make sound decisions about when each of these tools might be helpful, recognizing both the insight to be gained and their limitations. For example, mathematical proficient high school students analyze graphs of functions and solutions generated using a graphing calculator. They detect possible errors by strategically using estimation and other mathematical knowledge. When making mathematical models, they know that technology can enable them to visualize the results of varying assumptions, explore consequences, and compare predictions with data. Mathematically proficient students at various grade levels are able to identify relevant external mathematical resources, such as digital content located on a website, and use them to pose or solve problems. They are able to use technological tools to explore and deepen their understanding of concepts.

**MAFS.K12.MP.5.1:**

- Attend to precision.
- Mathematically proficient students try to communicate precisely to others. They try to use clear definitions in discussion with others and in their own reasoning. They state the meaning of the symbols they choose, including using the equal sign consistently and appropriately. They are careful about specifying units of measure, and labeling axes to clarify the correspondence with quantities in a problem. They calculate accurately and efficiently, express numerical answers with a degree of precision appropriate for the problem context. In the elementary grades, students give carefully formulated explanations to each other. By the time they reach high school they have learned to examine claims and make explicit use of definitions.

**MAFS.K12.MP.6.1:**

- Look for and make use of structure.
- Mathematically proficient students look closely to discern a pattern or structure. Young students, for example, might notice that three and seven more is the same amount as seven and three more, or they may sort a collection of shapes according to how many sides the shapes have. Later, students will see 7 + 8 equals the well remembered 7 + 5 + 3, in preparation for learning about the distributive property. In the expression x² + 9x + 14, older students can see the 14 as 2 × 7 and the 9 as 2 + 7. They recognize the significance of an existing line in a geometric figure and can use the strategy of drawing an auxiliary line for solving problems. They also can step back for an overview and shift perspective. They can see complicated things, such as some algebraic expressions, as single objects or as being composed of several objects. For example, they can see 5 – 3(x – y²) as 5 minus a positive number times a square and use that to realize that its value cannot be more than 5 for any real numbers x and y.

**MAFS.K12.MP.7.1:**

- Standard Relation to Course: Supporting

- Look for and make use of structure.

- Mathematically proficient students look closely to discern a pattern or structure. Young students, for example, might notice that three and seven more is the same amount as seven and three more, or they may sort a collection of shapes according to how many sides the shapes have. Later, students will see 7 + 8 equals the well remembered 7 + 5 + 3, in preparation for learning about the distributive property. In the expression x² + 9x + 14, older students can see the 14 as 2 × 7 and the 9 as 2 + 7. They recognize the significance of an existing line in a geometric figure and can use the strategy of drawing an auxiliary line for solving problems. They also can step back for an overview and shift perspective. They can see complicated things, such as some algebraic expressions, as single objects or as being composed of several objects. For example, they can see 5 – 3(x – y²) as 5 minus a positive number times a square and use that to realize that its value cannot be more than 5 for any real numbers x and y.
Look for and express regularity in repeated reasoning.

Mathematically proficient students notice if calculations are repeated, and look both for general methods and for shortcuts. Upper elementary students might notice when dividing 25 by 11 that they are repeating the same calculations over and over again, and conclude they have a repeating decimal. By paying attention to the calculation of slope as they repeatedly check whether points are on the line through (1, 2) with slope 3, middle school students might abstract the equation \( y - 2 = 3(x - 1) \), noticing the regularity in the way terms cancel when expanding \((x - 1)(x + 1), (x - 1)(x^2 + x + 1), \) and \((x - 1)(x^3 + x^2 + x + 1)\) might lead them to the general formula for the sum of a geometric series. As they work to solve a problem, mathematically proficient students maintain oversight of the process, while attending to the details. They continually evaluate the reasonableness of their intermediate results.

**Standard to Course: Supporting**

LAFS.5.RI.3.8: Explain the relationships or interactions between two or more individuals, events, ideas, or concepts in a historical, scientific, or technical text based on specific information in the text.

LAFS.5.RI.3.9: Draw evidence from literary or informational texts to support analysis, reflection, and research.

LAFS.5.RI.4.10: By the end of the year, read and comprehend informational texts, including history/social studies, science, and technical texts, at the high end of the grades 4–5 text complexity band independently and proficiently.

LAFS.5.SL.1.1: Engage effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grade 5 topics and texts, building on others’ ideas and expressing their own clearly.

- a. Come to discussions prepared, having read or studied required material; explicitly draw on that preparation and other information known about the topic to explore ideas under discussion.
- b. Follow agreed-upon rules for discussions and carry out assigned roles.
- c. Pose and respond to specific questions by making comments that contribute to the discussion and elaborate on the remarks of others.
- d. Review the key ideas expressed and draw conclusions in light of information and knowledge gained from the discussions.

LAFS.5.W.3.8: Recall relevant information from experiences or gather relevant information from print and digital sources; summarize or paraphrase information in notes and finished work; and provide a list of sources.

LAFS.5.W.3.9: Apply grade 5 Reading standards to literature (e.g., “Compare and contrast two or more characters, settings, or events in a story or a drama, drawing on specific details in the text [e.g., how characters interact]”).

LAFS.5.W.4.10: Apply grade 5 Reading standards to informational texts (e.g., “Explain how an author uses reasons and evidence to support particular points in a text, identifying which reasons and evidence support which point(s)”).

**General Course Information and Notes**

**GENERAL NOTES**

**Special Notes:**

**Instructional Practices**

Teaching from a range of complex text is optimized when teachers in all subject areas implement the following strategies on a routine basis:

1. Ensuring wide reading from complex text that varies in length.
2. Making close reading and rereading of texts central to lessons.
3. Emphasizing text-specific complex questions, and cognitively complex tasks, reinforce focus on the text and cultivate independence.
4. Emphasizing students supporting answers based upon evidence from the text.
5. Providing extensive research and writing opportunities (claims and evidence).

**Science and Engineering Practices** (NRC Framework for K-12 Science Education, 2010)

- Asking questions (for science) and defining problems (for engineering).
- Developing and using models.
- Planning and carrying out investigations.
- Analyzing and interpreting data.
- Using mathematics, information and computer technology, and computational thinking.
- Constructing explanations (for science) and designing solutions (for engineering).
- Engaging in argument from evidence.
- Obtaining, evaluating, and communicating information.

**English Language Development ELD Standards Special Notes Section:**

Teachers are required to provide listening, speaking, reading and writing instruction that allows English language learners (ELL) to communicate information, ideas and concepts for academic success in the content area of Science. For the given level of English language proficiency and with visual, graphic, or interactive support, students will interact with grade level words, expressions, sentences and discourse to process or produce language necessary for academic success. The ELD standard should specify a relevant content area concept or topic of study chosen by curriculum developers and teachers which maximizes an ELL’s need for communication and social skills. To access an ELL supporting document which delineates performance definitions and descriptors, please click on the following link:

https://cpalmsmediaprod.blob.core.windows.net/uploads/docs/standards/eld/sc.pdf
General Information

Course Number: 5020060

Course Path: Section: Grades PreK to 12 Education
Courses > Grade Group: Grades PreK to 5 Education
Courses > Subject: Science > SubSubject: General Sciences
Abbreviated Title: SCIENCE GRADE FIVE
Course Length: Year (Y)
Course Attributes:
  - Class Size Core Required

Course Type: Core Academic Course
Course Status: Course Approved
Grade Level(s): 5

Educator Certifications

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<tr>
<th>Certification</th>
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<tbody>
<tr>
<td>Elementary Education (Elementary Grades 1-6)</td>
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<tr>
<td>Middle Grades General Science (Middle Grades 5-9)</td>
</tr>
<tr>
<td>Science (Elementary Grades 1-6)</td>
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<tr>
<td>Elementary Education (Grades K-6)</td>
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### Course Standards

<table>
<thead>
<tr>
<th>Name</th>
<th>Description</th>
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<tbody>
<tr>
<td>SC.5.E.5.1:</td>
<td>Recognize that a galaxy consists of gas, dust, and many stars, including any objects orbiting the stars. Identify our home galaxy as the Milky Way.</td>
</tr>
<tr>
<td>SC.5.E.5.2:</td>
<td>Recognize the major common characteristics of all planets and compare/contrast the properties of inner and outer planets.</td>
</tr>
<tr>
<td>SC.5.E.5.3:</td>
<td>Distinguish among the following objects of the Solar System—Sun, planets, moons, asteroids, comets—and identify Earth's position in it.</td>
</tr>
<tr>
<td>SC.5.E.7.1:</td>
<td>Create a model to explain the parts of the water cycle. Water can be a gas, a liquid, or a solid and can go back from one state to another.</td>
</tr>
<tr>
<td>SC.5.E.7.2:</td>
<td>Recognize that the ocean is an integral part of the water cycle and is connected to all of Earth's water reservoirs via evaporation and precipitation processes.</td>
</tr>
<tr>
<td>SC.5.E.7.3:</td>
<td>Recognize how air temperature, barometric pressure, humidity, wind speed and direction, and precipitation determine the weather in a particular place and time.</td>
</tr>
<tr>
<td>SC.5.E.7.4:</td>
<td>Distinguish among the various forms of precipitation (rain, snow, sleet, and hail), making connections to the weather in a particular place and time.</td>
</tr>
<tr>
<td>SC.5.E.7.5:</td>
<td>Recognize that some of the weather-related differences, such as temperature and humidity, are found among different environments, such as swamps, deserts, and mountains.</td>
</tr>
<tr>
<td>SC.5.E.7.6:</td>
<td>Describe characteristics (temperature and precipitation) of different climate zones as they relate to latitude, elevation, and proximity to bodies of water.</td>
</tr>
<tr>
<td>SC.5.E.7.7:</td>
<td>Design a family preparedness plan for natural disasters and identify the reasons for having such a plan.</td>
</tr>
<tr>
<td>SC.5.L.14.1:</td>
<td>Identify the organs in the human body and describe their functions, including the skin, brain, heart, lungs, stomach, liver, intestines, pancreas, muscles and skeleton, reproductive organs, kidneys, bladder, and sensory organs.</td>
</tr>
<tr>
<td>SC.5.L.14.2:</td>
<td>Compare and contrast the function of organs and other physical structures of plants and animals, including humans, for example: some animals have skeletons for support—some with internal skeletons others with exoskeletons—while some plants have stems for support.</td>
</tr>
<tr>
<td>SC.5.L.15.1:</td>
<td>Describe how, when the environment changes, differences between individuals allow some plants and animals to survive and reproduce while others die or move to new locations.</td>
</tr>
<tr>
<td>SC.5.L.17.1:</td>
<td>Compare and contrast adaptations displayed by animals and plants that enable them to survive in different environments such as life cycles variations, animal behaviors and physical characteristics.</td>
</tr>
<tr>
<td>SC.5.N.1.1:</td>
<td>Define a problem, use appropriate reference materials to support scientific understanding, plan and carry out scientific investigations of various types such as: systematic observations, experiments requiring the identification of variables, collecting and organizing data, interpreting data in charts, tables, and graphics, analyze information, make predictions, and defend conclusions.</td>
</tr>
<tr>
<td>SC.5.N.1.2:</td>
<td>Explain the difference between an experiment and other types of scientific investigation.</td>
</tr>
<tr>
<td>SC.5.N.1.3:</td>
<td>Recognize and explain the need for repeated experimental trials.</td>
</tr>
<tr>
<td>SC.5.N.1.4:</td>
<td>Identify a control group and explain its importance in an experiment.</td>
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<tr>
<td>SC.5.N.1.5:</td>
<td>Recognize and explain that authentic scientific investigation frequently does not parallel the steps of &quot;the scientific method.&quot;</td>
</tr>
<tr>
<td>SC.5.N.1.6:</td>
<td>Recognize and explain the difference between personal opinion/interpretation and verified observation.</td>
</tr>
<tr>
<td>SC.5.N.2.1:</td>
<td>Recognize and explain that science is grounded in empirical observations that are testable; explanation must always be linked with evidence.</td>
</tr>
<tr>
<td>SC.5.N.2.2:</td>
<td>Recognize and explain that when scientific investigations are carried out, the evidence produced by those investigations should be replicable by others.</td>
</tr>
<tr>
<td>SC.5.P.8.1:</td>
<td>Compare and contrast the basic properties of solids, liquids, and gases, such as mass, volume, color, texture, and temperature.</td>
</tr>
<tr>
<td>SC.5.P.8.2:</td>
<td>Investigate and identify materials that will dissolve in water and those that will not and identify the conditions that will speed up or slow down the dissolving process.</td>
</tr>
<tr>
<td>SC.5.P.8.3:</td>
<td>Demonstrate and explain that mixtures of solids can be separated based on observable properties of their parts such as particle size, shape, color, and magnetic attraction.</td>
</tr>
<tr>
<td>SC.5.P.8.4:</td>
<td>Explore the scientific theory of atoms (also called atomic theory) by recognizing that all matter is composed of parts that are too small to be seen without magnification.</td>
</tr>
<tr>
<td>SC.5.P.9.1:</td>
<td>Investigate and describe that many physical and chemical changes are affected by temperature.</td>
</tr>
<tr>
<td>SC.5.P.10.1:</td>
<td>Investigate and describe some basic forms of energy, including light, heat, sound, electrical, chemical, and mechanical.</td>
</tr>
<tr>
<td>SC.5.P.10.2:</td>
<td>Investigate and explain that energy has the ability to cause motion or create change.</td>
</tr>
<tr>
<td>SC.5.P.10.3:</td>
<td>Investigate and explain that an electrically-charged object can attract an uncharged object and can either attract or repel another charged object without any contact between the objects.</td>
</tr>
<tr>
<td>SC.5.P.10.4:</td>
<td>Investigate and explain that electrical energy can be transformed into heat, light, and sound energy, as well as the energy of motion.</td>
</tr>
<tr>
<td>SC.5.P.11.1:</td>
<td>Investigate and illustrate the fact that the flow of electricity requires a closed circuit (a complete loop).</td>
</tr>
<tr>
<td>SC.5.P.11.2:</td>
<td>Identify and classify materials that conduct electricity and materials that do not.</td>
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<td>SC.5.P.13.3:</td>
<td>Investigate and describe that the more mass an object has, the less effect a given force will have on the object's motion.</td>
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<td>SC.5.P.13.4:</td>
<td>Investigate and explain that when a force is applied to an object but it does not move, it is because another opposing force is being applied by something in the environment so that the forces are balanced.</td>
</tr>
</tbody>
</table>

Mathematicians who participate in effortful learning both individually and with others:
- Analyze the problem in a way that makes sense given the task.
- Ask questions that will help with solving the task.
- Build perseverance by modifying methods as needed while solving a challenging task.
- Stay engaged and maintain a positive mindset when working to solve tasks.
- Help and support each other when attempting a new method or approach.

**Clarifications:**
Teachers who encourage students to participate actively in effortful learning both individually and with others:
- Cultivate a community of growth mindset learners.
- Foster perseverance in students by choosing tasks that are challenging.
- Develop students' ability to analyze and problem solve.
- Recognize students' effort when solving challenging problems.

**MA.K12.MTR.2.1:** Demonstrate understanding by representing problems in multiple ways.

Mathematicians who demonstrate understanding by representing problems in multiple ways:

- Build understanding through modeling and using manipulatives.
- Represent solutions to problems in multiple ways using objects, drawings, tables, graphs and equations.
- Progress from modeling problems with objects and drawings to using algorithms and equations.
- Express connections between concepts and representations.
- Choose a representation based on the given context or purpose.

**Clarifications:**

Teachers who encourage students to demonstrate understanding by representing problems in multiple ways:

- Help students make connections between concepts and representations.
- Provide opportunities for students to use manipulatives when investigating concepts.
- Guide students from concrete to pictorial to abstract representations as understanding progresses.
- Show students that various representations can have different purposes and can be useful in different situations.

**MA.K12.MTR.3.1:** Complete tasks with mathematical fluency.

Mathematicians who complete tasks with mathematical fluency:

- Select efficient and appropriate methods for solving problems within the given context.
- Maintain flexibility and accuracy while performing procedures and mental calculations.
- Complete tasks accurately and with confidence.
- Adapt procedures to apply them to a new context.
- Use feedback to improve efficiency when performing calculations.

**Clarifications:**

Teachers who encourage students to complete tasks with mathematical fluency:

- Provide students with the flexibility to solve problems by selecting a procedure that allows them to solve efficiently and accurately.
- Offer multiple opportunities for students to practice efficient and generalizable methods.
- Provide opportunities for students to reflect on the method they used and determine if a more efficient method could have been used.

**MA.K12.MTR.4.1:** Engage in discussions that reflect on the mathematical thinking of self and others.

Mathematicians who engage in discussions that reflect on the mathematical thinking of self and others:

- Communicate mathematical ideas, vocabulary and methods effectively.
- Analyze the mathematical thinking of others.
- Compare the efficiency of a method to those expressed by others.
- Recognize errors and suggest how to correctly solve the task.
- Justify results by explaining methods and processes.
- Construct possible arguments based on evidence.

**Clarifications:**

Teachers who encourage students to engage in discussions that reflect on the mathematical thinking of self and others:

- Establish a culture in which students ask questions of the teacher and their peers, and error is an opportunity for learning.
- Create opportunities for students to discuss their thinking with peers.
- Select, sequence and present student work to advance and deepen understanding of correct and increasingly efficient methods.
- Develop students' ability to justify methods and compare their responses to the responses of their peers.

**MA.K12.MTR.5.1:** Use patterns and structure to help understand and connect mathematical concepts.

Mathematicians who use patterns and structure to help understand and connect mathematical concepts:

- Focus on relevant details within a problem.
- Create plans and procedures to logically order events, steps or ideas to solve problems.
- Decompose a complex problem into manageable parts.
- Relate previously learned concepts to new concepts.
- Look for similarities among problems.
- Connect solutions of problems to more complicated large-scale situations.

**Clarifications:**

Teachers who encourage students to use patterns and structure to help understand and connect mathematical concepts:

- Help students recognize the patterns in the world around them and connect these patterns to mathematical concepts.
- Support students to develop generalizations based on the similarities found among problems.
- Provide opportunities for students to create plans and procedures to solve problems.
- Develop students' ability to construct relationships between their current understanding and more sophisticated ways of thinking.

**MA.K12.MTR.6.1:** Assess the reasonableness of solutions.

Mathematicians who assess the reasonableness of solutions:

- Estimate to discover possible solutions.
- Use benchmark quantities to determine if a solution makes sense.
- Check calculations when solving problems.
- Verify possible solutions by explaining the methods used.
- Evaluate results based on the given context.

**Clarifications:**
Teachers who encourage students to assess the reasonableness of solutions:
- Have students estimate or predict solutions prior to solving.
- Prompt students to continually ask, “Does this solution make sense? How do you know?”
- Reinforce that students check their work as they progress within and after a task.
- Strengthen students’ ability to verify solutions through justifications.

Apply mathematics to real-world contexts.
Mathematicians who apply mathematics to real-world contexts:
- Connect mathematical concepts to everyday experiences.
- Use models and methods to understand, represent and solve problems.
- Perform investigations to gather data or determine if a method is appropriate. • Redesign models and methods to improve accuracy or efficiency.

Clarifications:
Teachers who encourage students to apply mathematics to real-world contexts:
- Provide opportunities for students to create models, both concrete and abstract, and perform investigations.
- Challenge students to question the accuracy of their models and methods.
- Support students as they validate conclusions by comparing them to the given situation.
- Indicate how various concepts can be applied to other disciplines.

Cite evidence to explain and justify reasoning.

Clarifications:
K-1 Students include textual evidence in their oral communication with guidance and support from adults. The evidence can consist of details from the text without naming the text. During 1st grade, students learn how to incorporate the evidence in their writing. 2-3 Students include relevant textual evidence in their written and oral communication. Students should name the text when they refer to it. In 3rd grade, students should use a combination of direct and indirect citations.

4-5 Students continue with previous skills and reference comments made by speakers and peers. Students cite texts that they've directly quoted, paraphrased, or used for information. When writing, students will use the form of citation dictated by the instructor or the style guide referenced by the instructor.

6-8 Students continue with previous skills and use a style guide to create a proper citation.

9-12 Students continue with previous skills and should be aware of existing style guides and the ways in which they differ.

Read and comprehend grade-level complex texts proficiently.

Clarifications:
See Text Complexity for grade-level complexity bands and a text complexity rubric.

Make inferences to support comprehension.

Clarifications:
Students will make inferences before the words infer or inference are introduced. Kindergarten students will answer questions like “Why is the girl smiling?” or make predictions about what will happen based on the title page. Students will use the terms and apply them in 2nd grade and beyond.

Use appropriate collaborative techniques and active listening skills when engaging in discussions in a variety of situations.

Clarifications:
In kindergarten, students learn to listen to one another respectfully. In grades 1-2, students build upon these skills by justifying what they are thinking. For example: “I think _____ because ______.” The collaborative conversations are becoming academic conversations.

In grades 3-12, students engage in academic conversations discussing claims and justifying their reasoning, refining and applying skills. Students build on ideas, propel the conversation, and support claims and counterclaims with evidence.

Use the accepted rules governing a specific format to create quality work.

Clarifications:
Students will incorporate skills learned into work products to produce quality work. For students to incorporate these skills appropriately, they must receive instruction. A 3rd grade student creating a poster board display must have instruction in how to effectively present information to do quality work.

Use appropriate voice and tone when speaking or writing.

Clarifications:
In kindergarten and 1st grade, students learn the difference between formal and informal language. For example, the way we talk to our friends differs from the way we speak to adults. In 2nd grade and beyond, students practice appropriate social and academic language to discuss texts.

General Course Information and Notes

GENERAL NOTES
Special Notes:

Instructional Practices
Teaching from a range of complex text is optimized when teachers in all subject areas implement the following strategies on a routine basis:

1. Ensuring wide reading from complex text that varies in length.
2. Making close reading and rereading of texts central to lessons.
3. Emphasizing text-specific complex questions, and cognitively complex tasks, reinforce focus on the text and cultivate independence.
4. Emphasizing students supporting answers based upon evidence from the text.
5. Providing extensive research and writing opportunities (claims and evidence).

- Asking questions (for science) and defining problems (for engineering).
- Developing and using models.
- Planning and carrying out investigations.
- Analyzing and interpreting data.
- Using mathematics, information and computer technology, and computational thinking.
- Constructing explanations (for science) and designing solutions (for engineering).
- Engaging in argument from evidence.
- Obtaining, evaluating, and communicating information.

Florida's Benchmarks for Excellent Student Thinking (B.E.S.T.) Standards
This course includes Florida's B.E.S.T. ELA Expectations (EE) and Mathematical Thinking and Reasoning Standards (MTRs) for students. Florida educators should intentionally embed these standards within the content and their instruction as applicable. For guidance on the implementation of the EE and MTRs, please visit https://www.cpalms.org/Standards/BEST_Standards.aspx and select the appropriate B.E.S.T. Standards package.

English Language Development ELD Standards Special Notes Section:
Teachers are required to provide listening, speaking, reading and writing instruction that allows English language learners (ELL) to communicate information, ideas and concepts for academic success in the content area of Science. For the given level of English language proficiency and with visual, graphic, or interactive support, students will interact with grade level words, expressions, sentences and discourse to process or produce language necessary for academic success. The ELD standard should specify a relevant content area concept or topic of study chosen by curriculum developers and teachers which maximizes an ELL's need for communication and social skills. To access an ELL supporting document which delineates performance definitions and descriptors, please click on the following link: https://cpalmsmediaprod.blob.core.windows.net/uploads/docs/standards/eld/sc.pdf

GENERAL INFORMATION

**Course Number:** 5020060

**Course Path:** Section: Grades PreK to 12 Education
Courses > Grade Group: Grades PreK to 5 Education
Courses > Subject: Science > SubSubject: General
Sciences >

**Abbreviated Title:** SCIENCE GRADE FIVE

**Course Length:** Year (Y)

**Course Attributes:**
- Class Size Core Required

**Course Type:** Core Academic Course

**Course Status:** State Board Approved

**Grade Level(s):** 5

Educator Certifications

<table>
<thead>
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STEM Lab Kindergarten (#5020070) 2016 - 2022 (current)

Course Standards

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<td>Communicate about technology using developmentally appropriate terminology.</td>
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<td>Count to 100 by ones and by tens.</td>
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<td>MAFS.K.CC.1.2:</td>
<td>Count forward beginning from a given number within the known sequence (instead of having to begin at 1).</td>
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<td>MAFS.K.CC.1.3:</td>
<td>Read and write numerals from 0 to 20. Represent a number of objects with a written numeral 0–20 (with 0 representing a count of no objects).</td>
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<td>MAFS.K.CC.2.4:</td>
<td>Understand the relationship between numbers and quantities; connect counting to cardinality.</td>
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<td></td>
<td>a. When counting objects, say the number names in the standard order, pairing each object with one and only one number name and each number name with one and only one object.</td>
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<tr>
<td></td>
<td>b. Understand that the last number name said tells the number of objects counted. The number of objects is the same regardless of their arrangement or the order in which they were counted.</td>
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<td>c. Understand that each successive number name refers to a quantity that is one larger.</td>
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<td>MAFS.K.CC.2.5:</td>
<td>Count to answer “how many?” questions about as many as 20 things arranged in a line, a rectangular array, or a circle, or as many as 10 things in a scattered configuration; given a number from 1–20, count out that many objects.</td>
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<td>MAFS.K.G.1.1:</td>
<td>Describe objects in the environment using names of shapes, and describe the relative positions of these objects using terms such as above, below, beside, in front of, behind, and next to.</td>
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<td>MAFS.K.G.1.2:</td>
<td>Correctly name shapes regardless of their orientations or overall size.</td>
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<td>MAFS.K.G.1.3:</td>
<td>Identify shapes as two-dimensional (lying in a plane, “flat”) or three-dimensional (“solid”).</td>
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<td>MAFS.K.G.2.4:</td>
<td>Analyze and compare two- and three-dimensional shapes, in different sizes and orientations, using informal language to describe their similarities, differences, parts (e.g., number of sides and vertices/“corners”) and other attributes (e.g., having sides of equal length).</td>
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<td>MAFS.K.G.2.5:</td>
<td>Model shapes in the world by building shapes from components (e.g., sticks and clay balls) and drawing shapes.</td>
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<td>MAFS.K.G.2.6:</td>
<td>Compose simple shapes to form larger shapes. For example, “Can you join these two triangles with full sides touching to make a rectangle?”</td>
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<td>MAFS.K.MD.1.1:</td>
<td>Describe measurable attributes of objects, such as length or weight. Describe several measurable attributes of a single object.</td>
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<tr>
<td>MAFS.K.MD.1.2:</td>
<td>Directly compare two objects with a measurable attribute in common, to see which object has “more of”/“less of” the attribute, and describe the difference. For example, directly compare the heights of two children and describe one child as taller/shorter.</td>
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<td>MAFS.K.MD.1.a:</td>
<td>Express the length of an object as a whole number of length units, by laying multiple copies of a shorter object (the length unit) end to end; understand that the length measurement of an object is the number of same-size length units that span it with no gaps or overlaps. Limit to contexts where the object being measured is spanned by a whole number of length units with no gaps or overlaps.</td>
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<td>MAFS.K.MD.2.3:</td>
<td>Classify objects into given categories; count the numbers of objects in each category and sort the categories by count.</td>
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General Course Information and Notes

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**Special Notes:**
This course offers students an opportunity to deepen science, mathematics, engineering, and technology skills. The primary content focus will be to expand knowledge of current grade level standards in mathematics and science by applying that content in a real world, hands-on situation involving engineering and technology. For kindergarten, themes will focus on the investigation of number sense, measurement, geometry, earth science, and physical science concepts.

Students will participate in various hands-on STEM activities in this supplemental course to assist in the mastery of current grade level mathematics and science standards.

**Instructional Practices**
Teaching from a range of complex text is optimized when teachers in all subject areas implement the following strategies on a routine basis:

1. Ensuring wide reading from complex text that varies in length.
2. Making close reading and rereading of texts central to lessons.
3. Emphasizing text-specific complex questions, and cognitively complex tasks, reinforce focus on the text and cultivate independence.
4. Emphasizing students supporting answers based upon evidence from the text.
5. Providing extensive research and writing opportunities (claims and evidence).

**Science and Engineering Practices** (NRC Framework for K-12 Science Education, 2010)
- Asking questions (for science) and defining problems (for engineering).
- Developing and using models.
- Planning and carrying out investigations.
- Analyzing and interpreting data.
- Using mathematics, information and computer technology, and computational thinking.
- Constructing explanations (for science) and designing solutions (for engineering).
- Engaging in argument from evidence.
- Obtaining, evaluating, and communicating information.

**English Language Development (ELD) Standards Special Notes Section:**
Teachers are required to provide listening, speaking, reading and writing instruction that allows English Language Learners (ELL) to communicate information, ideas and concepts for academic success in science and math. For the given level of English language proficiency and with visual, graphic, or interactive support, students will interact with grade level words, expressions, sentences and discourse to process or produce language necessary for academic success. The ELD standard should specify a relevant content area concept or topic of study chosen by curriculum developers and teachers which maximizes an ELL's need for communication and social skills. To access an ELL supporting document which delineates performance definitions and descriptors, please click on the following link: [https://cpalmsmediaprod.blob.core.windows.net/uploads/docs/standards/eld/sc.pdf](https://cpalmsmediaprod.blob.core.windows.net/uploads/docs/standards/eld/sc.pdf).

For additional information on the development and implementation of the ELD standards, please contact the Bureau of Student Achievement through Language Acquisition at sala@fldoe.org.
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Mathematicians who participate in effortful learning both individually and with others:

- Analyze the problem in a way that makes sense given the task.
- Ask questions that will help with solving the task.
- Build perseverance by modifying methods as needed while solving a challenging task.
- Stay engaged and maintain a positive mindset when working to solve tasks.
- Help and support each other when attempting a new method or approach.

**Clarifications:**

- Teachers who encourage students to participate actively in effortful learning both individually and with others:
  - Cultivate a community of growth mindset learners.
  - Foster perseverance in students by choosing tasks that are challenging.
  - Develop students’ ability to analyze and problem solve.
  - Recognize students’ effort when solving challenging problems.

Demonstrate understanding by representing problems in multiple ways. Mathematicians who demonstrate understanding by representing problems in multiple ways:

- Build understanding through modeling and using manipulatives.
- Represent solutions to problems in multiple ways using objects, drawings, tables, graphs and equations.
- Progress from modeling problems with objects and drawings to using algorithms and equations.
- Express connections between concepts and representations.
- Choose a representation based on the given context or purpose.

**Clarifications:**

- Teachers who encourage students to demonstrate understanding by representing problems in multiple ways:
  - Help students make connections between concepts and representations.
  - Provide opportunities for students to use manipulatives when investigating concepts.
  - Guide students from concrete to pictorial to abstract representations as understanding progresses.
  - Show students that various representations can have different purposes and can be useful in different situations.

Complete tasks with mathematical fluency. Mathematicians who complete tasks with mathematical fluency:

- Select efficient and appropriate methods for solving problems within the given context.
- Maintain flexibility and accuracy while performing procedures and mental calculations.
- Complete tasks accurately and with confidence.
MA.K12.MTR.3.1: Adapt procedures to apply them to a new context.
Use feedback to improve efficiency when performing calculations.

Clarifications:
Teachers who encourage students to complete tasks with mathematical fluency:
- Provide students with the flexibility to solve problems by selecting a procedure that allows them to solve efficiently and accurately.
- Offer multiple opportunities for students to practice efficient and generalizable methods.
- Provide opportunities for students to reflect on the method they used and determine if a more efficient method could have been used.

Engage in discussions that reflect on the mathematical thinking of self and others.
Mathematicians who engage in discussions that reflect on the mathematical thinking of self and others:
- Communicate mathematical ideas, vocabulary and methods effectively.
- Analyze the mathematical thinking of others.
- Compare the efficiency of a method to those expressed by others.
- Recognize errors and suggest how to correctly solve the task.
- Justify results by explaining methods and processes.
- Construct possible arguments based on evidence.

Clarifications:
Teachers who encourage students to engage in discussions that reflect on the mathematical thinking of self and others:
- Establish a culture in which students ask questions of the teacher and their peers, and error is an opportunity for learning.
- Create opportunities for students to discuss their thinking with peers.
- Select, sequence and present student work to advance and deepen understanding of correct and increasingly efficient methods.
- Develop students' ability to justify methods and compare their responses to the responses of their peers.

Use patterns and structure to help understand and connect mathematical concepts.
Mathematicians who use patterns and structure to help understand and connect mathematical concepts:
- Focus on relevant details within a problem.
- Create plans and procedures to logically order events, steps or ideas to solve problems.
- Decompose a complex problem into manageable parts.
- Relate previously learned concepts to new concepts.
- Look for similarities among problems.
- Connect solutions of problems to more complicated large-scale situations.

Clarifications:
Teachers who encourage students to use patterns and structure to help understand and connect mathematical concepts:
- Help students recognize the patterns in the world around them and connect these patterns to mathematical concepts.
- Support students to develop generalizations based on the similarities found among problems.
- Provide opportunities for students to create plans and procedures to solve problems.
- Develop students' ability to construct relationships between their current understanding and more sophisticated ways of thinking.

Assess the reasonableness of solutions.
Mathematicians who assess the reasonableness of solutions:
- Estimate to discover possible solutions.
- Use benchmark quantities to determine if a solution makes sense.
- Check calculations when solving problems.
- Verify possible solutions by explaining the methods used.
- Evaluate results based on the given context.

Clarifications:
Teachers who encourage students to assess the reasonableness of solutions:
- Have students estimate or predict solutions prior to solving.
- Prompt students to continually ask, "Does this solution make sense? How do you know?"
- Reinforce that students check their work as they progress within and after a task.
- Strengthen students' ability to verify solutions through justifications.

Apply mathematics to real-world contexts.
Mathematicians who apply mathematics to real-world contexts:
- Connect mathematical concepts to everyday experiences.
- Use models and methods to understand, represent and solve problems.
- Perform investigations to gather data or determine if a method is appropriate.
- Redesign models and methods to improve accuracy or efficiency.

Clarifications:
Teachers who encourage students to apply mathematics to real-world contexts:
- Provide opportunities for students to create models, both concrete and abstract, and perform investigations.
- Challenge students to question the accuracy of their models and methods.
- Support students as they validate conclusions by comparing them to the given situation.
- Indicate how various concepts can be applied to other disciplines.

Cite evidence to explain and justify reasoning.

Clarifications:
K-1 Students include textual evidence in their oral communication with guidance and support from adults. The evidence can consist of details from the text without naming the text. During 1st grade, students learn how to incorporate the evidence in their writing.
2-3 Students include relevant textual evidence in their written and oral communication. Students should name the text when they refer to it. In 3rd grade, students should use a combination of direct and indirect citations.
### General Course Information and Notes

**VERSION DESCRIPTION**

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| ELA.K12.EE.1.1 | 4-5 Students continue with previous skills and reference comments made by speakers and peers. Students cite texts that they've directly quoted, paraphrased, or used for information. When writing, students will use the form of citation dictated by the instructor or the style guide referenced by the instructor.  
6-8 Students continue with previous skills and use a style guide to create a proper citation.  
9-12 Students continue with previous skills and should be aware of existing style guides and the ways in which they differ. |
| ELA.K12.EE.2.1 | Read and comprehend grade-level complex texts proficiently. |
| ELA.K12.EE.3.1 | Make inferences to support comprehension. |
| ELA.K12.EE.4.1 | Use appropriate collaborative techniques and active listening skills when engaging in discussions in a variety of situations. |
| ELA.K12.EE.5.1 | Use the accepted rules governing a specific format to create quality work. |
| ELA.K12.EE.6.1 | Use appropriate voice and tone when speaking or writing. |
| ELD.K12.ELL.SC.1 | English language learners communicate information, ideas and concepts necessary for academic success in the content area of Science. |
Educator Certifications

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STEM Lab Grade 1 (#5020080) 2016 - 2022 (current)

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<td>SC.1.E.5.2:</td>
<td>Explore the Law of Gravity by demonstrating that Earth's gravity pulls any object on or near Earth toward it even though nothing is touching the object.</td>
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<td>Investigate how magnifiers make things appear bigger and help people see things they could not see without them.</td>
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<td>Make observations of living things and their environment using the five senses.</td>
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<td>Identify the major parts of plants, including stem, roots, leaves, and flowers.</td>
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<td>Differentiate between living and nonliving things.</td>
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<td>SC.1.L.16.1:</td>
<td>Make observations that plants and animals closely resemble their parents, but variations exist among individuals within a population.</td>
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<td>SC.1.L.17.1:</td>
<td>Through observation, recognize that all plants and animals, including humans, need the basic necessities of air, water, food, and space.</td>
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<td>SC.1.N.1.1:</td>
<td>Raise questions about the natural world, investigate them in teams through free exploration, and generate appropriate explanations based on those explorations.</td>
</tr>
<tr>
<td>SC.1.N.1.2:</td>
<td>Using the five senses as tools, make careful observations, describe objects in terms of number, shape, texture, size, weight, color, and motion, and compare their observations with others.</td>
</tr>
<tr>
<td>SC.1.N.1.3:</td>
<td>Keep records as appropriate - such as pictorial and written records - of investigations conducted.</td>
</tr>
<tr>
<td>SC.1.N.1.4:</td>
<td>Ask &quot;how do you know?&quot; in appropriate situations.</td>
</tr>
<tr>
<td>SC.1.P.8.1:</td>
<td>Sort objects by observable properties, such as size, shape, color, temperature (hot or cold), weight (heavy or light), texture, and whether objects sink or float.</td>
</tr>
<tr>
<td>SC.1.P.12.1:</td>
<td>Demonstrate and describe the various ways that objects can move, such as in a straight line, zigzag, back-and-forth, round-and-round, fast, and slow.</td>
</tr>
<tr>
<td>SC.1.P.13.1:</td>
<td>Demonstrate that the way to change the motion of an object is by applying a push or a pull.</td>
</tr>
<tr>
<td>SC.K2-CS.CC-1.1:</td>
<td>Identify a variety of digital tools used for communication and collaboration (e.g., online library catalogs and databases).</td>
</tr>
<tr>
<td>SC.K2-CS.CC-1.3:</td>
<td>Collaborate and cooperate with peers, teachers, and others using technology to solve problems.</td>
</tr>
<tr>
<td>SC.K2-CS-CP-1.1:</td>
<td>Identify different kinds of data (e.g., text, charts, graphs, numbers, pictures, audio, video, and collections of objects).</td>
</tr>
<tr>
<td>SC.K2-CS-CP-1.3:</td>
<td>Propose a solution to a problem or question based on an analysis of the data and critical thinking, individually and collaboratively.</td>
</tr>
<tr>
<td>SC.K2-CS-CP-1.4:</td>
<td>Create data visualizations (e.g., charts and infographics), individually and collaboratively.</td>
</tr>
<tr>
<td>SC.K2-CS-CP-2.2:</td>
<td>Perform a simple task (e.g., making a sandwich and brushing teeth) breaking it into small steps.</td>
</tr>
<tr>
<td>SC.K2-CS-CP-3.1:</td>
<td>Create developmentally appropriate multimedia products with support from teachers, family members, or student partners.</td>
</tr>
<tr>
<td>SC.K2-CS-CP-3.2:</td>
<td>Prepare a simple presentation of digital products and applications.</td>
</tr>
<tr>
<td>SC.K2-CS-CP-2.2:</td>
<td>Solve age-appropriate problems (e.g., puzzles and logical-thinking programs) with or without technology (i.e., computational thinking).</td>
</tr>
<tr>
<td>SC.K2-CS-CP-2.5:</td>
<td>Create a simple algorithm, individually and collaboratively, without using computers to complete the task (e.g., making a sandwich, getting ready for school).</td>
</tr>
<tr>
<td>SC.K2-CS-CS-2.8:</td>
<td>Gather and organize information using concept-mapping tools.</td>
</tr>
<tr>
<td>SC.K2-CS-CS-3.2:</td>
<td>Create, review, and revise artifacts that include text, images, and audio using digital tools.</td>
</tr>
<tr>
<td>SC.K2-CS-CS-4.2:</td>
<td>Recognize and operate different types of computers, applications and peripherals (e.g., use input/output devices such as a mouse, keyboard, or touch screen; find, navigate, launch a program).</td>
</tr>
<tr>
<td>MAFS.1.G.1.1:</td>
<td>Distinguish between defining attributes (e.g., triangles are closed and three-sided) versus non-defining attributes (e.g., color, orientation, overall size); build and draw shapes to possess defining attributes.</td>
</tr>
<tr>
<td>MAFS.1.G.1.2:</td>
<td>Compose two-dimensional shapes (rectangles, squares, trapezoids, triangles, half-circles, and quarter-circles) or three-dimensional shapes (cubes, right rectangular prisms, right circular cones, and right circular cylinders) to create a composite shape, and compose new shapes from the composite shape.</td>
</tr>
<tr>
<td>MAFS.1.MD.1.1:</td>
<td>Order three objects by length; compare the lengths of two objects indirectly by using a third object.</td>
</tr>
<tr>
<td>MAFS.1.MD.1.a:</td>
<td>Understand how to use a ruler to measure length to the nearest inch.</td>
</tr>
<tr>
<td>MAFS.1.MD.1.a:</td>
<td>a. Recognize that the ruler is a tool that can be used to measure the attribute of length.</td>
</tr>
<tr>
<td>MAFS.1.MD.1.a:</td>
<td>b. Recognize that the number of length intervals between two points is the same.</td>
</tr>
<tr>
<td>MAFS.1.MD.1.a:</td>
<td>c. Recognize that the units marked on a ruler have equal length intervals and fit together with no gaps or overlaps. These intervals form a sequence.</td>
</tr>
<tr>
<td>MAFS.1.MD.3.4:</td>
<td>Organize, represent, and interpret data with up to three categories; ask and answer questions about the total number of data points, how many in each category, and how many more or less are in one category than in another.</td>
</tr>
<tr>
<td>MAFS.1.NBT.2.2:</td>
<td>Understand that the two digits of a two-digit number represent amounts of tens and ones.</td>
</tr>
<tr>
<td>MAFS.1.NBT.2.2:</td>
<td>a. 10 can be thought of as a bundle of ten ones — called a &quot;ten.&quot;</td>
</tr>
<tr>
<td>MAFS.1.NBT.2.2:</td>
<td>b. The numbers from 11 to 19 are composed of a ten and one, two, three, four, five, six, seven, eight, or nine ones.</td>
</tr>
<tr>
<td>MAFS.1.NBT.2.2:</td>
<td>c. The numbers 10, 20, 30, 40, 50, 60, 70, 80, 90 refer to one, two, three, four, five, six, seven, eight, or nine tens (and 0 ones).</td>
</tr>
<tr>
<td>MAFS.1.NBT.2.3:</td>
<td>Decompose two-digit numbers in multiple ways (e.g., 64 can be decomposed into 4 tens and 4 ones or into 5 tens and 14 ones).</td>
</tr>
<tr>
<td>MAFS.1.NBT.2.3:</td>
<td>Compare two two-digit numbers based on meanings of the tens and ones digits, recording the results of comparisons with the symbols &gt;, =, and &lt;.</td>
</tr>
<tr>
<td>ELD.K12.ELL.SC.1:</td>
<td>English language learners communicate information, ideas and concepts necessary for academic success in the content area of Science.</td>
</tr>
</tbody>
</table>
VERSION DESCRIPTION

This course offers students an opportunity to deepen science, mathematics, engineering, and technology skills. The primary content focus will be to expand knowledge of current grade level standards in mathematics and science by applying that content in a real-world, hands-on situation involving engineering and technology. For first grade, themes will focus on the investigation of number sense, measurement, geometry, earth science, life science, and physical science concepts.

Students will participate in various hands-on STEM activities in this supplemental course to assist in the mastery of current grade level mathematics and science standards.

Instructional Practices
Teaching from a range of complex text is optimized when teachers in all subject areas implement the following strategies on a routine basis:

1. Ensuring wide reading from complex text that varies in length.
2. Making close reading and rereading of texts central to lessons.
3. Emphasizing text-specific complex questions, and cognitively complex tasks, reinforce focus on the text and cultivate independence.
4. Emphasizing students supporting answers based upon evidence from the text.
5. Providing extensive research and writing opportunities (claims and evidence).


- Asking questions (for science) and defining problems (for engineering).
- Developing and using models.
- Planning and carrying out investigations.
- Analyzing and interpreting data.
- Using mathematics, information and computer technology, and computational thinking.
- Constructing explanations (for science) and designing solutions (for engineering).
- Engaging in argument from evidence.
- Obtaining, evaluating, and communicating information.

English Language Development (ELD) Standards Special Notes Section:

Teachers are required to provide listening, speaking, reading and writing instruction that allows English Language Learners (ELL) to communicate information, ideas and concepts for academic success in science and math. For the given level of English language proficiency and with visual, graphic, or interactive support, students will interact with grade level words, expressions, sentences and discourse to process or produce language necessary for academic success. The ELD standard should specify a relevant content area concept or topic of study chosen by curriculum developers and teachers which maximizes an ELL's need for communication and social skills. To access an ELL supporting document which delineates performance definitions and descriptors, please click on the following link: https://cpalmsmediaprod.blob.core.windows.net/uploads/docs/standards/eld/sc.pdf.

For additional information on the development and implementation of the ELD standards, please contact the Bureau of Student Achievement through Language Acquisition at sala@fldoe.org.

GENERAL INFORMATION

Course Number: 5020080
Course Path: Section: Grades PreK to 12 Education
Courses > Grade Group: Grades PreK to 5 Education
Courses > Subject: Science > SubSubject: General Sciences >
Abbreviated Title: STEM Lab 1
Course Length: Year (Y)
Course Attributes:
- Class Size Core Required

Course Status: Course Approved

Educator Certifications

Elementary Education (Elementary Grades 1-6)
Elementary Education (Grades K-6)
**Course Standards**

<table>
<thead>
<tr>
<th>Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>SC.1.E.5.1:</td>
<td>Observe and discuss that there are more stars in the sky than anyone can easily count and that they are not scattered evenly in the sky.</td>
</tr>
<tr>
<td>SC.1.E.5.2:</td>
<td>Explore the Law of Gravity by demonstrating that Earth's gravity pulls any object on or near Earth toward it even though nothing is touching the object.</td>
</tr>
<tr>
<td>SC.1.E.5.3:</td>
<td>Investigate how magnifiers make things appear bigger and help people see things they could not see without them.</td>
</tr>
<tr>
<td>SC.1.L1.14.1:</td>
<td>Make observations of living things and their environment using the five senses.</td>
</tr>
<tr>
<td>SC.1.L1.14.2:</td>
<td>Identify the major parts of plants, including stem, roots, leaves, and flowers.</td>
</tr>
<tr>
<td>SC.1.L1.16.1:</td>
<td>Make observations that plants and animals closely resemble their parents, but variations exist among individuals within a population.</td>
</tr>
<tr>
<td>SC.1.L1.17.1:</td>
<td>Through observation, recognize that all plants and animals, including humans, need the basic necessities of air, water, food, and space.</td>
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<td>SC.1.N.1.1:</td>
<td>Raise questions about the natural world, investigate them in teams through free exploration, and generate appropriate explanations based on those explorations.</td>
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<td>SC.1.P.1.6:</td>
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<td>Create data visualizations (e.g., charts and infographics), individually and collaboratively.</td>
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<td>Prepare a simple presentation of digital products and applications.</td>
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<td>SC.1.P.1.11:</td>
<td>Solve age-appropriate problems (e.g., puzzles and logical-thinking programs) with or without technology (i.e., computational thinking).</td>
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<td>SC.1.P.1.12:</td>
<td>Create a simple algorithm, individually and collaboratively, without using computers to complete the task (e.g., making a sandwich, getting ready for school).</td>
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<td>SC.1.P.1.14:</td>
<td>Gather and organize information using concept-mapping tools.</td>
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<td>Create, review, and revise artifacts that include text, images, and audio using digital tools.</td>
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<td>SC.1.P.1.16:</td>
<td>Recognize and operate different types of computers, applications and peripherals (e.g., use input/output devices such as a mouse, keyboard, or touch screen; find, navigate, launch a program).</td>
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**Mathematicians who demonstrate understanding by representing problems in multiple ways:**
- Analyze the problem in a way that makes sense given the task.
- Ask questions that will help with solving the task.
- Build perseverance by modifying methods as needed while solving a challenging task.
- Stay engaged and maintain a positive mindset when working to solve tasks.
- Help and support each other when attempting a new method or approach.

**Mathematicians who participate in effortful learning both individually and with others:**
- Analyze the problem in a way that makes sense given the task.
- Ask questions that will help with solving the task.
- Build perseverance by modifying methods as needed while solving a challenging task.
- Stay engaged and maintain a positive mindset when working to solve tasks.
- Help and support each other when attempting a new method or approach.

**Teachers who encourage students to participate actively in effortful learning both individually and with others:**
- Cultivate a community of growth mindset learners.
- Foster perseverance in students by choosing tasks that are challenging.
- Develop students' ability to analyze and problem solve.
- Recognize students' effort when solving challenging problems.

**Teachers who encourage students to demonstrate understanding by representing problems in multiple ways:**
- Help students make connections between concepts and representations.
- Provide opportunities for students to use manipulatives when investigating concepts.
- Guide students from concrete to pictorial to abstract representations as understanding progresses.
- Show students that various representations can have different purposes and can be useful in different situations.

<table>
<thead>
<tr>
<th>MA.K12.MTR.3.1:</th>
<th>Complete tasks with mathematical fluency. Mathematics who complete tasks with mathematical fluency:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Select efficient and appropriate methods for solving problems within the given context.</td>
</tr>
<tr>
<td></td>
<td>Maintain flexibility and accuracy while performing procedures and mental calculations.</td>
</tr>
<tr>
<td></td>
<td>Complete tasks accurately and with confidence.</td>
</tr>
<tr>
<td></td>
<td>Adapt procedures to apply them to a new context.</td>
</tr>
<tr>
<td></td>
<td>Use feedback to improve efficiency when performing calculations.</td>
</tr>
</tbody>
</table>

**Clarifications:**
Teachers who encourage students to complete tasks with mathematical fluency:
- Provide students with the flexibility to solve problems by selecting a procedure that allows them to solve efficiently and accurately.
- Offer multiple opportunities for students to practice efficient and generalizable methods.
- Provide opportunities for students to reflect on the method they used and determine if a more efficient method could have been used.

<table>
<thead>
<tr>
<th>MA.K12.MTR.4.1:</th>
<th>Engage in discussions that reflect on the mathematical thinking of self and others. Mathematics who engage in discussions that reflect on the mathematical thinking of self and others:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Communicate mathematical ideas, vocabulary and methods effectively.</td>
</tr>
<tr>
<td></td>
<td>Analyze the mathematical thinking of others.</td>
</tr>
<tr>
<td></td>
<td>Compare the efficiency of a method to those expressed by others.</td>
</tr>
<tr>
<td></td>
<td>Recognize errors and suggest how to correctly solve the task.</td>
</tr>
<tr>
<td></td>
<td>Justify results by explaining methods and processes.</td>
</tr>
<tr>
<td></td>
<td>Construct possible arguments based on evidence.</td>
</tr>
</tbody>
</table>

**Clarifications:**
Teachers who encourage students to engage in discussions that reflect on the mathematical thinking of self and others:
- Establish a culture in which students ask questions of the teacher and their peers, and error is an opportunity for learning.
- Create opportunities for students to discuss their thinking with peers.
- Select, sequence and present student work to advance and deepen understanding of correct and increasingly efficient methods.
- Develop students’ ability to justify methods and compare their responses to the responses of their peers.

<table>
<thead>
<tr>
<th>MA.K12.MTR.5.1:</th>
<th>Use patterns and structure to help understand and connect mathematical concepts. Mathematics who use patterns and structure to help understand and connect mathematical concepts:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Focus on relevant details within a problem.</td>
</tr>
<tr>
<td></td>
<td>Create plans and procedures to logically order events, steps or ideas to solve problems.</td>
</tr>
<tr>
<td></td>
<td>Decompose a complex problem into manageable parts.</td>
</tr>
<tr>
<td></td>
<td>Relate previously learned concepts to new concepts.</td>
</tr>
<tr>
<td></td>
<td>Look for similarities among problems.</td>
</tr>
<tr>
<td></td>
<td>Connect solutions of problems to more complicated large-scale situations.</td>
</tr>
</tbody>
</table>

**Clarifications:**
Teachers who encourage students to use patterns and structure to help understand and connect mathematical concepts:
- Help students recognize the patterns in the world around them and connect these patterns to mathematical concepts.
- Support students to develop generalizations based on the similarities found among problems.
- Provide opportunities for students to create plans and procedures to solve problems.
- Develop students’ ability to construct relationships between their current understanding and more sophisticated ways of thinking.

<table>
<thead>
<tr>
<th>MA.K12.MTR.6.1:</th>
<th>Assess the reasonableness of solutions. Mathematics who assess the reasonableness of solutions:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Estimate to discover possible solutions.</td>
</tr>
<tr>
<td></td>
<td>Use benchmark quantities to determine if a solution makes sense.</td>
</tr>
<tr>
<td></td>
<td>Check calculations when solving problems.</td>
</tr>
<tr>
<td></td>
<td>Verify possible solutions by explaining the methods used.</td>
</tr>
<tr>
<td></td>
<td>Evaluate results based on the given context.</td>
</tr>
</tbody>
</table>

**Clarifications:**
Teachers who encourage students to assess the reasonableness of solutions:
- Have students estimate or predict solutions prior to solving.
- Prompt students to continually ask, “Does this solution make sense? How do you know?”
- Reinforce that students check their work as they progress within and after a task.
- Strengthen students’ ability to verify solutions through justifications.

<table>
<thead>
<tr>
<th>MA.K12.MTR.7.1:</th>
<th>Apply mathematics to real-world contexts. Mathematics who apply mathematics to real-world contexts:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Connect mathematical concepts to everyday experiences.</td>
</tr>
<tr>
<td></td>
<td>Use models and methods to understand, represent and solve problems.</td>
</tr>
<tr>
<td></td>
<td>Perform investigations to gather data or determine if a method is appropriate. • Redesign models and methods to improve accuracy or efficiency.</td>
</tr>
</tbody>
</table>

**Clarifications:**
Teachers who encourage students to apply mathematics to real-world contexts:
- Provide opportunities for students to create models, both concrete and abstract, and perform investigations.
- Challenge students to question the accuracy of their models and methods.
Cite evidence to explain and justify reasoning.

**Clariﬁcations:**
- K-1 Students include textual evidence in their oral communication with guidance and support from adults. The evidence can consist of details from the text without naming the text. During 1st grade, students learn how to incorporate the evidence in their writing.
- 2-3 Students include relevant textual evidence in their written and oral communication. Students should name the text when they refer to it. In 3rd grade, students should use a combination of direct and indirect citations.
- 4-5 Students continue with previous skills and reference comments made by speakers and peers. Students cite texts that they’ve directly quoted, paraphrased, or used for information. When writing, students will use the form of citation dictated by the instructor or the style guide referenced by the instructor.
- 6-8 Students continue with previous skills and use a style guide to create a proper citation.
- 9-12 Students continue with previous skills and should be aware of existing style guides and the ways in which they differ.

**ELA.K12.EE.1.1:**
- Read and comprehend grade-level complex texts proﬁciently.
- **Clariﬁcations:**
  - See Text Complexity for grade-level complexity bands and a text complexity rubric.

**ELA.K12.EE.2.1:**
- Make inferences to support comprehension.
- **Clariﬁcations:**
  - Students will make inferences before the words infer or inference are introduced. Kindergarten students will answer questions like “Why is the girl smiling?” or make predictions about what will happen based on the title page. Students will use the terms and apply them in 2nd grade and beyond.

**ELA.K12.EE.3.1:**
- Use appropriate collaborative techniques and active listening skills when engaging in discussions in a variety of situations.
- **Clariﬁcations:**
  - In kindergarten, students learn to listen to one another respectfully. In grades 1-2, students build upon these skills by justifying what they are thinking. For example: “I think ______ because ______.” The collaborative conversations are becoming academic conversations.
  - In grades 3-12, students engage in academic conversations discussing claims and justifying their reasoning, refining and applying skills. Students build on ideas, propel the conversation, and support claims and counterclaims with evidence.

**ELA.K12.EE.4.1:**
- Use the accepted rules governing a speciﬁc format to create quality work.
- **Clariﬁcations:**
  - Students will incorporate skills learned into work products to produce quality work. For students to incorporate these skills appropriately, they must receive instruction. A 3rd grade student creating a poster board display must have instruction in how to effectively present information to do quality work.

**ELA.K12.EE.5.1:**
- Use appropriate voice and tone when speaking or writing.
- **Clariﬁcations:**
  - In kindergarten and 1st grade, students learn the difference between formal and informal language. For example, the way we talk to our friends differs from the way we speak to adults. In 2nd grade and beyond, students practice appropriate social and academic language to discuss texts.

**ELA.K12.EE.6.1:**
- English language learners communicate information, ideas and concepts necessary for academic success in the content area of Science.

**ELD.K12.ELL.5C.1:**
- English language learners communicate information, ideas and concepts necessary for academic success in the content area of Science.

**General Course Information and Notes**

**VERSION DESCRIPTION**

This course offers students an opportunity to deepen science, mathematics, engineering, and technology skills. The primary content focus will be to expand knowledge of current grade level standards in mathematics and science by applying that content in a real world, hands-on situation involving engineering and technology. For first grade, themes will focus on the investigation of number sense, measurement, geometry, earth science, life science, and physical science concepts.

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**Science and Engineering Practices** (NRC Framework for K-12 Science Education, 2010)

- Asking questions (for science) and defining problems (for engineering).
- Developing and using models.
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- Analyzing and interpreting data.
- Using mathematics, information and computer technology, and computational thinking.
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### GENERAL INFORMATION

**Course Number:** 5020080  
**Course Path:**  
**Course Status:** State Board Approved

| Course | Section | Grades PreK to 12 Education  
|--------|---------|-----------------------------|
| Courses | Grade Group | Grades PreK to 5 Education  
| Courses | Subject | Science > SubSubject: General  
| Sciences | | |
| Abbreviated Title | STEM Lab 1  
| Course Length | Year (Y)  
| Course Attributes |  
| | Class Size Core Required

### Educator Certifications

- Elementary Education (Elementary Grades 1-6)
- Elementary Education (Grades K-6)
Define simulation and identify the concepts illustrated by a simple simulation. Investigate the effect of applying various pushes and pulls on different objects. Recognize that Earth is made up of rocks. Rocks come in many sizes and shapes. Use addition and subtraction within 100 to solve word problems involving lengths that are given in the same units, e.g., by using drawings (such as rulers) and equations with a symbol for the unknown number to represent the problem. Prepare a simple presentation of digital products and applications. Generate measurement data by measuring lengths of several objects to the nearest whole unit, or by making repeated measurements of the same object. Define a computer program as a set of commands created by people to do something. Create a digital artifact (independently and collaboratively) that clearly expresses thoughts and ideas. Recognize that solids have a definite shape and that liquids and gases take the shape of their container. Construct a simple program using tools that do not require a textual programming language (e.g. block-based programming language). Investigate that materials can be altered to change some of their properties, but not all materials respond the same way to any one alteration. Raise questions about the natural world, investigate them in teams through free exploration and systematic observations, and generate appropriate explanations based on those explorations. Observe and measure objects in terms of their properties, including size, shape, color, temperature, weight, texture, sinking or floating in water, and attraction and repulsion of magnets. Identify objects and materials as solid, liquid, or gas. Recognize that solids have a definite shape and that liquids and gases have no definite shape. Observe and describe water in its solid, liquid, and gaseous states. Create, review, and revise artifacts that include text, images, and audio using digital tools. Discuss that people use electricity or other forms of energy to cook food, run machines, and light our homes. Investigate by observing and measuring, that the Sun’s energy directly and indirectly warms the water, land, and air. Recognize that objects are pulled toward the ground unless something holds them up. Create developmentally appropriate multimedia products with support from teachers, family members, or student partners. Solve age-appropriate problems (e.g., puzzles and logical thinking problems) with or without technology (i.e., computational thinking). Discuss the importance of water in the human body, and how it is important to drink water every day and season to season. Demonstrate that the greater the force (push or pull) applied to an object, the greater the change in motion of the object. Describe how small pieces of rock and dead plant and animal parts can be the basis of soil and explain the process by which soil is formed. Describe how plants and animals get the food that they need to grow and live. Be the basis of soil and explain the process by which soil is formed. Observe and describe how water left in an open container disappears (evaporates), but water in a closed container does not disappear (evaporate). Observe and describe that water has the ability to retain water, and the ability to support the growth of plants. Observe and describe that water has the ability to absorb heat and cool things down. Observe and describe that water can change from a solid to a liquid, and from a liquid to a gas (e.g., water left in a closed container). Describe how rocks are made up of minerals. Observe and describe that water can change from a liquid to a solid, and from a solid to a liquid (e.g., water left in a closed container). Observe and describe the ability to retain water, and the ability to support the growth of plants. Describe small pieces of rock and dead plant and animal parts as the basis of soil and explain the process by which soil is formed. Observe and describe that water can change from a liquid to a gas, and from a gas to a liquid (e.g., water left in an open container). Describe models as representations of real-life systems that can be manipulated to show how those systems operate. Observe and measure objects in terms of their properties, including size, shape, color, temperature, weight, texture, sinking or floating in water, and attraction and repulsion of magnets. Identify objects and materials as solid, liquid, or gas. Recognize that solids have a definite shape and that liquids and gases have no definite shape.
General Course Information and Notes

VERSION DESCRIPTION

This course offers students an opportunity to deepen science, mathematics, engineering, and technology skills. The primary content focus will be to expand knowledge of current grade level standards in mathematics and science by applying that content in a real world, hands-on situation involving engineering and technology. For second grade, themes will focus on the investigation of number sense, measurement, earth science, and physical science concepts.

Students will participate in various hands-on STEM activities in this supplemental course to assist in the mastery of current grade level mathematics and science standards.

Instructional Practices
Teaching from a range of complex text is optimized when teachers in all subject areas implement the following strategies on a routine basis:

1. Ensuring wide reading from complex text that varies in length.
2. Making close reading and rereading of texts central to lessons.
3. Emphasizing text-specific complex questions, and cognitively complex tasks, reinforce focus on the text and cultivate independence.
4. Emphasizing students supporting answers upon evidence from the text.
5. Providing extensive research and writing opportunities (claims and evidence).


- Asking questions (for science) and defining problems (for engineering).
- Developing and using models.
- Planning and carrying out investigations.
- Analyzing and interpreting data.
- Using mathematics, information and computer technology, and computational thinking.
- Constructing explanations (for science) and designing solutions (for engineering).
- Engaging in argument from evidence.
- Obtaining, evaluating, and communicating information.

English Language Development (ELD) Standards Special Notes Section:

Teachers are required to provide listening, speaking, reading and writing instruction that allows English Language Learners (ELL) to communicate information, ideas and concepts for academic success in science and math. For the given level of English language proficiency and with visual, graphic, or interactive support, students will interact with grade level words, expressions, sentences and discourse to process or produce language necessary for academic success. The ELD standard should specify a relevant content area concept or topic of study chosen by curriculum developers and teachers which maximizes an ELL's need for communication and social skills. To access an ELL supporting document which delineates performance definitions and descriptors, please click on the following link:

https://cpalmsmediaprod.blob.core.windows.net/uploads/docs/standards/eld/sc.pdf

For additional information on the development and implementation of the ELD standards, please contact the Bureau of Student Achievement through Language Acquisition at sala@fldoe.org.
SC.2.E.6.1: Recognize that Earth is made up of rocks. Rocks come in many sizes and shapes.
SC.2.E.6.2: Describe how small pieces of rock and dead plant and animal parts can be the basis of soil and explain the process by which soil is formed.
SC.2.E.6.3: Classify soil types based on color, texture (size of particles), the ability to retain water, and the ability to support the growth of plants.
SC.2.E.7.1: Compare and describe changing patterns in nature that repeat themselves, such as weather conditions including temperature and precipitation, day to day and season to season.
SC.2.E.7.2: Investigate by observing and measuring, that the Sun's energy directly and indirectly warms the water, land, and air.
SC.2.E.7.3: Investigate, observe and describe how water left in an open container disappears (evaporates), but water in a closed container does not disappear (evaporate).
SC.2.E.7.4: Investigate that air is all around us and that moving air is wind.
SC.2.N.1.1: Raise questions about the natural world, investigate them in teams through free exploration and systematic observations, and generate appropriate explanations based on those explorations.
SC.2.N.1.2: Compare the observations made by different groups using the same tools.
SC.2.N.1.3: Ask "how do you know?" in appropriate situations and attempt reasonable answers when asked the same question by others.
SC.2.N.1.4: Explain how particular scientific investigations should yield similar conclusions when repeated.
SC.2.N.1.5: Distinguish between empirical observation (what you see, hear, feel, smell, or taste) and ideas or inferences (what you think).
SC.2.N.1.6: Explain how scientists alone or in groups are always investigating new ways to solve problems.
SC.2.P.8.1: Observe and measure objects in terms of their properties, including size, shape, color, temperature, weight, texture, sinking or floating in water, and attraction and repulsion of magnets.
SC.2.P.8.2: Identify objects and materials as solid, liquid, or gas.
SC.2.P.8.3: Recognize that solids have a definite shape and that liquids and gases take the shape of their container.
SC.2.P.8.4: Observe and describe water in its solid, liquid, and gaseous states.
SC.2.P.8.5: Measure and compare temperatures taken every day at the same time.
SC.2.P.8.6: Measure and compare the volume of liquids using containers of various shapes and sizes.
SC.2.P.9.1: Investigate that materials can be altered to change some of their properties, but not all materials respond the same way to any one alteration.
SC.2.P.10.1: Discuss that people use electricity or other forms of energy to cook their food, cool or warm their homes, and power their cars.
SC.2.P.13.1: Investigate the effect of applying various pushes and pulls on different objects.
SC.2.P.13.2: Demonstrate that magnets can be used to make some things move without touching them.
SC.2.P.13.3: Recognize that objects are pulled toward the ground unless something holds them up.
SC.2.P.13.4: Demonstrate that the greater the force (push or pull) applied to an object, the greater the change in motion of the object.
SK.2.CS-CC.1.2: Conduct basic keyword searches, and exchange information and feedback with teachers and other students (e.g., e-mail and text messaging).
SK.2.CS-CC.1.3: Collaborate and cooperate with peers, teachers, and others using technology to solve problems.
SK.2.CS-CP.2.1: Define a computer program as a set of commands created by people to do something.
SK.2.CS-CP.2.4: Construct a simple program using tools that do not require a textual programming language (e.g., block-based programming language).
SK.2.CS-CP.3.1: Create developmentally appropriate multimedia products with support from teachers, family members, or student partners.
SK.2.CS-CP.3.2: Prepare a simple presentation of digital products and applications.
SK.2.CS-CS.1.1: Define simulation and identify the concepts illustrated by a simple simulation (e.g., growth, human health, and the butterfly life cycle).
SK.2.CS-CS.1.3: Describe how models represent a real-life system (e.g., globe or map).
SK.2.CS-CS.2.1: Arrange or sort information into useful order, such as sorting students by birth date, with or without technology.
SK.2.CS-CS.2.2: Solve age-appropriate problems (e.g., puzzles and logical thinking programs) with or without technology (i.e., computational thinking).
SK.2.CS-CS.2.4: Define an algorithm as a sequence of defined steps.
SK.2.CS-CS.2.6: Illustrate thoughts, ideas, and stories in a step-by-step manner using writing tools, digital cameras, and drawing tools.
SK.2.CS-CS.2.7: Develop and present an algorithm using tangible materials.
SK.2.CS-CS.3.1: Create a digital artifact (independently and collaboratively) that clearly expresses thoughts and ideas.
SK.2.CS-CS.3.2: Create, review, and revise artifacts that include text, images, and audio using digital tools.
SK.2.CS-CS.4.3: Explain that a computer program is running when a program or command is executed.

Mathematicians who participate in effortful learning both individually and with others:
- Analyze the problem in a way that makes sense given the task.
- Ask questions that will help with solving the task.
- Build perseverance by modifying methods as needed while solving a challenging task.
- Stay engaged and maintain a positive mindset when working to solve tasks.
- Help and support each other when attempting a new method or approach.

MA.K12.MTR.1.1: Clarifications:
Teachers who encourage students to participate actively in effortful learning both individually and with others:
- Cultivate a community of growth mindset learners.
- Foster perseverance in students by choosing tasks that are challenging.
- Develop students' ability to analyze and problem solve.
- Recognize students' effort when solving challenging problems.

Demonstrate understanding by representing problems in multiple ways.
Mathematicians who demonstrate understanding by representing problems in multiple ways:

- Build understanding through modeling and using manipulatives.
- Represent solutions to problems in multiple ways using objects, drawings, tables, graphs and equations.
- Progress from modeling problems with objects and drawings to using algorithms and equations.
- Express connections between concepts and representations.
- Choose a representation based on the given context or purpose.

**Clarifications:**

Teachers who encourage students to demonstrate understanding by representing problems in multiple ways:

- Help students make connections between concepts and representations.
- Provide opportunities for students to use manipulatives when investigating concepts.
- Guide students from concrete to pictorial to abstract representations as understanding progresses.
- Show students that various representations can have different purposes and can be useful in different situations.

Complete tasks with mathematical fluency.

Mathematicians who complete tasks with mathematical fluency:

- Select efficient and appropriate methods for solving problems within the given context.
- Maintain flexibility and accuracy while performing procedures and mental calculations.
- Complete tasks accurately and with confidence.
- Adapt procedures to apply them to a new context.
- Use feedback to improve efficiency when performing calculations.

**Clarifications:**

Teachers who encourage students to complete tasks with mathematical fluency:

- Provide students with the flexibility to solve problems by selecting a procedure that allows them to solve efficiently and accurately.
- Offer multiple opportunities for students to practice efficient and generalizable methods.
- Provide opportunities for students to reflect on the method they used and determine if a more efficient method could have been used.

Engage in discussions that reflect on the mathematical thinking of self and others.

Mathematicians who engage in discussions that reflect on the mathematical thinking of self and others:

- Communicate mathematical ideas, vocabulary and methods effectively.
- Analyze the mathematical thinking of others.
- Compare the efficiency of a method to those expressed by others.
- Recognize errors and suggest how to correctly solve the task.
- Justify results by explaining methods and processes.
- Construct possible arguments based on evidence.

**Clarifications:**

Teachers who encourage students to engage in discussions that reflect on the mathematical thinking of self and others:

- Establish a culture in which students ask questions of the teacher and their peers, and error is an opportunity for learning.
- Create opportunities for students to discuss their thinking with peers.
- Select, sequence and present student work to advance and deepen understanding of correct and increasingly efficient methods.
- Develop students’ ability to justify methods and compare their responses to the responses of their peers.

Use patterns and structure to help understand and connect mathematical concepts.

Mathematicians who use patterns and structure to help understand and connect mathematical concepts:

- Focus on relevant details within a problem.
- Create plans and procedures to logically order events, steps or ideas to solve problems.
- Decompose a complex problem into manageable parts.
- Relate previously learned concepts to new concepts.
- Look for similarities among problems.
- Connect solutions of problems to more complicated large-scale situations.

**Clarifications:**

Teachers who encourage students to use patterns and structure to help understand and connect mathematical concepts:

- Help students recognize the patterns in the world around them and connect these patterns to mathematical concepts.
- Support students to develop generalizations based on the similarities found among problems.
- Provide opportunities for students to create plans and procedures to solve problems.
- Develop students’ ability to construct relationships between their current understanding and more sophisticated ways of thinking.

Assess the reasonableness of solutions.

Mathematicians who assess the reasonableness of solutions:

- Estimate to discover possible solutions.
- Use benchmark quantities to determine if a solution makes sense.
- Check calculations when solving problems.
- Verify possible solutions by explaining the methods used.
- Evaluate results based on the given context.

**Clarifications:**

Teachers who encourage students to assess the reasonableness of solutions:

- Have students estimate or predict solutions prior to solving.
- Prompt students to continually ask, “Does this solution make sense? How do you know?”
- Reinforce that students check their work as they progress within and after a task.
- Strengthen students’ ability to verify solutions through justifications.
Apply mathematics to real-world contexts. Mathematicians who apply mathematics to real-world contexts:
- Connect mathematical concepts to everyday experiences.
- Use models and methods to understand, represent and solve problems.
- Perform investigations to gather data or determine if a method is appropriate. • Redesign models and methods to improve accuracy or efficiency.

MA.K12.MTR.7.1:

Clariﬁcations:
Teachers who encourage students to apply mathematics to real-world contexts:
- Provide opportunities for students to create models, both concrete and abstract, and perform investigations.
- Challenge students to question the accuracy of their models and methods.
- Support students as they validate conclusions by comparing them to the given situation.
- Indicate how various concepts can be applied to other disciplines.

Cite evidence to explain and justify reasoning.

Clariﬁcations:
K-1 Students include textual evidence in their oral communication with guidance and support from adults. The evidence can consist of details from the text without naming the text. During 1st grade, students learn how to incorporate the evidence in their writing.

2-3 Students include relevant textual evidence in their written and oral communication. Students should name the text when they refer to it. In 3rd grade, students should use a combination of direct and indirect citations.

4-5 Students continue with previous skills and reference comments made by speakers and peers. Students cite texts that they’ve directly quoted, paraphrased, or used for information. When writing, students will use the form of citation dictated by the instructor or the style guide referenced by the instructor.

6-8 Students continue with previous skills and use a style guide to create a proper citation.

9-12 Students continue with previous skills and should be aware of existing style guides and the ways in which they differ.

Read and comprehend grade-level complex texts proﬁciently.

Clariﬁcations:
See Text Complexity for grade-level complexity bands and a text complexity rubric.

Make inferences to support comprehension.

Clariﬁcations:
Students will make inferences before the words infer or inference are introduced. Kindergarten students will answer questions like “Why is the girl smiling?” or make predictions about what will happen based on the title page. Students will use the terms and apply them in 2nd grade and beyond.

Use appropriate collaborative techniques and active listening skills when engaging in discussions in a variety of situations.

Clariﬁcations:
In kindergarten, students learn to listen to one another respectfully. In grades 1-2, students build upon these skills by justifying what they are thinking. For example: “I think ______ because ______.” The collaborative conversations are becoming academic conversations.

In grades 3-12, students engage in academic conversations discussing claims and justifying their reasoning, refining and applying skills. Students build on ideas, propel the conversation, and support claims and counterclaims with evidence.

Use the accepted rules governing a speciﬁc format to create quality work.

Clariﬁcations:
Students will incorporate skills learned into work products to produce quality work. For students to incorporate these skills appropriately, they must receive instruction. A 3rd grade student creating a poster board display must have instruction in how to effectively present information to do quality work.

Use appropriate voice and tone when speaking or writing.

Clariﬁcations:
In kindergarten and 1st grade, students learn the difference between formal and informal language. For example, the way we talk to our friends differs from the way we speak to adults. In 2nd grade and beyond, students practice appropriate social and academic language to discuss texts.

ELD.K12.EE.5C.1: English language learners communicate information, ideas and concepts necessary for academic success in the content area of Science.

General Course Information and Notes

VERSION DESCRIPTION

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GENERAL INFORMATION

Course Number: 5020090
Course Path: Section: Grades PreK to 12 Education
Courses: Grade Group: Grades PreK to 5 Education
Courses: Subject: Science > SubSubject: General Sciences
Abbreviated Title: STEM LAB 2
Course Length: Year (Y)
Course Attributes:
- Class Size Core Required

Course Status: State Board Approved

Educator Certifications
Elementary Education (Elementary Grades 1-6)
Elementary Education (Grades K-6)
<table>
<thead>
<tr>
<th>Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>SC.3.L.14.1</td>
<td>Investigate and describe how plants respond to stimuli (heat, light, gravity), such as the way plant stems grow toward light and their roots grow downward in response to gravity.</td>
</tr>
<tr>
<td>SC.3.L.14.2</td>
<td>Investigate and describe how plants respond to stimuli (heat, light, gravity), such as the way plant stems grow toward light and their roots grow downward in response to gravity.</td>
</tr>
<tr>
<td>SC.3.L.15.1</td>
<td>Classify animals into major groups (mammals, birds, reptiles, amphibians, fish, arthropods, vertebrates and invertebrates, those having live births and those which lay eggs) according to their physical characteristics and behaviors.</td>
</tr>
<tr>
<td>SC.3.L.15.2</td>
<td>Classify flowering and nonflowering plants into major groups such as those that produce seeds, or those like ferns and mosses that produce spores, according to their physical characteristics.</td>
</tr>
<tr>
<td>SC.3.L.17.1</td>
<td>Describe how animals and plants respond to changing seasons.</td>
</tr>
<tr>
<td>SC.3.L.17.2</td>
<td>Recognize that plants use energy from the Sun, air, and water to make their own food.</td>
</tr>
<tr>
<td>SC.3.N.1.1</td>
<td>Raise questions about the natural world, investigate them individually and in teams through free exploration and systematic investigations, and generate appropriate explanations based on those explorations.</td>
</tr>
<tr>
<td>SC.3.N.1.2</td>
<td>Compare the observations made by different groups using the same tools and seek reasons to explain the differences across groups.</td>
</tr>
<tr>
<td>SC.3.N.1.3</td>
<td>Keep records as appropriate, such as pictorial, written, or simple charts and graphs, of investigations conducted.</td>
</tr>
<tr>
<td>SC.3.N.1.4</td>
<td>Recognize the importance of communication among scientists.</td>
</tr>
<tr>
<td>SC.3.N.1.5</td>
<td>Recognize that scientists question, discuss, and check each other’s evidence and explanations.</td>
</tr>
<tr>
<td>SC.3.N.1.6</td>
<td>Infer based on observation.</td>
</tr>
<tr>
<td>SC.3.N.1.7</td>
<td>Explain that empirical evidence is information, such as observations or measurements, that is used to help validate explanations of natural phenomena.</td>
</tr>
<tr>
<td>SC.3.N.3.1</td>
<td>Recognize that words in science can have different or more specific meanings than their use in everyday language; for example, energy, cell, heat/cold, and evidence.</td>
</tr>
<tr>
<td>SC.3.N.3.2</td>
<td>Recognize that scientists use models to help understand and explain how things work.</td>
</tr>
<tr>
<td>SC.3.N.3.3</td>
<td>Recognize that all models are approximations of natural phenomena; as such, they do not perfectly account for all observations.</td>
</tr>
<tr>
<td>SC.3.P.8.1</td>
<td>Measure and compare temperatures of various samples of solids and liquids.</td>
</tr>
<tr>
<td>SC.3.P.8.2</td>
<td>Measure and compare the mass and volume of solids and liquids.</td>
</tr>
<tr>
<td>SC.3.P.8.3</td>
<td>Compare materials and objects according to properties such as size, shape, color, texture, and hardness.</td>
</tr>
<tr>
<td>SC.3.P.9.1</td>
<td>Describe the changes water undergoes when it changes state through heating and cooling by using familiar scientific terms such as melting, freezing, boiling, evaporation, and condensation.</td>
</tr>
<tr>
<td>SC.3.P.10.1</td>
<td>Identify some basic forms of energy such as light, heat, sound, electrical, and mechanical.</td>
</tr>
<tr>
<td>SC.3.P.10.2</td>
<td>Recognize that energy has the ability to cause motion or create change.</td>
</tr>
<tr>
<td>SC.3.P.10.3</td>
<td>Demonstrate that light travels in a straight line until it strikes an object or travels from one medium to another.</td>
</tr>
<tr>
<td>SC.3.P.10.4</td>
<td>Demonstrate that light can be reflected, refracted, and absorbed.</td>
</tr>
<tr>
<td>SC.3.P.11.1</td>
<td>Investigate, observe, and explain that things that give off light often also give off heat.</td>
</tr>
<tr>
<td>SC.3.P.11.2</td>
<td>Investigate, observe, and explain that heat is produced when one object rubs against another, such as rubbing one’s hands together.</td>
</tr>
<tr>
<td>SC.35.CS-CS.1.1</td>
<td>Identify technology tools for individual and collaborative data collection, writing, communication, and publishing activities.</td>
</tr>
<tr>
<td>SC.35.CS-CS.1.2</td>
<td>Describe key ideas and details while working individually or collaboratively using digital tools and media-rich resources in a way that informs, persuades, and/or entertains.</td>
</tr>
<tr>
<td>SC.35.CS-CS.1.3</td>
<td>Identify ways that technology can foster teamwork, and collaboration can support problem solving and innovation.</td>
</tr>
<tr>
<td>SC.35.CS-CS.1.4</td>
<td>Identify and describe examples of databases from everyday life (e.g., library catalogs, school records, telephone directories, and contact lists).</td>
</tr>
<tr>
<td>SC.35.CS-CS.1.5</td>
<td>Identify, research, and collect a data set on a topic, issue, problem, or question using age-appropriate technologies.</td>
</tr>
<tr>
<td>SC.35.CS-CS.1.6</td>
<td>Collect, organize, graph, and analyze data to answer a question using a database or spreadsheet.</td>
</tr>
<tr>
<td>SC.35.CS-CS.2.1</td>
<td>Solve age-appropriate problems using information organized using digital graphic organizers (e.g., concept maps and Venn-diagrams).</td>
</tr>
<tr>
<td>SC.35.CS-CS.2.2</td>
<td>Explain the process of arranging or sorting information into useful order as well as the purpose for doing so.</td>
</tr>
<tr>
<td>SC.35.CS-CS.2.3</td>
<td>Manipulate and publish multimedia artifacts using digital tools (local and online).</td>
</tr>
<tr>
<td>SC.35.CS-CS.3.1</td>
<td>Describe how hardware applications (e.g., Global Positioning System (GPS) navigation for driving directions, text-to-speech translation, and language translation) can enable everyone to do things they could not do otherwise.</td>
</tr>
<tr>
<td>SC.35.CS-CS.3.2</td>
<td>Communicate about technology using appropriate terminology.</td>
</tr>
<tr>
<td>SC.35.CS-CS.3.3</td>
<td>Identify digital information resources used to answer research questions (e.g., online library catalog, online encyclopedias, databases, and websites).</td>
</tr>
<tr>
<td>SC.35.CS-CS.3.4</td>
<td>Gather, organize, and analyze information from digital resources.</td>
</tr>
<tr>
<td>SC.35.CS-CS.3.5</td>
<td>Compare digital resources for accuracy, relevancy, and appropriateness.</td>
</tr>
<tr>
<td>SC.35.CS-CS.4.1</td>
<td>Describe the difference between digital artifacts that are open or free and those that are protected by copyright.</td>
</tr>
</tbody>
</table>
PARTITION SHAPES INTO PARTS WITH EQUAL AREAS. EXPRESS THE AREA OF EACH PART AS A UNIT FRACTION OF THE WHOLE.

MAFS.3.G.1.2:
Partition shapes into parts with equal areas. Express the area of each part as a unit fraction of the whole. For example, partition a shape into 4 parts with equal area, and describe the area of each part as 1/4 of the area of the shape.

MAFS.3.MD.1.2:
Clarifications:
Examples of Opportunities for In-Depth Focus
Continuous measurement quantities such as liquid volume, mass, and so on are an important context for fraction arithmetic (cf. 4.NF.2.4c, 5.NF.2.7c, 5.NF.2.3). In grade 3, students begin to get a feel for continuous measurement quantities and solve whole-number problems involving such quantities.

MAFS.3.MD.2.3:
Draw a scaled picture graph and a scaled bar graph to represent a data set with several categories. Solve one- and two-step "how many more" and "how many less" problems using information presented in scaled bar graphs. For example, draw a bar graph in which each square in the bar graph might represent 5 pets.

MAFS.3.MD.2.4:
Generate measurement data by measuring lengths using rulers marked with halves and fourths of an inch. Show the data by making a line plot, where the horizontal scale is marked off in appropriate units—whole numbers, halves, or quarters.

MAFS.3.NBT.1.1:
Understand a fraction 1/b as the quantity formed by 1 part when a whole is partitioned into b equal parts; understand a fraction a/b as the quantity formed by a parts of size 1/b. Express whole numbers as fractions, and recognize fractions that are equivalent to whole numbers.

MAFS.3.NBT.1.2:
Fluently add and subtract within 1000 using strategies and algorithms based on place value, properties of operations, and/or the relationship between addition and subtraction.

Clarifications:
Students fluently add and subtract within 1000 using strategies and algorithms based on place value, properties of operations, and/or the relationship between addition and subtraction. (Although 3.OA.3.7 and 3.NBT.1.2 are both fluency standards, these two standards do not represent equal investments of time in grade 3. Note that students in grade 2 were already adding and subtracting within 1000, just not fluently. That makes 3.NBT.1.2 a relatively small and incremental expectation. By contrast, multiplication and division are new in grade 3, and meeting the multiplication and division fluency standard 3.OA.3.7 with understanding is a major portion of students’ work in grade 3.)

MAFS.3.NBT.1.3:
Multiply one-digit whole numbers by multiples of 10 in the range 10–90 (e.g., 9 × 80, 5 × 60) using strategies based on place value and properties of operations.

MAFS.3.NF.1.1:
Understand a fraction 1/b as the quantity formed by 1 part when a whole is partitioned into b equal parts; understand a fraction a/b as the quantity formed by a parts of size 1/b. Explain equivalence of fractions in special cases, and compare fractions by reasoning about their size.

a. Understand two fractions as equivalent (equal) if they are the same size, or the same point on a number line.

b. Recognize and generate simple equivalent fractions, e.g., 1/2 = 2/4, 4/6 = 2/3. Explain why the fractions are equivalent, e.g., by using a visual fraction model.

c. Express whole numbers as fractions, and recognize fractions that are equivalent to whole numbers. Examples: Express 3 in the form 3/1; recognize that 6/1 = 6; locate 4/4 and 1 at the same point of a number line diagram.

d. Compare two fractions with the same numerator or the same denominator by reasoning about their size. Recognize that comparisons are valid only when the two fractions refer to the same whole. Record the results of comparisons with the symbols >, =, or <, and justify the conclusions, e.g., by using a visual fraction model.

ELD.K12.ELL.SC.1:
English language learners communicate information, ideas and concepts necessary for academic success in the content area of Science.

General Course Information and Notes

VERSION DESCRIPTION

This course offers students an opportunity to deepen science, mathematics, engineering, and technology skills. The primary content focus will be to expand knowledge of current grade level standards in mathematics and science by applying that content in a real world, hands-on situation involving engineering and technology. For third grade, themes will focus on the investigation of number sense, measurement, geometry, life science, and physical science concepts.

Students will participate in various hands-on STEM activities in this supplemental course to assist in the mastery of current grade level mathematics and science standards.

Instructional Practices
Teaching from a range of complex text is optimized when teachers in all subject areas implement the following strategies on a routine basis:

1. Ensuring wide reading from complex text that varies in length.
2. Making close reading and rereading of texts central to lessons.
3. Emphasizing text-specific complex questions, and cognitively complex tasks, reinforce focus on the text and cultivate independence.
4. Emphasizing students supporting answers based upon evidence from the text.
5. Providing extensive research and writing opportunities (claims and evidence).


• Asking questions (for science) and defining problems (for engineering).
• Developing and using models.
• Planning and carrying out investigations.
• Analyzing and interpreting data.
• Using mathematics, information and computer technology, and computational thinking.
• Constructing explanations (for science) and designing solutions (for engineering).
• Engaging in argument from evidence.
• Obtaining, evaluating, and communicating information.

English Language Development (ELD) Standards Special Notes Section:
Teachers are required to provide listening, speaking, reading and writing instruction that allows English Language Learners (ELL) to communicate information, ideas and concepts for academic success in science and math. For the given level of English language proficiency and with visual, graphic, or interactive support, students will interact with grade level words, expressions, sentences and discourse to process or produce language necessary for academic success. The ELD standard should specify a relevant content area concept or topic of study chosen by curriculum developers and teachers which maximizes an ELL's need for communication and social skills. To access an ELL supporting document which delineates performance definitions and descriptors, please click on the following link: https://cpalmsmediaprod.blob.core.windows.net/uploads/docs/standards/eld/sc.pdf.

For additional information on the development and implementation of the ELD standards, please contact the Bureau of Student Achievement through Language Acquisition at sala@fldoe.org.

**GENERAL INFORMATION**

- **Course Number:** 5020100
- **Course Path:** Section: Grades PreK to 12 Education
  Courses > Grade Group: Grades PreK to 5 Education
  Courses > Subject: Science > SubSubject: General Sciences
- **Abbreviated Title:** STEM LAB 3
- **Course Length:** Year (Y)
- **Course Attributes:**
  - Class Size Core Required

**Educator Certifications**

- Elementary Education (Elementary Grades 1-6)
- Elementary Education (Grades K-6)
Course Standards

<table>
<thead>
<tr>
<th>Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>SC.3.L.14.1</td>
<td>Describe structures in plants and their roles in food production, support, water and nutrient transport, and reproduction.</td>
</tr>
<tr>
<td>SC.3.L.14.2</td>
<td>Investigate and describe how plants respond to stimuli (heat, light, gravity), such as the way plant stems grow toward light and their roots grow downward in response to gravity.</td>
</tr>
<tr>
<td>SC.3.L.15.1</td>
<td>Classify animals into major groups (mammals, birds, reptiles, amphibians, fish, arthropods, vertebrates and invertebrates, those having live births and those which lay eggs) according to their physical characteristics and behaviors.</td>
</tr>
<tr>
<td>SC.3.L.15.2</td>
<td>Classify flowering and nonflowering plants into major groups such as those that produce seeds, or those like ferns and mosses that produce spores, according to their physical characteristics.</td>
</tr>
<tr>
<td>SC.3.L.17.1</td>
<td>Describe how animals and plants respond to changing seasons.</td>
</tr>
<tr>
<td>SC.3.L.17.2</td>
<td>Recognize that plants use energy from the Sun, air, and water to make their own food.</td>
</tr>
<tr>
<td>SC.3.N.1.1</td>
<td>Raise questions about the natural world, investigate them individually and in teams through free exploration and systematic investigations, and generate appropriate explanations based on those explorations.</td>
</tr>
<tr>
<td>SC.3.N.1.2</td>
<td>Compare the observations made by different groups using the same tools and seek reasons to explain the differences across groups.</td>
</tr>
<tr>
<td>SC.3.N.1.3</td>
<td>Keep records as appropriate, such as pictorial, written, or simple charts and graphs, of investigations conducted.</td>
</tr>
<tr>
<td>SC.3.N.1.4</td>
<td>Recognize the importance of communication among scientists.</td>
</tr>
<tr>
<td>SC.3.N.1.5</td>
<td>Recognize that scientists question, discuss, and check each other's evidence and explanations.</td>
</tr>
<tr>
<td>SC.3.N.1.6</td>
<td>Infer based on observation.</td>
</tr>
<tr>
<td>SC.3.N.1.7</td>
<td>Explain that empirical evidence is information, such as observations or measurements, that is used to help validate explanations of natural phenomena.</td>
</tr>
<tr>
<td>SC.3.N.3.1</td>
<td>Recognize that words in science can have different or more specific meanings than their use in everyday language; for example, energy, cell, heat/cold, and evidence.</td>
</tr>
<tr>
<td>SC.3.N.3.2</td>
<td>Recognize that scientists use models to help understand and explain how things work.</td>
</tr>
<tr>
<td>SC.3.N.3.3</td>
<td>Recognize that all models are approximations of natural phenomena; as such, they do not perfectly account for all observations.</td>
</tr>
<tr>
<td>SC.3.P.8.1</td>
<td>Measure and compare temperatures of various samples of solids and liquids.</td>
</tr>
<tr>
<td>SC.3.P.8.2</td>
<td>Measure and compare the mass and volume of solids and liquids.</td>
</tr>
<tr>
<td>SC.3.P.8.3</td>
<td>Compare materials and objects according to properties such as size, shape, color, texture, and hardness.</td>
</tr>
<tr>
<td>SC.3.P.9.1</td>
<td>Describe the changes water undergoes when it changes state through heating and cooling by using familiar scientific terms such as melting, freezing, boiling, evaporation, and condensation.</td>
</tr>
<tr>
<td>SC.3.P.10.1</td>
<td>Identify some basic forms of energy such as light, heat, sound, electrical, and mechanical.</td>
</tr>
<tr>
<td>SC.3.P.10.2</td>
<td>Recognize that energy has the ability to cause motion or create change.</td>
</tr>
<tr>
<td>SC.3.P.10.3</td>
<td>Demonstrate that light travels in a straight line until it strikes an object or travels from one medium to another.</td>
</tr>
<tr>
<td>SC.3.P.10.4</td>
<td>Demonstrate that light can be reflected, refracted, and absorbed.</td>
</tr>
<tr>
<td>SC.3.P.11.1</td>
<td>Investigate, observe, and explain that things that give off light often also give off heat.</td>
</tr>
<tr>
<td>SC.3.P.11.2</td>
<td>Investigate, observe, and explain that heat is produced when one object rubs against another, such as rubbing one’s hands together.</td>
</tr>
<tr>
<td>SC.35.CS-CS.1.1</td>
<td>Identify technology tools for individual and collaborative data collection, writing, communication, and publishing activities.</td>
</tr>
<tr>
<td>SC.35.CS-CS.1.2</td>
<td>Describe key ideas and details while working individually or collaboratively using digital tools and media-rich resources in a way that informs, persuades, and/or entertains.</td>
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<td>SC.35.CS-CS.1.3</td>
<td>Identify ways that technology can foster teamwork, and collaboration can support problem solving and innovation.</td>
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<td>SC.35.CS-CS.1.4</td>
<td>Create a simple model of a system (e.g., flower or solar system) and explain what the model shows and does not show.</td>
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<tr>
<td>SC.35.CS-CS.1.5</td>
<td>Solve age-appropriate problems using information organized using digital graphic organizers (e.g., concept maps and Venn-diagrams).</td>
</tr>
<tr>
<td>SC.35.CS-CS.1.6</td>
<td>Explain the process of arranging or sorting information into useful order as well as the purpose for doing so.</td>
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<tr>
<td>SC.35.CS-CS.1.7</td>
<td>Manipulate and publish multimedia artifacts using digital tools (local and online).</td>
</tr>
<tr>
<td>SC.35.CS-CS.1.8</td>
<td>Create an artifact (independently and collaboratively) that answers a research question clearly and communicates thoughts and ideas.</td>
</tr>
<tr>
<td>SC.35.CS-CS.1.9</td>
<td>Describe how hardware applications (e.g., Global Positioning System (GPS) navigation for driving directions, text-to-speech translation, and language translation) can enable everyone to do things they could not do otherwise.</td>
</tr>
<tr>
<td>SC.35.CS-CS.1.10</td>
<td>Communicate about technology using appropriate terminology.</td>
</tr>
<tr>
<td>SC.35.CS-CS.1.11</td>
<td>Identify digital information resources used to answer research questions (e.g., online library catalog, online encyclopedias, databases, and websites).</td>
</tr>
<tr>
<td>SC.35.CS-CS.1.12</td>
<td>Gather, organize, and analyze information from digital resources.</td>
</tr>
<tr>
<td>SC.35.CS-CS.1.13</td>
<td>Compare digital resources for accuracy, relevancy, and appropriateness.</td>
</tr>
<tr>
<td>SC.35.CS-CS.1.14</td>
<td>Describe the difference between digital artifacts that are open or free and those that are protected by copyright. Mathematics who participate in effortful learning both individually and with others.</td>
</tr>
</tbody>
</table>
MA.K12.MTR.1.1:

- Analyze the problem in a way that makes sense given the task.
- Ask questions that will help with solving the task.
- Build perseverance by modifying methods as needed while solving a challenging task.
- Stay engaged and maintain a positive mindset when working to solve tasks.
- Help and support each other when attempting a new method or approach.

Clarifications:
Teachers who encourage students to participate actively in effortful learning both individually and with others:
- Cultivate a community of growth mindset learners.
- Foster perseverance in students by choosing tasks that are challenging.
- Develop students’ ability to analyze and problem solve.
- Recognize students’ effort when solving challenging problems.

MA.K12.MTR.2.1:

- Complete tasks with mathematical fluency.
- Maintain flexibility and accuracy while performing procedures and mental calculations.
- Adapt procedures to apply them to a new context.
- Use feedback to improve efficiency when performing calculations.

Clarifications:
Teachers who encourage students to complete tasks with mathematical fluency:
- Select efficient and appropriate methods for solving problems within the given context.
- Provide multiple opportunities for students to practice efficient and generalizable methods.
- Guide students from concrete to pictorial to abstract representations as understanding progresses.
- Show students that various representations can have different purposes and can be useful in different situations.

MA.K12.MTR.3.1:

- Engage in discussions that reflect on the mathematical thinking of self and others.
- Communicate mathematical ideas, vocabulary and methods effectively.
- Analyze the mathematical thinking of others.
- Compare the efficiency of a method to those expressed by others.
- Recognize errors and suggest how to correctly solve the task.
- Justify results by explaining methods and processes.
- Construct possible arguments based on evidence.

Clarifications:
Teachers who encourage students to engage in discussions that reflect on the mathematical thinking of self and others:
- Establish a culture in which students ask questions of the teacher and their peers, and error is an opportunity for learning.
- Create opportunities for students to discuss their thinking with peers.
- Select, sequence and present student work to advance and deepen understanding of correct and increasingly efficient methods.
- Develop students’ ability to analyze and problem solve.
- Foster perseverance in students by choosing tasks that are challenging.
- Cultivate a community of growth mindset learners.
- Recognize students’ effort when solving challenging problems.

MA.K12.MTR.4.1:

- Use patterns and structure to help understand and connect mathematical concepts.
- Focus on relevant details within a problem.
- Create plans and procedures to logically order events, steps or ideas to solve problems.
- Decompose a complex problem into manageable parts.
- Look for similarities among problems.
- Connect solutions of problems to more complicated large-scale situations.

Clarifications:
Teachers who encourage students to use patterns and structure to help understand and connect mathematical concepts:
- Help students recognize the patterns in the world around them and connect these patterns to mathematical concepts.
- Support students to develop generalizations based on the similarities found among problems.
- Provide opportunities for students to create plans and procedures to solve problems.
- Develop students’ ability to construct relationships between their current understanding and more sophisticated ways of thinking.

MA.K12.MTR.5.1:

- Assess the reasonableness of solutions.
- Mathematicians who assess the reasonableness of solutions:
- Demonstrate understanding by representing problems in multiple ways.
- Develop students’ ability to analyze and problem solve.
- Recognize students’ effort when solving challenging problems.
MA.K12.MTR.6.1:

- Estimate to discover possible solutions.
- Use benchmark quantities to determine if a solution makes sense.
- Check calculations when solving problems.
- Verify possible solutions by explaining the methods used.
- Evaluate results based on the given context.

**Clarifications:**
Teachers who encourage students to assess the reasonableness of solutions:
- Have students estimate or predict solutions prior to solving.
- Prompt students to continually ask, "Does this solution make sense? How do you know?"
- Reinforce that students check their work as they progress within and after a task.
- Strengthen students' ability to verify solutions through justifications.

Apply mathematics to real-world contexts.
Mathematicians who apply mathematics to real-world contexts:
- Connect mathematical concepts to everyday experiences.
- Use models and methods to understand, represent and solve problems.
- Perform investigations to gather data or determine if a method is appropriate. • Redesign models and methods to improve accuracy or efficiency.

MA.K12.MTR.7.1:

**Clarifications:**
Teachers who encourage students to apply mathematics to real-world contexts:
- Provide opportunities for students to create models, both concrete and abstract, and perform investigations.
- Challenge students to question the accuracy of their models and methods.
- Support students as they validate conclusions by comparing them to the given situation.
- Indicate how various concepts can be applied to other disciplines.

Cite evidence to explain and justify reasoning.

**Clarifications:**
K-1 Students include textual evidence in their oral communication with guidance and support from adults. The evidence can consist of details from the text without naming the text. During 1st grade, students learn how to incorporate the evidence in their writing.
2-3 Students include relevant textual evidence in their written and oral communication. Students should name the text when they refer to it. In 3rd grade, students should use a combination of direct and indirect citations.
4-5 Students continue with previous skills and reference comments made by speakers and peers. Students cite texts that they've directly quoted, paraphrased, or used for information. When writing, students will use the form of citation dictated by the instructor or the style guide referenced by the instructor.
6-8 Students continue with previous skills and use a style guide to create a proper citation.
9-12 Students continue with previous skills and should be aware of existing style guides and the ways in which they differ.

ELA.K12.EE.1.1:

- Read and comprehend grade-level complex texts proficiently.
- Make inferences to support comprehension.
- Use appropriate collaborative techniques and active listening skills when engaging in discussions in a variety of situations.
- Use the accepted rules governing a specific format to create quality work.
- Use appropriate voice and tone when speaking or writing.

**Clarifications:**
- Students will incorporate skills learned into work products to produce quality work. For students to incorporate these skills appropriately, they must receive instruction. A 3rd grade student creating a poster board display must have instruction in how to effectively present information to do quality work.
- English language learners communicate information, ideas and concepts necessary for academic success in the content area of Science.

**General Course Information and Notes**
This course offers students an opportunity to deepen science, mathematics, engineering, and technology skills. The primary content focus will be to expand knowledge of current grade level standards in mathematics and science by applying that content in a real world, hands-on situation involving engineering and technology. For third grade, themes will focus on the investigation of number sense, measurement, geometry, life science, and physical science concepts.

Students will participate in various hands-on STEM activities in this supplemental course to assist in the mastery of current grade level mathematics and science standards.

**Instructional Practices**

Teaching from a range of complex text is optimized when teachers in all subject areas implement the following strategies on a routine basis:

1. Ensuring wide reading from complex text that varies in length.
2. Making close reading and rereading of texts central to lessons.
3. Emphasizing text-specific complex questions, and cognitively complex tasks, reinforce focus on the text and cultivate independence.
4. Emphasizing students supporting answers based upon evidence from the text.
5. Providing extensive research and writing opportunities (claims and evidence).

**Science and Engineering Practices (NRC Framework for K-12 Science Education, 2010)**

- Asking questions (for science) and defining problems (for engineering).
- Developing and using models.
- Planning and carrying out investigations.
- Analyzing and interpreting data.
- Using mathematics, information and computer technology, and computational thinking.
- Constructing explanations (for science) and designing solutions (for engineering).
- Engaging in argument from evidence.
- Obtaining, evaluating, and communicating information.

**English Language Development (ELD) Standards Special Notes Section:**

Teachers are required to provide listening, speaking, reading and writing instruction that allows English Language Learners (ELL) to communicate information, ideas and concepts for academic success in science and math. For the given level of English language proficiency and with visual, graphic, or interactive support, students will interact with grade level words, expressions, sentences and discourse to process or produce language necessary for academic success. The ELD standard should specify a relevant content area concept or topic of study chosen by curriculum developers and teachers which maximizes an ELL's need for communication and social skills. To access an ELL supporting document which delineates performance definitions and descriptors, please click on the following link:


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<tr>
<td>Course Path:</td>
<td>Section: Grades PreK to 12 Education</td>
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<td>Courses:</td>
<td>Grade Group: Grades PreK to 5 Education</td>
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<tr>
<td></td>
<td>Subject: Science SubSubject: General</td>
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<td>Sciences: General</td>
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<td>Abbreviated Title</td>
<td>STEM LAB 3</td>
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<tr>
<td>Course Length</td>
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<td>Status</td>
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<td>Class Size Core Required</td>
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</table>

**Educator Certifications**

- Elementary Education (Elementary Grades 1-6)
- Elementary Education (Grades K-6)
**Course Standards**

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<th>Name</th>
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<tr>
<td>SC.35.CS-CC.1.1:</td>
<td>Identify technology tools for individual and collaborative data collection, writing, communication, and publishing activities.</td>
</tr>
<tr>
<td>SC.35.CS-CC.1.2:</td>
<td>Describe key ideas and details while working individually or collaboratively using digital tools and media-rich resources in a way that informs, persuades, and/or entertains.</td>
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<tr>
<td>SC.35.CS-CC.1.3:</td>
<td>Identify ways that technology can foster teamwork, and collaboration can support problem solving and innovation.</td>
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<tr>
<td>SC.35.CS-CC.1.5:</td>
<td>Explain that providing and receiving feedback from others can improve performance and outcomes for collaborative digital projects.</td>
</tr>
<tr>
<td>SC.35.CS-CP.1.12:</td>
<td>Identify and describe examples of databases from everyday life (e.g., library catalogs, school records, telephone directories, and contact lists).</td>
</tr>
<tr>
<td>SC.35.CS-CP.1.13:</td>
<td>Identify, research, and collect a data set on a topic, issue, problem, or question using age-appropriate technologies.</td>
</tr>
<tr>
<td>SC.35.CS-CP.1.14:</td>
<td>Collect, organize, graph, and analyze data to answer a question using a database or spreadsheet.</td>
</tr>
<tr>
<td>SC.35.CS-CP.2.1:</td>
<td>Perform keyboarding skills for communication and the input of data and information.</td>
</tr>
<tr>
<td>SC.35.CS-CP.2.2:</td>
<td>Create, test, and modify a program in a graphical environment (e.g., block-based visual programming language), individually and collaboratively.</td>
</tr>
<tr>
<td>SC.35.CS-CP.2.3:</td>
<td>Explain that programs need known initial conditions (e.g., set initial score to zero in a game, initialize variables, or initial values set by hardware input).</td>
</tr>
<tr>
<td>SC.35.CS-CP.2.5:</td>
<td>Detect and correct program errors, including those involving arithmetic operators, conditionals, and repetition, using interactive debugging.</td>
</tr>
<tr>
<td>SC.35.CS-CP.3.1:</td>
<td>Write, communicate and publish activities using technology tools.</td>
</tr>
<tr>
<td>SC.35.CS-CP.3.2:</td>
<td>Present digitally created products, either individually and collaboratively, where a topic, concept, or skill is carefully analyzed or thoughtfully explored.</td>
</tr>
<tr>
<td>SC.35.CS-CP.3.11:</td>
<td>Answer a question, individually and collaboratively, using data from a simulation.</td>
</tr>
<tr>
<td>SC.35.CS-CP.3.14:</td>
<td>Create a simple model of a system (e.g., flower or solar system) and explain what the model shows and does not show.</td>
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<td>SC.35.CS-CP.3.21:</td>
<td>Solve age-appropriate problems using information organized using digital graphic organizers (e.g., concept maps and Venn-diagrams).</td>
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<td>SC.35.CS-CP.3.23:</td>
<td>Explore the process of arranging or sorting information into useful order as well as the purpose for doing so.</td>
</tr>
<tr>
<td>SC.35.CS-CP.3.27:</td>
<td>Identify and correct logical errors in algorithms; written, mapped, live action, or digital.</td>
</tr>
<tr>
<td>SC.35.CS-CP.3.28:</td>
<td>Systematically test and identify logical errors in algorithms.</td>
</tr>
<tr>
<td>SC.35.CS-CP.3.29:</td>
<td>Explain how to correct logical errors in algorithms; written, mapped, live action, or digital.</td>
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<td>SC.35.CS-CS.3.1:</td>
<td>Manipulate and publish multimedia artifacts using digital tools (local and online).</td>
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<td>SC.35.CS-CS.3.2:</td>
<td>Create an artifact (independently and collaboratively) that answers a research question clearly communicating thoughts and ideas.</td>
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<tr>
<td>SC.35.CS-PC.3.2:</td>
<td>Gather, organize, and analyze information from digital resources.</td>
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<td>SC.35.CS-PC.3.3:</td>
<td>Compare digital resources for accuracy, relevancy, and appropriateness.</td>
</tr>
<tr>
<td>SC.4.E.6.1:</td>
<td>Identify the three categories of rocks: igneous (formed from molten rock); sedimentary (pieces of other rocks and fossilized organisms); and metamorphic (formed from heat and pressure).</td>
</tr>
<tr>
<td>SC.4.E.6.2:</td>
<td>Identify the physical properties of common earth-forming minerals, including hardness, color, luster, cleavage, and streak color, and recognize the role of minerals in the formation of rocks.</td>
</tr>
<tr>
<td>SC.4.E.6.3:</td>
<td>Recognize that humans need resources found on Earth and that these are either renewable or nonrenewable.</td>
</tr>
<tr>
<td>SC.4.E.6.4:</td>
<td>Describe the basic differences between physical weathering (breaking down of rock by wind, water, ice, temperature change, and plants) and erosion (movement of rock by gravity, wind, water, and ice).</td>
</tr>
<tr>
<td>SC.4.E.6.5:</td>
<td>Investigate how technology and tools help to extend the ability of humans to observe very small things and very large things.</td>
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<td>Recognize that an object in motion always changes its position and may change its direction.</td>
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<td>MAFS.4.G.1.1</td>
<td>Classify two-dimensional figures based on the presence or absence of parallel or perpendicular lines, or the presence or absence of angles of a specified size. Recognize right triangles as a category, and identify right triangles.</td>
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<td>MAFS.4.G.1.2</td>
<td>Recognize a line of symmetry for a two-dimensional figure as a line across the figure such that the figure can be folded along the line into matching parts. Identify line-symmetric figures and draw lines of symmetry.</td>
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<td>MAFS.4.G.1.3</td>
<td>Know relative sizes of measurement units within one system of units including km, m, cm; kg, g; lb, oz.; l, ml; hr, min, sec. Within a single system of measurement, express measurements in a larger unit in terms of a smaller unit. Record measurement equivalents in a two-column table. For example, know that 1 ft is 12 times as long as 1 in. Express the length of a 4 ft snake as 48 in. Generate a conversion table for feet and inches listing the number pairs (1, 12), (2, 24), (3, 36), ...</td>
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<tr>
<td>MAFS.4.MD.1.2</td>
<td>Measure angles in whole-number degrees using a protractor. Sketch angles of specified measure.</td>
</tr>
<tr>
<td>MAFS.4.MD.2.4</td>
<td>Apply the area and perimeter formulas for rectangles in real world and mathematical problems. For example, find the width of a rectangular room given the area of the flooring and the length, by viewing the area formula as a multiplication equation with an unknown factor.</td>
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<tr>
<td>MAFS.4.MD.3.5</td>
<td>Recognize angles as geometric shapes that are formed wherever two rays share a common endpoint, and understand concepts of angle measurement:</td>
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<td>MAFS.4.MD.3.6</td>
<td>Measuring liquid volumes using a graduated cylinder.</td>
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<td>MAFS.4.MD.3.7</td>
<td>Recognize measurement as additive. When an angle is decomposed into non-overlapping parts, the angle measure of the whole is the sum of the angle measures of the parts. Solve addition and subtraction problems to find unknown angles on a diagram in real world and mathematical problems, e.g., by using an equation with a symbol for the unknown angle measure.</td>
</tr>
<tr>
<td>MAFS.4.NF.3.5</td>
<td>Express a fraction with denominator 10 as an equivalent fraction with denominator 100, and use this technique to add fractions with respective denominators 10 and 100. For example, express 3/10 as 30/100, and add 3/10 + 4/100 = 34/100.</td>
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<td>MAFS.4.NF.3.6</td>
<td>Use decimal notation for fractions with denominators 10 or 100. For example, rewrite 0.62 as 62/100; describe a length as 0.62 meters; locate 0.62 on a number line diagram.</td>
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<tr>
<td>MAFS.4.NF.3.7</td>
<td>Compare two decimals to hundredths by reasoning about their size. Recognize that comparisons are valid only when the two decimals refer to the same whole. Record the results of comparisons with the symbols &gt;, =, or &lt; and justify the conclusions, e.g., by using a visual model.</td>
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**General Course Information and Notes**

**VERSION DESCRIPTION**

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4. Emphasizing students supporting answers based upon evidence from the text.
5. Providing extensive research and writing opportunities (claims and evidence).

**Science and Engineering Practices** (NRC Framework for K-12 Science Education, 2010)

- Asking questions (for science) and defining problems (for engineering).
- Developing and using models.
- Planning and carrying out investigations.
- Analyzing and interpreting data.
- Using mathematics, information and computer technology, and computational thinking.
- Constructing explanations (for science) and designing solutions (for engineering).
Engaging in argument from evidence.
Obtaining, evaluating, and communicating information.

English Language Development (ELD) Standards Special Notes Section:
Teachers are required to provide listening, speaking, reading and writing instruction that allows English Language Learners (ELL) to communicate information, ideas and concepts for academic success in science and math. For the given level of English language proficiency and with visual, graphic, or interactive support, students will interact with grade level words, expressions, sentences and discourse to process or produce language necessary for academic success. The ELD standard should specify a relevant content area concept or topic of study chosen by curriculum developers and teachers which maximizes an ELL's need for communication and social skills. To access an ELL supporting document which delineates performance definitions and descriptors, please click on the following link: https://cpalmsmediaprod.blob.core.windows.net/uploads/docs/standards/eld/sc.pdf.

For additional information on the development and implementation of the ELD standards, please contact the Bureau of Student Achievement through Language Acquisition at sala@fldoe.org.

GENERAL INFORMATION

Course Number: 5020110
Course Path: Sections: Grades PreK to 12 Education
Courses > Grade Group: Grades PreK to 5 Education
Courses > Subject: Science > SubSubject: General Sciences >
Abbreviated Title: STEM LAB 4
Course Length: Year (Y)
Course Attributes:
- Class Size Core Required
Course Status: Course Approved

Educator Certifications

Elementary Education (Elementary Grades 1-6)
Elementary Education (Grades K-6)
## Course Standards

<table>
<thead>
<tr>
<th>Name</th>
<th>Description</th>
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<tbody>
<tr>
<td>SC.35.CS-CC.1.1:</td>
<td>Identify technology tools for individual and collaborative data collection, writing, communication, and publishing activities.</td>
</tr>
<tr>
<td>SC.35.CS-CC.1.2:</td>
<td>Describe key ideas and details while working individually or collaboratively using digital tools and media-rich resources in a way that informs, persuades, and/or entertains.</td>
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<tr>
<td>SC.35.CS-CC.1.3:</td>
<td>Identify ways that technology can foster teamwork, and collaboration can support problem solving and innovation.</td>
</tr>
<tr>
<td>SC.35.CS-CC.1.5:</td>
<td>Explain that providing and receiving feedback from others can improve performance and outcomes for collaborative digital projects.</td>
</tr>
<tr>
<td>SC.35.CS-CP.1.2:</td>
<td>Identify and describe examples of databases from everyday life (e.g., library catalogs, school records, telephone directories, and contact lists).</td>
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<tr>
<td>SC.35.CS-CP.1.3:</td>
<td>Identify, research, and collect a data set on a topic, issue, problem, or question using age-appropriate technologies.</td>
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<tr>
<td>SC.35.CS-CP.1.4:</td>
<td>Collect, organize, graph, and analyze data to answer a question using a database or spreadsheet.</td>
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<tr>
<td>SC.35.CS-CP.2.1:</td>
<td>Perform keyboarding skills for communication and the input of data and information.</td>
</tr>
<tr>
<td>SC.35.CS-CP.2.2:</td>
<td>Create, test, and modify a program in a graphical environment (e.g., block-based visual programming language), individually and collaboratively.</td>
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<tr>
<td>SC.35.CS-CP.2.4:</td>
<td>Explain that programs need known initial conditions (e.g., set initial score to zero in a game, initialize variables, or initial values set by hardware input).</td>
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<tr>
<td>SC.35.CS-CP.2.5:</td>
<td>Detect and correct program errors, including those involving arithmetic operators, conditionals, and repetition, using interactive debugging.</td>
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<td>SC.35.CS-CP.3.1:</td>
<td>Write, communicate and publish activities using technology tools.</td>
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<td>SC.35.CS-CP.3.2:</td>
<td>Present digitally created products, either individually and collaboratively, where a topic, concept, or skill is carefully analyzed or thoughtfully explored.</td>
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<td>SC.35.CS-CS.1.1:</td>
<td>Identify the concepts illustrated by a simulation (e.g., ecosystem, predator/prey, and invasive species).</td>
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<td>SC.35.CS-CS.1.3:</td>
<td>Answer a question, individually and collaboratively, using data from a simulation.</td>
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<td>SC.35.CS-CS.1.4:</td>
<td>Create a simple model of a system (e.g., flower or solar system) and explain what the model shows and does not show.</td>
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<td>SC.35.CS-CS.2.1:</td>
<td>Solve age-appropriate problems using information organized using digital graphic organizers (e.g., concept maps and Venn-diagrams).</td>
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<td>SC.35.CS-CS.2.2:</td>
<td>Explain the process of arranging or sorting information into useful order as well as the purpose for doing so.</td>
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<td>SC.35.CS-CS.2.7:</td>
<td>Identify and correct logical errors in algorithms; written, mapped, live action, or digital.</td>
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<td>Systematically test and identify logical errors in algorithms.</td>
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<td>Explain how to correct logical errors in algorithms; written, mapped, live action, or digital.</td>
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<td>SC.35.CS-CP.3.1:</td>
<td>Manipulate and publish multimedia artifacts using digital tools (local and online).</td>
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<td>SC.35.CS-CP.3.2:</td>
<td>Create an artifact (independently and collaboratively) that answers a research question clearly communicating thoughts and ideas.</td>
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<td>Gather, organize, and analyze information from digital resources.</td>
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<td>Compare digital resources for accuracy, relevancy, and appropriateness.</td>
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<td>SCA.4.E.6.1:</td>
<td>Identify the three categories of rocks: igneous (formed from molten rock); sedimentary (pieces of other rocks and fossilized organisms); and metamorphic (formed from heat and pressure).</td>
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<td>SCA.4.E.6.2:</td>
<td>Identify the physical properties of common earth-forming minerals, including hardness, color, luster, cleavage, and streak color, and recognize the role of minerals in the formation of rocks.</td>
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<td>SCA.4.E.6.3:</td>
<td>Recognize that humans need resources found on Earth and that these are either renewable or nonrenewable.</td>
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<td>Describe the basic differences between physical weathering (breaking down of rock by wind, water, ice, temperature change, and plants) and erosion (movement of rock by gravity, wind, water, and ice).</td>
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Investigate and describe that the speed of an object is determined by the distance it travels in a unit of time and that objects can move at different speeds.

Mathematicians who participate in effortful learning both individually and with others:
- Analyze the problem in a way that makes sense given the task.
- Ask questions that will help with solving the task.
- Build perseverance by modifying methods as needed while solving a challenging task.
- Stay engaged and maintain a positive mindset when working to solve tasks.
- Help and support each other when attempting a new method or approach.

Clarifications:
Teachers who encourage students to participate actively in effortful learning both individually and with others:
- Cultivate a community of growth mindset learners.
- Foster perseverance in students by choosing tasks that are challenging.
- Develop students' ability to analyze and problem solve.
- Recognize students' effort when solving challenging problems.

Mathematicians who demonstrate understanding by representing problems in multiple ways:
- Build understanding through modeling and using manipulatives.
- Represent solutions to problems in multiple ways using objects, drawings, tables, graphs and equations.
- Progress from modeling problems with objects and drawings to using algorithms and equations.
- Express connections between concepts and representations.
- Choose a representation based on the given context or purpose.

Clarifications:
Teachers who encourage students to demonstrate understanding by representing problems in multiple ways:
- Help students make connections between concepts and representations.
- Provide opportunities for students to use manipulatives when investigating concepts.
- Guide students from concrete to pictorial to abstract representations as understanding progresses.
- Show students that various representations can have different purposes and can be useful in different situations.

Mathematicians who complete tasks with mathematical fluency:
- Select efficient and appropriate methods for solving problems within the given context.
- Maintain flexibility and accuracy while performing procedures and mental calculations.
- Complete tasks accurately and with confidence.
- Adapt procedures to apply them to a new context.
- Use feedback to improve efficiency when performing calculations.

Clarifications:
Teachers who encourage students to complete tasks with mathematical fluency:
- Provide students with the flexibility to solve problems by selecting a procedure that allows them to solve efficiently and accurately.
- Offer multiple opportunities for students to practice efficient and generalizable methods.
- Provide opportunities for students to reflect on the method they used and determine if a more efficient method could have been used.

Mathematicians who engage in discussions that reflect on the mathematical thinking of self and others:
- Communicate mathematical ideas, vocabulary and methods effectively.
- Analyze the mathematical thinking of others.
- Compare the efficiency of a method to those expressed by others.
- Recognize errors and suggest how to correctly solve the task.
- Justify results by explaining methods and processes.
- Construct possible arguments based on evidence.

Clarifications:
Teachers who encourage students to engage in discussions that reflect on the mathematical thinking of self and others:
- Establish a culture in which students ask questions of the teacher and their peers, and error is an opportunity for learning.
- Create opportunities for students to discuss their thinking with peers.
- Select, sequence and present student work to advance and deepen understanding of correct and increasingly efficient methods.
- Develop students' ability to justify methods and compare their responses to the responses of their peers.

Mathematicians who use patterns and structure to help understand and connect mathematical concepts:
- Focus on relevant details within a problem.
- Create plans and procedures to logically order events, steps or ideas to solve problems.
- Decompose a complex problem into manageable parts.
- Relate previously learned concepts to new concepts.
- Look for similarities among problems.
- Connect solutions of problems to more complicated large-scale situations.

Clarifications:
Teachers who encourage students to use patterns and structure to help understand and connect mathematical concepts:
6-8 Students continue with previous skills and use a style guide to create a proper citation.

Mathematics who assess the reasonableness of solutions:

- Estimate to discover possible solutions.
- Use benchmark quantities to determine if a solution makes sense.
- Check calculations when solving problems.
- Verify possible solutions by explaining the methods used.
- Evaluate results based on the given context.

**Clarifications:**
Teachers who encourage students to assess the reasonableness of solutions:

- Have students estimate or predict solutions prior to solving.
- Prompt students to continually ask, "Does this solution make sense? How do you know?"
- Reinforce that students check their work as they progress within and after a task.
- Strengthen students' ability to verify solutions through justifications.

Apply mathematics to real-world contexts.

Mathematics who apply mathematics to real-world contexts:

- Connect mathematical concepts to everyday experiences.
- Use models and methods to understand, represent and solve problems.
- Perform investigations to gather data or determine if a method is appropriate.
- Redesign models and methods to improve accuracy or efficiency.

**Clarifications:**
Teachers who encourage students to apply mathematics to real-world contexts:

- Provide opportunities for students to create models, both concrete and abstract, and perform investigations.
- Challenge students to question the accuracy of their models and methods.
- Support students as they validate conclusions by comparing them to the given situation.
- Indicate how various concepts can be applied to other disciplines.

Cite evidence to explain and justify reasoning.

**Clarifications:**

K-1 Students include textual evidence in their oral communication with guidance and support from adults. The evidence can consist of details from the text without naming the text. During 1st grade, students learn how to incorporate the evidence in their writing.

2-3 Students include relevant textual evidence in their written and oral communication. Students should name the text when they refer to it. In 3rd grade, students should use a combination of direct and indirect citations.

4-5 Students continue with previous skills and reference comments made by speakers and peers. Students cite texts that they’ve directly quoted, paraphrased, or used for information. When writing, students will use the form of citation dictated by the instructor or the style guide referenced by the instructor.

6-8 Students continue with previous skills and use a style guide to create a proper citation.

9-12 Students continue with previous skills and should be aware of existing style guides and the ways in which they differ.

Read and comprehend grade-level complex texts proficiently.

**Clarifications:**
See Text Complexity for grade-level complexity bands and a text complexity rubric.

Make inferences to support comprehension.

**Clarifications:**
Students will make inferences before the words infer or inference are introduced. Kindergarten students will answer questions like "Why is the girl smiling?" or make predictions about what will happen based on the title page. Students will use the terms and apply them in 2nd grade and beyond.

Use appropriate collaborative techniques and active listening skills when engaging in discussions in a variety of situations.

**Clarifications:**
In kindergarten, students learn to listen to one another respectfully.

In grades 1-2, students build upon these skills by justifying what they are thinking. For example: "I think _____ because _____.” The collaborative conversations are becoming academic conversations.

In grades 3-12, students engage in academic conversations discussing claims and justifying their reasoning, refining and applying skills. Students build on ideas, propel the conversation, and support claims and counterclaims with evidence.

Use the accepted rules governing a specific format to create quality work.

**Clarifications:**
Students will incorporate skills learned into work products to produce quality work. For students to incorporate these skills appropriately, they must receive instruction. A 3rd grade student creating a poster board display must have instruction in how to effectively present information to do quality work.

Use appropriate voice and tone when speaking or writing.

**Clarifications:**
In kindergarten and 1st grade, students learn the difference between formal and informal language. For example, the way we talk to our friends differs from the way we speak to adults. In 2nd grade and beyond, students practice appropriate social and academic language to discuss texts.
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- Constructing explanations (for science) and designing solutions (for engineering).
- Engaging in argument from evidence.
- Obtaining, evaluating, and communicating information.

English Language Development (ELD) Standards Special Notes Section:
Teachers are required to provide listening, speaking, reading and writing instruction that allows English Language Learners (ELL) to communicate information, ideas and concepts for academic success in science and math. For the given level of English language proficiency and with visual, graphic, or interactive support, students will interact with grade level words, expressions, sentences and discourse to process or produce language necessary for academic success. The ELD standard should specify a relevant content area concept or topic of study chosen by curriculum developers and teachers which maximizes an ELL's need for communication and social skills. To access an ELL supporting document which delineates performance definitions and descriptors, please click on the following link: https://cpalmsmediaprod.blob.core.windows.net/uploads/docs/standards/eld/sc.pdf.

GENERAL INFORMATION

Course Number: 5020110

Course Path: Sections: Grades PreK to 12 Education
Courses > Grade Group: Grades PreK to 5 Education
Courses > Subject: Science > SubSubject: General
Sciences >
Abbreviated Title: STEM LAB 4
Course Length: Year (Y)
Course Attributes:
- Class Size Core Required

Course Status: State Board Approved

Educator Certifications
Elementary Education (Elementary Grades 1-6)
Elementary Education (Grades K-6)
### Course Standards

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**MAPS.S.G.1.1:** Use a pair of perpendicular number lines, called axes, to define a coordinate system, with the intersection of the lines (the origin) arranged to coincide with the 0 on each line and a given point in the plane located by using an ordered pair of numbers, called its coordinates. Understand that the first number indicates how far to travel from the origin in the direction of one axis, and the second number indicates how far to travel in the direction of the second axis, with the convention that the names of the two axes and the coordinates correspond (e.g., x-axis and x-coordinate, y-axis and y-coordinate).
M.A.F.S.G.1.2: Represent real world and mathematical problems by graphing points in the first quadrant of the coordinate plane, and interpret coordinate values of points in the context of the situation.

M.A.F.S.MD.1.1: Convert among different-sized standard measurement units (i.e., km, m, cm; kg, g; lb, oz.; l, ml; hr, min, sec) within a given measurement system (e.g., convert 5 cm to 0.05 m), and use these conversions in solving multi-step, real world problems.

M.A.F.S.MD.2.2: Make a line plot to display a data set of measurements in fractions of a unit (1/2, 1/4, 1/8). Use operations on fractions for this grade to solve problems involving information presented in line plots. For example, given different measurements of liquid in identical beakers, find the amount of liquid each beaker would contain if the total amount in all the beakers was redistributed equally.

M.A.F.S.MD.3.3: Recognize volume as an attribute of solid figures and understand concepts of volume measurement.
   a. A cube with side length 1 unit, called a “unit cube,” is said to have “one cubic unit” of volume, and can be used to measure volume.
   b. A solid figure which can be packed without gaps or overlaps using n unit cubes is said to have a volume of n cubic units.

M.A.F.S.MD.3.4: Measure volumes by counting unit cubes, using cubic cm, cubic in, cubic ft, and improvised units.
   a. Find the volume of a right rectangular prism with whole-number side lengths by packing it with unit cubes, and show that the volume is the same as would be found by multiplying the edge lengths, equivalently by multiplying the height by the area of the base. Represent threefold whole-number products as volumes, e.g., to represent the associative property of multiplication.
   b. Apply the formulas V = l × w × h and V = B × h for rectangular prisms to find volumes of right rectangular prisms with whole-number edge lengths in the context of solving real world and mathematical problems.
   c. Recognize volume as additive. Find volumes of solid figures composed of two non-overlapping right rectangular prisms by adding the volumes of the non-overlapping parts, applying this technique to solve real world problems.

Clarifications:
Examples of Opportunities for In-Depth Focus
Students work with volume as an attribute of a solid figure and as a measurement quantity. Students also relate volume to multiplication and addition. This work begins a progression leading to valuable skills in geometric measurement in middle school.

M.A.F.S.NF.1.1: Add and subtract fractions with unlike denominators (including mixed numbers) by replacing given fractions with equivalent fractions in such a way as to produce an equivalent sum or difference of fractions with like denominators. For example, 2/3 + 5/4 = 8/12 + 15/12 = 23/12. (In general, a/b + c/d = (ad + bc)/bd.)

Solve word problems involving addition and subtraction of fractions referring to the same whole, including cases of unlike denominators, e.g., by using visual fraction models or equations to represent the problem. Use benchmark fractions and number sense of fractions to estimate mentally and assess the reasonableness of answers. For example, recognize an incorrect result 2/5 + 1/2 = 3/7, by observing that 3/7 < 1/2.

Clarifications:
Examples of Opportunities for In-Depth Focus
When students meet this standard, they bring together the threads of fraction equivalence (grades 3–5) and addition and subtraction (grades K–4) to fully extend addition and subtraction to fractions.

M.A.F.S.NF.2.3: Interpret a fraction as division of the numerator by the denominator (a/b = a ÷ b). Solve word problems involving division of whole numbers leading to answers in the form of fractions or mixed numbers, e.g., by using visual fraction models or equations to represent the problem. For example, interpret 3/4 as the result of dividing 3 by 4, noting that 3/4 multiplied by 4 equals 3, and that when 3 wholes are shared equally among 4 people each person has a share of size 3/4. If 9 people want to share a 50-pound sack of rice equally by weight, how many pounds of rice should each person get? Between what two whole numbers does your answer lie?

ELD.K12.ELL.SC.1: English language learners communicate information, ideas and concepts necessary for academic success in the content area of Science.

General Course Information and Notes

VERSION DESCRIPTION

This course offers students an opportunity to deepen science, mathematics, engineering, and technology skills. The primary content focus will be to expand knowledge of current grade level standards in mathematics and science by applying that content in a real world, hands-on situation involving engineering and technology. For fifth grade, themes will focus on the investigation of number sense, measurement, geometry, and physical science concepts.

Students will participate in various hands-on STEM activities in this supplemental course to assist in the mastery of current grade level mathematics and science standards.

Instructional Practices
Teaching from a range of complex text is optimized when teachers in all subject areas implement the following strategies on a routine basis:

1. Ensuring wide reading from complex text that varies in length.
2. Making close reading and rereading of texts central to lessons.
3. Emphasizing text-specific complex questions, and cognitively complex tasks, reinforce focus on the text and cultivate independence.
4. Emphasizing students supporting answers based upon evidence from the text.
5. Providing extensive research and writing opportunities (claims and evidence).


- Asking questions (for science) and defining problems (for engineering).
- Developing and using models.
- Planning and carrying out investigations.
- Analyzing and interpreting data.
- Using mathematics, information and computer technology, and computational thinking.
Educator Certifications

Elementary Education (Elementary Grades 1-6)
Elementary Education (Grades K-6)

English Language Development (ELD) Standards Special Notes Section:

Teachers are required to provide listening, speaking, reading and writing instruction that allows English Language Learners (ELL) to communicate information, ideas and concepts for academic success in science and math. For the given level of English language proficiency and with visual, graphic, or interactive support, students will interact with grade level words, expressions, sentences and discourse to process or produce language necessary for academic success. The ELD standard should specify a relevant content area concept or topic of study chosen by curriculum developers and teachers which maximizes an ELL's need for communication and social skills. To access an ELL supporting document which delineates performance definitions and descriptors, please click on the following link: https://cpalmsmediaprod.blob.core.windows.net/uploads/docs/standards/eld/sc.pdf.

For additional information on the development and implementation of the ELD standards, please contact the Bureau of Student Achievement through Language Acquisition at sala@fldoe.org.

GENERAL INFORMATION

Course Number: 5020120

Course Path: Grades PreK to 12 Education
Courses > Grade Group: Grades PreK to 5 Education
Courses > Subject: Science > SubSubject: General Sciences
Abbreviated Title: STEM LAB 5
Course Length: Year (Y)
Course Attributes:
- Class Size Core Required

Course Status: Course Approved
**Course Standards**

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Mathematicians who participate in effortful learning both individually and with others:
- Analyze the problem in a way that makes sense given the task.
- Ask questions that will help with solving the task.
- Build perseverance by modifying methods as needed while solving a challenging task.
MA.K12.MTR.1.1

- Stay engaged and maintain a positive mindset when working to solve tasks.
- Help and support each other when attempting a new method or approach.

**Clariﬁcations:**
Teachers who encourage students to participate actively in effortful learning both individually and with others:
- Cultivate a community of growth mindset learners.
- Foster perseverance in students by choosing tasks that are challenging.
- Develop students’ ability to analyze and problem solve.
- Recognize students’ effort when solving challenging problems.

MA.K12.MTR.3.1

Demonstrate understanding by representing problems in multiple ways.
Mathematicians who demonstrate understanding by representing problems in multiple ways:
- Build understanding through modeling using manipulatives.
- Represent solutions to problems in multiple ways using objects, drawings, tables, graphs and equations.
- Progress from modeling problems with objects and drawings to using algorithms and equations.
- Express connections between concepts and representations.
- Choose a representation based on the given context or purpose.

**Clariﬁcations:**
Teachers who encourage students to demonstrate understanding by representing problems in multiple ways:
- Help students make connections between concepts and representations.
- Provide opportunities for students to use manipulatives when investigating concepts.
- Guide students from concrete to pictorial to abstract representations as understanding progresses.
- Show students that various representations can have different purposes and can be useful in different situations.

MA.K12.MTR.1.2

Complete tasks with mathematical ﬂuency.
Mathematicians who complete tasks with mathematical ﬂuency:
- Select efﬁcient and appropriate methods for solving problems within the given context.
- Maintain ﬂexibility and accuracy while performing procedures and mental calculations.
- Complete tasks accurately and with conﬁdence.
- Adapt procedures to apply them to a new context.
- Use feedback to improve efﬁciency when performing calculations.

**Clariﬁcations:**
Teachers who encourage students to complete tasks with mathematical ﬂuency:
- Provide students with the ﬂexibility to solve problems by selecting a procedure that allows them to solve efﬁciently and accurately.
- Offer multiple opportunities for students to practice efﬁcient and generalizable methods.
- Provide opportunities for students to reﬂect on the method they used and determine if a more efﬁcient method could have been used.

MA.K12.MTR.4.1

Engage in discussions that reﬂect on the mathematical thinking of self and others.
Mathematicians who engage in discussions that reﬂect on the mathematical thinking of self and others:
- Communicate mathematical ideas, vocabulary and methods effectively.
- Analyze the mathematical thinking of others.
- Compare the efﬁciency of a method to those expressed by others.
- Recognize errors and suggest how to correctly solve the task.
- Justify results by explaining methods and processes.
- Construct possible arguments based on evidence.

**Clariﬁcations:**
Teachers who encourage students to engage in discussions that reﬂect on the mathematical thinking of self and others:
- Establish a culture in which students ask questions of the teacher and their peers, and error is an opportunity for learning.
- Create opportunities for students to discuss their thinking with peers.
- Select, sequence and present student work to advance and deepen understanding of correct and increasingly efﬁcient methods.
- Develop students’ ability to justify methods and compare their responses to the responses of their peers.

MA.K12.MTR.5.1

Use patterns and structure to help understand and connect mathematical concepts.
Mathematicians who use patterns and structure to help understand and connect mathematical concepts:
- Focus on relevant details within a problem.
- Create plans and procedures to logically order events, steps or ideas to solve problems.
- Decompose a complex problem into manageable parts.
- Relate previously learned concepts to new concepts.
- Look for similarities among problems.
- Connect solutions of problems to more complicated large-scale situations.

**Clariﬁcations:**
Teachers who encourage students to use patterns and structure to help understand and connect mathematical concepts:
- Help students recognize the patterns in the world around them and connect these patterns to mathematical concepts.
- Support students to develop generalizations based on the similarities found among problems.
- Provide opportunities for students to create plans and procedures to solve problems.
- Develop students’ ability to construct relationships between their current understanding and more sophisticated ways of thinking.

MA.K12.MTR.2.1

Assess the reasonableness of solutions.
Mathematicians who assess the reasonableness of solutions:
- Estimate to discover possible solutions.
- Use benchmark quantities to determine if a solution makes sense.

**Clarifications:**
Teachers who encourage students to use patterns and structure to help understand and connect mathematical concepts:
| MA.K12.MTR.6.1: | **Clarifications:**
<table>
<thead>
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<tbody>
<tr>
<td>Teachers who encourage students to assess the reasonableness of solutions:</td>
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<tr>
<td>• Have students estimate or predict solutions prior to solving.</td>
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<tr>
<td>• Prompt students to continually ask, “Does this solution make sense? How do you know?’”</td>
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<tr>
<td>• Reinforce that students check their work as they progress within and after a task.</td>
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<tr>
<td>• Strengthen students’ ability to verify solutions through justifications.</td>
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| MA.K12.MTR.7.1: | **Clarifications:**
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<tbody>
<tr>
<td>Teachers who encourage students to apply mathematics to real-world contexts:</td>
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<tr>
<td>• Provide opportunities for students to create models, both concrete and abstract, and perform investigations.</td>
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<tr>
<td>• Challenge students to question the accuracy of their models and methods.</td>
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<tr>
<td>• Support students as they validate conclusions by comparing them to the given situation.</td>
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<tr>
<td>• Indicate how various concepts can be applied to other disciplines.</td>
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| ELA.K12.EE.1.1: | **Clarifications:**
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<tbody>
<tr>
<td>K-1 Students include textual evidence in their oral communication with guidance and support from adults. The evidence can consist of details from the text without naming the text. During 1st grade, students learn how to incorporate the evidence in their writing.</td>
<td></td>
</tr>
<tr>
<td>2-3 Students include relevant textual evidence in their written and oral communication. Students should name the text when they refer to it. In 3rd grade, students should use a combination of direct and indirect citations.</td>
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<tr>
<td>4-5 Students continue with previous skills and reference comments made by speakers and peers. Students cite texts that they’ve directly quoted, paraphrased, or used for information. When writing, students will use the form of citation dictated by the instructor or the style guide referenced by the instructor.</td>
<td></td>
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<tr>
<td>6-8 Students continue with previous skills and use a style guide to create a proper citation.</td>
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<tr>
<td>9-12 Students continue with previous skills and should be aware of existing style guides and the ways in which they differ.</td>
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| ELA.K12.EE.2.1: | **Clarifications:**
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<tr>
<td><strong>See Text Complexity for grade-level complexity bands and a text complexity rubric.</strong></td>
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</table>

| ELA.K12.EE.3.1: | **Clarifications:**
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<tbody>
<tr>
<td>Students will make inferences before the words infer or inference are introduced. Kindergarten students will answer questions like “Why is the girl smiling?” or make predictions about what will happen based on the title page. Students will use the terms and apply them in 2nd grade and beyond.</td>
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</table>

| ELA.K12.EE.4.1: | **Clarifications:**
<table>
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<tbody>
<tr>
<td>In kindergarten, students learn to listen to one another respectfully.</td>
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<tr>
<td>In grades 1-2, students build upon these skills by justifying what they are thinking. For example: “I think ______ because ______.” The collaborative conversations are becoming academic conversations.</td>
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<tr>
<td>In grades 3-12, students engage in academic conversations discussing claims and justifying their reasoning, refining and applying skills. Students build on ideas, propel the conversation, and support claims and counterclaims with evidence.</td>
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</table>

| ELA.K12.EE.5.1: | **Clarifications:**
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<tbody>
<tr>
<td>Students will incorporate skills learned into work products to produce quality work. For students to incorporate these skills appropriately, they must receive instruction. A 3rd grade student creating a poster board display must have instruction in how to effectively present information to do quality work.</td>
<td></td>
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</tbody>
</table>

| ELA.K12.EE.6.1: | **Clarifications:**
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<tbody>
<tr>
<td>In kindergarten and 1st grade, students learn the difference between formal and informal language. For example, the way we talk to our friends differs from the way we speak to adults. In 2nd grade and beyond, students practice appropriate social and academic language to discuss texts.</td>
<td></td>
</tr>
</tbody>
</table>

| ELD.K12.ELL.SC.1: | **English language learners communicate information, ideas and concepts necessary for academic success in the content area of Science.** |

**General Course Information and Notes**

**VERSION DESCRIPTION**

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Educator Certifications

Elementary Education (Elementary Grades 1-6)
Elementary Education (Grades K-6)

Instructional Practices

Teaching from a range of complex text is optimized when teachers in all subject areas implement the following strategies on a routine basis:

1. Ensuring wide reading from complex text that varies in length.
2. Making close reading and rereading of texts central to lessons.
3. Emphasizing text-specific complex questions, and cognitively complex tasks, reinforce focus on the text and cultivate independence.
4. Emphasizing students supporting answers based upon evidence from the text.
5. Providing extensive research and writing opportunities (claims and evidence).


- Asking questions (for science) and defining problems (for engineering).
- Developing and using models.
- Planning and carrying out investigations.
- Analyzing and interpreting data.
- Using mathematics, information and computer technology, and computational thinking.
- Constructing explanations (for science) and designing solutions (for engineering).
- Engaging in argument from evidence.
- Obtaining, evaluating, and communicating information.

English Language Development (ELD) Standards Special Notes Section:

Teachers are required to provide listening, speaking, reading and writing instruction that allows English Language Learners (ELL) to communicate information, ideas and concepts for academic success in science and math. For the given level of English language proficiency and with visual, graphic, or interactive support, students will interact with grade level words, expressions, sentences and discourse to process or produce language necessary for academic success. The ELD standard should specify a relevant content area concept or topic of study chosen by curriculum developers and teachers which maximizes an ELL’s need for communication and social skills. To access an ELL supporting document which delineates performance definitions and descriptors, please click on the following link: https://cpalmsmediaprod.blob.core.windows.net/uploads/docs/standards/eld/sc.pdf.

GENERAL INFORMATION

Course Number: 5020120
Course Path: Section: Grades PreK to 12 Education
Courses -> Grade Group: Grades PreK to 5 Education
Courses -> Subject: Science -> SubSubject: General
Sciences ->
Abbreviated Title: STEM LAB 5
Course Length: Year (Y)
Course Attributes:
- Class Size Core Required

Course Status: State Board Approved
### Course Standards

**Use grade appropriate Nature of Science benchmarks**

If this course is offered to sixth grade students, then the SC.6.N benchmarks should be integrated into the sixth grade course, and SC.7.N and SC.8.N benchmarks should be omitted from the sixth grade course.

<table>
<thead>
<tr>
<th>Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>SC.6.L.14.1</td>
<td>Describe and identify patterns in the hierarchical organization of organisms from atoms to molecules and cells to tissues to organs to organ systems to organisms.</td>
</tr>
<tr>
<td>SC.6.L.14.2</td>
<td>Investigate and explain the components of the scientific theory of cells (cell theory): all organisms are composed of cells (single-celled or multi-cellular), all cells come from pre-existing cells, and cells are the basis of life.</td>
</tr>
<tr>
<td>SC.6.L.14.3</td>
<td>Recognize and explore how cells of all organisms undergo similar processes to maintain homeostasis, including extracting energy from food, getting rid of waste, and reproducing.</td>
</tr>
<tr>
<td>SC.6.L.14.4</td>
<td>Compare and contrast the structure and function of major organelles of plant and animal cells, including cell wall, cell membrane, nucleus, cytoplasm, chloroplasts, mitochondria, and vacuoles.</td>
</tr>
<tr>
<td>SC.6.L.14.5</td>
<td>Identify and investigate the general functions of the major systems of the human body (digestive, respiratory, circulatory, reproductive, excretory, immune, nervous, and musculoskeletal) and describe ways these systems interact with each other to maintain homeostasis.</td>
</tr>
<tr>
<td>SC.6.L.14.6</td>
<td>Compare and contrast types of infectious agents that may infect the human body, including viruses, bacteria, fungi, and parasites.</td>
</tr>
<tr>
<td>SC.6.L.15.1</td>
<td>Analyze and describe how and why organisms are classified according to shared characteristics with emphasis on the Linnaean system combined with the concept of Domains.</td>
</tr>
<tr>
<td>SC.6.L.15.2</td>
<td>Recognize that systems interact with each other to maintain homeostasis.</td>
</tr>
<tr>
<td>SC.7.L.16.1</td>
<td>Define a problem from the sixth grade curriculum, use appropriate reference materials to support scientific understanding, plan and carry out scientific investigation of various types, such as systematic observations or experiments, identify variables, collect and organize data, interpret data in charts, tables, and graphics, analyze information, make predictions, and defend conclusions.</td>
</tr>
<tr>
<td>SC.7.L.16.2</td>
<td>Explain why scientific investigations should be reproducible.</td>
</tr>
<tr>
<td>SC.7.L.16.3</td>
<td>Explain the difference between an experiment and other types of scientific investigation, and explain the relative benefits and limitations of each.</td>
</tr>
<tr>
<td>SC.7.L.16.4</td>
<td>Discuss, compare, and negotiate methods used, results obtained, and explanations among groups of students conducting the same investigation.</td>
</tr>
<tr>
<td>SC.7.L.16.5</td>
<td>Recognize that science involves creativity, not just in designing experiments, but also in creating explanations that fit evidence.</td>
</tr>
<tr>
<td>SC.7.L.16.6</td>
<td>Distinguish science from other activities involving thought.</td>
</tr>
<tr>
<td>SC.7.L.16.7</td>
<td>Explain that scientific knowledge is durable because it is open to change as new evidence or interpretations are encountered.</td>
</tr>
<tr>
<td>SC.7.L.16.8</td>
<td>Recognize that scientists who make contributions to scientific knowledge come from all kinds of backgrounds and possess varied talents, interests, and goals.</td>
</tr>
<tr>
<td>SC.7.L.16.9</td>
<td>Recognize and explain that a scientific theory is a well-supported and widely accepted explanation of nature and is not simply a claim posed by an individual. Thus, the use of the term theory in science is very different than how it is used in everyday life.</td>
</tr>
<tr>
<td>SC.7.L.16.10</td>
<td>Recognize and explain that a scientific law is a description of a specific relationship under given conditions in the natural world. Thus, scientific laws are different from societal laws.</td>
</tr>
<tr>
<td>SC.7.L.16.11</td>
<td>Give several examples of scientific laws.</td>
</tr>
<tr>
<td>SC.7.L.16.12</td>
<td>Identify the role of models in the context of the sixth grade science benchmarks.</td>
</tr>
<tr>
<td>SC.7.L.16.13</td>
<td>Recognize that fossil evidence is consistent with the scientific theory of evolution that living things evolved from earlier species.</td>
</tr>
<tr>
<td>SC.7.L.16.14</td>
<td>Explore the scientific theory of evolution by recognizing and explaining ways in which genetic variation and environmental factors contribute to evolution by natural selection and diversity of organisms.</td>
</tr>
<tr>
<td>SC.7.L.16.15</td>
<td>Explore the scientific theory of evolution by relating how the inability of a species to adapt within a changing environment may contribute to the extinction of that species.</td>
</tr>
<tr>
<td>SC.7.L.16.16</td>
<td>Understand and explain that every organism requires a set of instructions that specifies its traits, that this hereditary information (DNA) contains genes located in the chromosomes of each cell, and that heredity is the passage of these instructions from one generation to another.</td>
</tr>
<tr>
<td>SC.7.L.16.17</td>
<td>Determine the probabilities for genotype and phenotype combinations using Punnett Squares and pedigrees.</td>
</tr>
<tr>
<td>SC.7.L.16.18</td>
<td>Compare and contrast the general processes of sexual reproduction requiring meiosis and asexual reproduction requiring mitosis.</td>
</tr>
<tr>
<td>SC.7.L.16.19</td>
<td>Recognize and explore the impact of biotechnology (cloning, genetic engineering, artificial selection) on the individual, society and the environment.</td>
</tr>
<tr>
<td>SC.7.L.16.20</td>
<td>Explain and illustrate the roles of and relationships among producers, consumers, and decomposers in the process of energy transfer in a food web.</td>
</tr>
<tr>
<td>SC.7.L.16.21</td>
<td>Compare and contrast the relationships among organisms such as mutualism, predation, parasitism, competition, and commensalism.</td>
</tr>
<tr>
<td>SC.7.L.16.22</td>
<td>Describe and investigate various limiting factors in the local ecosystem and their impact on native populations, including food, shelter, water, space, disease, parasitism, predation, and nesting sites.</td>
</tr>
<tr>
<td>SC.7.N.1.1</td>
<td>Define a problem from the seventh grade curriculum, use appropriate reference materials to support scientific understanding, plan and carry out scientific investigation of various types, such as systematic observations or experiments, identify variables, collect and organize data, interpret data in charts, tables, and graphics, analyze information, make predictions, and defend conclusions.</td>
</tr>
<tr>
<td>SC.7.N.1.2</td>
<td>Differentiate replication (by others) from repetition (multiple trials).</td>
</tr>
<tr>
<td>SC.7.N.1.3</td>
<td>Distinguish between an experiment (which must involve the identification and control of variables) and other forms of scientific investigation and explain that not all scientific knowledge is derived from experimentation.</td>
</tr>
<tr>
<td>SC.7.N.1.4</td>
<td>Identify test variables (independent variables) and outcome variables (dependent variables) in an experiment.</td>
</tr>
<tr>
<td>SC.7.N.1.5</td>
<td>Describe the methods used in the pursuit of a scientific explanation as seen in different fields of science such as biology, geology, and physics.</td>
</tr>
<tr>
<td>SC.7.N.1.6</td>
<td>Explain that empirical evidence is the cumulative body of observations of a natural phenomenon on which scientific explanations are based.</td>
</tr>
<tr>
<td>SC.7.N.1.7</td>
<td>Explain that scientific knowledge is the result of a great deal of debate and confirmation within the science community.</td>
</tr>
<tr>
<td>SC.7.N.2.1</td>
<td>Identify an instance from the history of science in which scientific knowledge has changed when new evidence or new interpretations are encountered.</td>
</tr>
<tr>
<td>SC.7.N.3.1</td>
<td>Recognize and explain the difference between theories and laws and give several examples of scientific theories and the evidence that supports them.</td>
</tr>
</tbody>
</table>
Identify the benefits and limitations of the use of scientific models.

Sc.7.n.3.2: Describe and investigate the process of photosynthesis, such as the roles of light, carbon dioxide, water and chlorophyll; production of food; release of oxygen.

Sc.8.l.18.1: Describe and investigate how cellular respiration breaks down food to provide energy and releases carbon dioxide.

Sc.8.l.18.3: Construct a scientific model of the carbon cycle to show how matter and energy are continuously transferred within and between organisms and their physical environment.

Sc.8.l.18.4: Cite evidence that living systems follow the Laws of Conservation of Mass and Energy.

Sc.B.n.1.1: Define a problem from the eighth grade curriculum using appropriate reference materials to support scientific understanding, plan and carry out scientific investigations of various types, such as systematic observations or experiments, identify variables, collect and organize data, interpret data in charts, tables, and graphics, analyze information, make predictions, and defend conclusions.

Sc.B.n.1.2: Design and conduct a study using repeated trials and replication.

Sc.B.n.1.3: Use phrases such as "results support" or "fail to support" in science, understanding that science does not offer conclusive 'proof' of a knowledge claim.

Sc.B.n.1.4: Explain how hypotheses are valuable if they lead to further investigations, even if they turn out not to be supported by the data.

Sc.B.n.1.5: Analyze the methods used to develop a scientific explanation as seen in different fields of science.

Sc.B.n.1.6: Understand that scientific investigations involve the collection of relevant empirical evidence, the use of logical reasoning, and the application of imagination in devising hypotheses, predictions, explanations and models to make sense of the collected evidence.

Sc.B.n.2.1: Distinguish between scientific and pseudoscientific ideas.

Sc.B.n.2.2: Discuss what characterizes science and its methods.

Sc.B.n.3.1: Select models useful in relating the results of their own investigations.

Sc.B.n.3.2: Explain why theories may be modified but are rarely discarded.

Sc.B.n.4.1: Explain that science is one of the processes that can be used to inform decision making at the community, state, national, and international levels.

Sc.B.n.4.2: Explain how political, social, and economic concerns can affect science, and vice versa.

Lafs.6.SL.1.2: Interpret information presented in diverse media and formats (e.g., visually, quantitatively, orally) and explain how it contributes to a topic, text, or issue under study.

Lafs.6.SL.1.3: Delineate a speaker's argument and specific claims, distinguishing claims that are supported by reasons and evidence from claims that are not.

Lafs.6.SL.2.4: Present claims and findings, sequencing ideas logically and using pertinent descriptions, facts, and details to accentuate main ideas or themes; use appropriate eye contact, adequate volume, and clear pronunciation.

Lafs.6.SL.2.5: Include multimedia components (e.g., graphics, images, music, sound) and visual displays in presentations to clarify information.

Lafs.6.RST.1.1: Cite specific textual evidence to support analysis of science and technical texts.

Lafs.6.RST.1.2: Determine the central ideas or conclusions of a text; provide an accurate summary of the text distinct from prior knowledge or opinions.

Lafs.6.RST.1.3: Follow precisely a multistep procedure when carrying out experiments, taking measurements, or performing technical tasks.

Lafs.6.RST.2.4: Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 6-8 texts and topics.

Lafs.6.RST.2.5: Analyze the structure an author uses to organize a text, including how the major sections contribute to the whole and to an understanding of the topic.

Lafs.6.RST.2.6: Analyze the author's purpose in providing an explanation, describing a procedure, or discussing an experiment in a text.

Lafs.6.RST.3.7: Integrate quantitative or technical information expressed in words in a text with a version of that information expressed visually (e.g., in a flowchart, diagram, model, graph, or table).

Lafs.6.RST.3.8: Distinguish among facts, reasoned judgment based on research findings, and speculation in a text.

Lafs.6.RST.3.9: Compare and contrast the information gained from experiments, simulations, video, or multimedia sources with that gained from reading a text on the same topic.

Lafs.6.WHST.1.1: Write arguments focused on discipline-specific content.

a. Introduce claim(s) about a topic or issue, acknowledge and distinguish the claim(s) from alternate or opposing claims, and organize the reasons and evidence logically.

b. Support claim(s) with logical reasoning and relevant, accurate data and evidence that demonstrate an understanding of the topic or text, using credible sources.

c. Use words, phrases, and clauses to create cohesion and clarify the relationships among claim(s), counterclaims, reasons, and evidence.

d. Establish and maintain a formal style.

e. Provide a concluding statement or section that follows from and supports the argument presented.

Lafs.6.WHST.1.2: Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes.

a. Introduce a topic clearly, previewing what is to follow; organize ideas, concepts, and information into broader categories as appropriate to achieving purpose; include formatting (e.g., headings), graphics (e.g., charts, tables), and multimedia when useful to aiding comprehension.

b. Develop the topic with relevant, well-chosen facts, definitions, concrete details, quotations, or other information and examples.

c. Use appropriate and varied transitions to create cohesion and clarify the relationships among ideas and concepts.

d. Use precise language and domain-specific vocabulary to inform about or explain the topic.

e. Establish and maintain a formal style and objective tone.

f. Provide a concluding statement or section that follows from and supports the information or explanation presented.

Lafs.6.WHST.2.4: Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.

Lafs.6.WHST.2.5: With some guidance and support from peers and adults, develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on how useful and audience have been addressed.

Lafs.6.WHST.2.6: Use technology, including the Internet, to produce and publish writing and present the relationships between information and ideas clearly and efficiently.

Lafs.6.WHST.3.7: Conduct short research projects to answer a question (including a self-generated question), drawing on several sources and generating additional related, focused questions that allow for multiple avenues of exploration.

Lafs.6.WHST.3.8: Gather relevant information from multiple print and digital sources, using search terms effectively; assess the credibility and accuracy of each source; and quote or paraphrase the data and conclusions of others while avoiding plagiarism and following a standard format for citation.

Lafs.6.WHST.3.9: Draw evidence from informational texts to support analysis reflection, and research.

Lafs.6.WHST.4.10: Write routinely over extended time frames (time for reflection and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences.
Use variables to represent two quantities in a real-world problem that change in relationship to one another; write an equation to express one quantity, thought of as the dependent variable, in terms of the other quantity, thought of as the independent variable. Analyze the relationship between the dependent and independent variables using graphs and tables, and relate these to the equation. For example, in a problem involving motion at constant speed, list and graph ordered pairs of distances and times, and write the equation $d=65t$ to represent the relationship between distance and time.

Display numerical data in plots on a number line, including dot plots, histograms, and box plots.

Summarize numerical data sets in relation to their context, such as by:

- Reporting the number of observations.
- Describing the nature of the attribute under investigation, including how it was measured and its units of measurement.
- Giving quantitative measures of center (median and/or mean) and variability (interquartile range and/or mean absolute deviation), as well as describing any overall pattern and any striking deviations from the overall pattern with reference to the context in which the data were gathered.
- Relating the choice of measures of center and variability to the shape of the data distribution and the context in which the data were gathered.

Make sense of problems and persevere in solving them.

Mathematically proficient students start by explaining to themselves the meaning of a problem and looking for entry points to its solution. They analyze givens, constraints, relationships, and goals. They make conjectures about the form and meaning of the solution and plan a solution pathway rather than simply jumping into a solution attempt. They consider analogous problems, and try special cases and simpler forms of the original problem in order to gain insight into its solution. They monitor and evaluate their progress and change course if necessary. Older students might, depending on the context of the problem, transform algebraic expressions or change the viewing window on their graphing calculator to get the information they need. Mathematically proficient students can explain correspondences between equations, verbal descriptions, tables, and graphs or draw diagrams of important features and relationships, graph data, and search for regularity or trends. Younger students might rely on using concrete objects or pictures to help conceptualize and solve a problem. Mathematically proficient students check their answers to problems using a different method, and they continually ask themselves, “Does this make sense?” They can understand the approaches of others to solving complex problems and identify correspondences between different approaches.

Standard Relation to Course: Supporting

Reason abstractly and quantitatively.

Mathematically proficient students make sense of quantities and their relationships in problem situations. They bring two complementary abilities to bear on problems involving quantitative relationships: the ability to decontextualize—to abstract a given situation and represent it symbolically and manipulate the representing symbols as if they have a life of their own, without necessarily attending to their referents—and the ability to contextualize, to pause as needed during the manipulation process in order to probe into the referents for the symbols involved. Quantitative reasoning entails habits of creating a coherent representation of the problem at hand; considering the units involved; attending to the meaning of quantities, not just how to compute them; and knowing and flexibly using different properties of operations and objects.

Standard Relation to Course: Supporting

Construct viable arguments and critique the reasoning of others.

Mathematically proficient students understand and use stated assumptions, definitions, and previously established results in constructing arguments. They make conjectures and build a logical progression of statements to explore the truth of their conjectures. They analyze situations by breaking them into cases, and can recognize and use counterexamples. They justify their conclusions, communicate them to others, and respond to the arguments of others. They reason inductively about data, making plausible arguments that take into account the context from which the data arose. Mathematically proficient students are also able to compare the effectiveness of two plausible arguments, distinguish correct logic or reasoning from that which is flawed, and—if there is a flaw in an argument—explain what it is. Elementary students can construct arguments using concrete referents such as objects, drawings, diagrams, and actions. Such arguments can make sense and be correct, even though they are not generalized or made formal until later grades. Later, students learn to determine domains to which an argument applies. Students at all grades can listen or read arguments using concrete referents or use a function to describe how one quantity changes in relationship to another. Mathematically proficient students who can apply what they know are comfortable making assumptions and approximations to simplify a complicated situation, realizing that these might not always generalize and make formal until later grades. Later, students learn to determine domains to which an argument applies. Students at all grades can listen or read arguments using concrete referents or use a function to describe how one quantity changes in relationship to another. Mathematically proficient students who can apply what they know are comfortable making assumptions and approximations to simplify a complicated situation, realizing that these might not always generalize and make formal until later grades. Later, students learn to determine domains to which an argument applies. Students at all grades can listen or read arguments using concrete referents or use a function to describe how one quantity changes in relationship to another. Mathematically proficient students who can apply what they know are comfortable making assumptions and approximations to simplify a complicated situation, realizing that these might not always generalize and make formal until later grades. Later, students learn to determine domains to which an argument applies.

Standard Relation to Course: Supporting

Model with mathematics.

Mathematically proficient students can apply the mathematics they know to solve problems arising in everyday life, society, and the workplace. In early grades, this might be as simple as writing an addition equation to describe a situation. In middle grades, a student might apply proportional reasoning to plan a school event or analyze a problem in the community. By high school, a student might use geometry to solve a design problem or use a function to describe how one quantity of interest depends on another. Mathematically proficient students who can apply what they know are comfortable making assumptions and approximations to simplify a complicated situation, realizing that these may need revision later. They are able to identify important quantities in a practical situation and map their relationships using such tools as diagrams, two-way tables, graphs, flowcharts and formulas. They can analyze those relationships mathematically to draw conclusions. They routinely interpret their mathematical results in the context of the situation and reflect on whether the results make sense, possibly improving the model if it has not served its purpose.

Standard Relation to Course: Supporting

Use appropriate tools strategically.

Mathematically proficient students consider the available tools when solving a mathematical problem. These tools might include pencil and paper, concrete models, a ruler, a protractor, a calculator, a spreadsheet, a computer algebra system, a statistical package, or dynamic geometry software. Proficient students are sufficiently familiar with tools appropriate for their grade or course to make sound decisions about when each of these tools might be helpful, recognizing both the insight to be gained and their limitations. For example, mathematically proficient high school students analyze graphs of functions and solutions generated using a graphing calculator. They detect possible errors by strategically using estimation and other mathematical knowledge. When making mathematical models, they know that technology can enable them to visualize the results of varying assumptions, explore consequences, and compare predictions with data. Mathematically proficient students at various grade levels are able to identify relevant external mathematical resources, such as digital content located on a website, and use them to pose or solve problems. They are able to use technological tools to explore and deepen their understanding of concepts.

Standard Relation to Course: Supporting

Attend to precision.

Mathematically proficient students try to communicate precisely to others. They try to use clear definitions in discussion with others and in their own reasoning. They state the meaning of the symbols they choose, including using the equal sign consistently and appropriately. They are careful...
about specifying units of measure, and labeling axes to clarify the correspondence with quantities in a problem. They calculate accurately and efficiently, express numerical answers with a degree of precision appropriate for the problem context. In the elementary grades, students give carefully formulated explanations to each other. By the time they reach high school they have learned to examine claims and make explicit use of definitions.

**Standard Relation to Course: Supporting**

**MAFS.K12.MP.7.1:**

*Look for and make use of structure.*

Mathematically proficient students look closely to discern a pattern or structure. Young students, for example, might notice that three and seven more is the same amount as seven and three more, or they may sort a collection of shapes according to how many sides the shapes have. Later, students will see 7 × 8 equals the well remembered 7 × 5 + 7 × 3, in preparation for learning about the distributive property. In the expression x² + 9x + 14, older students can see the 14 as 2 × 7 and the 9 as 2 + 7. They recognize the significance of an existing line in a geometric figure and can use the strategy of drawing an auxiliary line for solving problems. They also can step back for an overview and shift perspective. They can see complicated things, such as some algebraic expressions, as single objects or as being composed of several objects. For example, they can see 5 – 3(x – y²) as 5 minus a positive number times a square and use that to realize that its value cannot be more than 5 for any real numbers x and y.

**Standard Relation to Course: Supporting**

**MAFS.K12.MP.8.1:**

*Look for and express regularity in repeated reasoning.*

Mathematically proficient students notice if calculations are repeated, and look both for general methods and for shortcuts. Upper elementary students might notice when dividing 25 by 11 that they are repeating the same calculations over and over again, and conclude they have a repeating decimal. By paying attention to the calculation of slope as they repeatedly check whether points are on the line through (1, 2) with slope 3, middle school students might abstract the equation (y – 2)/(x – 1) = 3. Noticing the regularity in the way terms cancel when expanding (x – 1)(x + 1), (x – 1)(x² + x + 1), and (x – 1)(x³ + x² + x + 1) might lead them to the general formula for the sum of a geometric series. As they work to solve a problem, mathematically proficient students maintain oversight of the process, while attending to the details. They continually evaluate the reasonableness of their intermediate results.

**Standard Relation to Course: Supporting**

**HE.6.C.1.8:**

*Clarifications:*

Obesity related to poor nutrition and inactivity, cancer and chronic lung disease related to tobacco use, injuries caused from failure to use seat restraint, and sexually transmitted diseases caused by sexual activity.

**HE.7.C.1.3:**

*Clarifications:*

Food refrigeration, appropriate home heating and cooling, air/water quality, and garbage/trash collection.

**HE.7.C.1.7:**

*Clarifications:*

Sickle-cell anemia, diabetes, and acne.

**ELD.K12.ELL.SC.1:** English language learners communicate information, ideas and concepts necessary for academic success in the content area of Science.

**ELD.K12.ELL.SI.1:** English language learners communicate for social and instructional purposes within the school setting.

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**General Course Information and Notes**

**GENERAL NOTES**

Laboratory investigations that include the use of scientific inquiry, research, measurement, problem solving, laboratory apparatus and technologies, experimental procedures, and safety procedures are an integral part of this course. The National Science Teachers Association (NSTA) recommends that at the middle school level, all students should have multiple opportunities every week to explore science laboratory investigations (labs). School laboratory investigations are defined by the National Research Council (NRC) as an experience in the laboratory, classroom, or the field that provides students with opportunities to interact directly with natural phenomena or with data collected by others using tools, materials, data collection techniques, and models (NRC, 2006, p. 3). Laboratory investigations in the middle school classroom should help all students develop a growing understanding of the complexity and ambiguity of empirical work, as well as the skills to calibrate and troubleshoot equipment used to make observations. Learners should understand measurement error; and have the skills to aggregate, interpret, and present the resulting data (NRC 2006, p. 77; NSTA, 2007).

**Special Notes:**

**Instructional Practices**

Teaching from a range of complex text is optimized when teachers in all subject areas implement the following strategies on a routine basis:

1. Ensuring wide reading from complex text that varies in length.
2. Making close reading and rereading of texts central to lessons.
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4. Emphasizing students' supporting answers based upon evidence from the text.
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**Science and Engineering Practices** (NRC Framework for K-12 Science Education, 2010)

- Asking questions (for science) and defining problems (for engineering).
- Developing and using models.
- Planning and carrying out investigations.
- Analyzing and interpreting data.
- Using mathematics, information and computer technology, and computational thinking.
- Constructing explanations (for science) and designing solutions (for engineering).
Engaging in argument from evidence.

Obtaining, evaluating, and communicating information.

**Literacy Standards in Science**

Secondary science courses include reading standards for literacy in science and technical subjects 6-12 and writing standards for literacy in history/social studies, science, and technical subjects 6-12. The courses also include speaking and listening standards. For a complete list of standards required for this course click on the blue tile labeled course standards. You may also download the complete course including all required standards and notes sections using the export function located at the top of this page.

**English Language Development ELD Standards**

Teachers are required to provide listening, speaking, reading and writing instruction that allows English language learners (ELL) to communicate information, ideas and concepts for academic success in the content area of Science. For the given level of English language proficiency and with visual, graphic, or interactive support, students will interact with grade level words, expressions, sentences and discourse to process or produce language necessary for academic success. The ELD standard should specify a relevant content area concept or topic of study chosen by curriculum developers and teachers which maximizes an ELL’s need for communication and social skills.

To access an ELL supporting document which delineates performance definitions and descriptors, please click on the following link:
https://cpalmsmediaprod.blob.core.windows.net/uploads/docs/standards/eld/sc.pdf

**Additional Instructional Resources:**

A.V.E. for Success Collection is provided by the Florida Association of School Administrators: http://www.fasa.net/4DCGI/cms/review.html?Action=CMS_Document&DocID=139. Please be aware that these resources have not been reviewed by CPALMS and there may be a charge for the use of some of them in this collection.

**GENERAL INFORMATION**

**Course Number:** 2000010

**Course Path:** Section: Grades PreK to 12 Education
Courses > Grade Group: Grades 6 to 8 Education
Courses > Subject: Science > SubSubject: Biological Sciences

**Abbreviated Title:** M/J LIF SCI

**Course Length:** Year (Y)

**Course Attributes:**
- Class Size Core Required

**Course Level:** 2

**Course Status:** Course Approved

**Grade Level(s):** 6,7,8

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**Educator Certifications**

<table>
<thead>
<tr>
<th>Science (Secondary Grades 7-12)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Middle Grades Integrated Curriculum (Middle Grades 5-9)</td>
</tr>
<tr>
<td>Middle Grades General Science (Middle Grades 5-9)</td>
</tr>
<tr>
<td>Biology (Grades 6-12)</td>
</tr>
</tbody>
</table>
Course Standards

Use grade appropriate Nature of Science benchmarks (i.e. if this course is offered to sixth grade students, then the SC.6.N benchmarks should be integrated into the sixth grade course, and SC.7.N and SC.8.N benchmarks should be omitted from the sixth grade course).

<table>
<thead>
<tr>
<th>Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>SC.6.L.14.1</td>
<td>Describe and identify patterns in the hierarchical organization of organisms from atoms to molecules and cells to tissues to organs to organ systems to organisms.</td>
</tr>
<tr>
<td>SC.6.L.14.2</td>
<td>Investigate and explain the components of the scientific theory of cells (cell theory): all organisms are composed of cells (single-celled or multi-cellular), all cells come from pre-existing cells, and cells are the basic unit of life.</td>
</tr>
<tr>
<td>SC.6.L.14.3</td>
<td>Recognize and explore how cells of all organisms undergo similar processes to maintain homeostasis, including extracting energy from food, getting rid of waste, and reproducing.</td>
</tr>
<tr>
<td>SC.6.L.14.4</td>
<td>Compare and contrast the structure and function of major organelles of plant and animal cells, including cell wall, cell membrane, nucleus, cytoplasm, chloroplasts, mitochondria, and vacuoles.</td>
</tr>
<tr>
<td>SC.6.L.14.5</td>
<td>Identify and investigate the general functions of the major systems of the human body (digestive, respiratory, circulatory, reproductive, excretory, immune, nervous, and musculoskeletal) and describe ways these systems interact with each other to maintain homeostasis.</td>
</tr>
<tr>
<td>SC.6.L.14.6</td>
<td>Compare and contrast types of infectious agents that may infect the human body, including viruses, bacteria, fungi, and parasites.</td>
</tr>
<tr>
<td>SC.6.L.15.1</td>
<td>Analyze and describe how and why organisms are classified according to shared characteristics with emphasis on the Linnaean system combined with the concept of Domains.</td>
</tr>
<tr>
<td>SC.6.N.1.1</td>
<td>Define a problem from the sixth grade curriculum, use appropriate reference materials to support scientific understanding, plan and carry out scientific investigation of various types, such as systematic observations or experiments, identify variables, collect and organize data, interpret data in charts, tables, and graphics, analyze information, make predictions, and defend conclusions.</td>
</tr>
<tr>
<td>SC.6.N.1.2</td>
<td>Explain why scientific investigations should be replicable.</td>
</tr>
<tr>
<td>SC.6.N.1.3</td>
<td>Explain the difference between an experiment and other types of scientific investigation, and explain the relative benefits and limitations of each.</td>
</tr>
<tr>
<td>SC.6.N.1.4</td>
<td>Discuss, compare, and negotiate methods used, results obtained, and explanations among groups of students conducting the same investigation.</td>
</tr>
<tr>
<td>SC.6.N.1.5</td>
<td>Recognize that science involves creativity, not just in designing experiments, but also in creating explanations that fit evidence.</td>
</tr>
<tr>
<td>SC.6.N.2.1</td>
<td>Distinguish science from other activities involving thought.</td>
</tr>
<tr>
<td>SC.6.N.2.2</td>
<td>Explain that scientific knowledge is durable because it is open to change as new evidence or interpretations are encountered.</td>
</tr>
<tr>
<td>SC.6.N.2.3</td>
<td>Recognize that scientists who make contributions to scientific knowledge come from all kinds of backgrounds and possess varied talents, interests, and goals.</td>
</tr>
<tr>
<td>SC.6.N.3.1</td>
<td>Recognize and explain that a scientific theory is a well-supported and widely accepted explanation of nature and is not simply a claim posed by an individual. Thus, the use of the term theory in science is very different than how it is used in everyday life.</td>
</tr>
<tr>
<td>SC.6.N.3.2</td>
<td>Recognize and explain that a scientific law is a description of a specific relationship under given conditions in the natural world. Thus, scientific laws are different from societal laws.</td>
</tr>
<tr>
<td>SC.6.N.3.3</td>
<td>Give several examples of scientific laws.</td>
</tr>
<tr>
<td>SC.6.N.3.4</td>
<td>Identify the role of models in the context of the sixth grade science benchmarks.</td>
</tr>
<tr>
<td>SC.7.L.15.1</td>
<td>Recognize that fossil evidence is consistent with the scientific theory of evolution that living things evolved from earlier species.</td>
</tr>
<tr>
<td>SC.7.L.15.2</td>
<td>Explore the scientific theory of evolution by recognizing and explaining ways in which genetic variation and environmental factors contribute to evolution by natural selection and diversity of organisms.</td>
</tr>
<tr>
<td>SC.7.L.15.3</td>
<td>Explore the scientific theory of evolution by relating how the inability of a species to adapt within a changing environment may contribute to the extinction of that species.</td>
</tr>
<tr>
<td>SC.7.L.16.1</td>
<td>Understand and explain that every organism requires a set of instructions that specifies its traits, that this hereditary information (DNA) contains genes located in the chromosomes of each cell, and that heredity is the passage of these instructions from one generation to another.</td>
</tr>
<tr>
<td>SC.7.L.16.2</td>
<td>Determine the probabilities for genotype and phenotype combinations using Punnett Squares and pedigrees.</td>
</tr>
<tr>
<td>SC.7.L.16.3</td>
<td>Compare and contrast the general processes of reproduction requiring meiosis and asexual reproduction requiring mitosis.</td>
</tr>
<tr>
<td>SC.7.L.16.4</td>
<td>Recognize and explore the impact of biotechnology (cloning, genetic engineering, artificial selection) on the individual, society and the environment.</td>
</tr>
<tr>
<td>SC.7.L.17.1</td>
<td>Explain and illustrate the roles of and relationships among producers, consumers, and decomposers in the process of energy transfer in a food web.</td>
</tr>
<tr>
<td>SC.7.L.17.2</td>
<td>Compare and contrast the relationships among organisms such as mutualism, predation, parasitism, competition, and commensalism.</td>
</tr>
<tr>
<td>SC.7.L.17.3</td>
<td>Describe and investigate various limiting factors in the local ecosystem and their impact on native populations, including food, shelter, water, space, disease, parasitism, predation, and nesting sites.</td>
</tr>
<tr>
<td>SC.7.N.1.1</td>
<td>Define a problem from the seventh grade curriculum, use appropriate reference materials to support scientific understanding, plan and carry out scientific investigation of various types, such as systematic observations or experiments, identify variables, collect and organize data, interpret data in charts, tables, and graphics, analyze information, make predictions, and defend conclusions.</td>
</tr>
<tr>
<td>SC.7.N.1.2</td>
<td>Differentiate replication (by others) from repetition (multiple trials).</td>
</tr>
<tr>
<td>SC.7.N.1.3</td>
<td>Distinguish between an experiment (which must involve the identification and control of variables) and other forms of scientific investigation and explain that not all scientific knowledge is derived from experimentation.</td>
</tr>
<tr>
<td>SC.7.N.1.4</td>
<td>Identify test variables (independent variables) and outcome variables (dependent variables) in an experiment.</td>
</tr>
<tr>
<td>SC.7.N.1.5</td>
<td>Describe the methods used in the pursuit of a scientific explanation as seen in different fields of science such as biology, geology, and physics.</td>
</tr>
<tr>
<td>SC.7.N.1.6</td>
<td>Explain that empirical evidence is the cumulative body of observations of a natural phenomenon on which scientific explanations are based.</td>
</tr>
<tr>
<td>SC.7.N.1.7</td>
<td>Explain that scientific knowledge is the result of a great deal of debate and confirmation within the science community.</td>
</tr>
<tr>
<td>SC.7.N.2.1</td>
<td>Identify an instance from the history of science in which scientific knowledge has changed when new evidence or new interpretations are encountered.</td>
</tr>
<tr>
<td>SC.7.N.3.1</td>
<td>Recognize and explain the difference between theories and laws and give several examples of scientific theories and the evidence that supports them.</td>
</tr>
<tr>
<td>SC.7.N.3.2:</td>
<td>Identify the benefits and limitations of the use of scientific models.</td>
</tr>
<tr>
<td>SC.8.L.18.1:</td>
<td>Describe and investigate the process of photosynthesis, such as the roles of light, carbon dioxide, water and chlorophyll; production of food; release of oxygen.</td>
</tr>
<tr>
<td>SC.8.L.18.2:</td>
<td>Describe and investigate how cellular respiration breaks down food to provide energy and releases carbon dioxide.</td>
</tr>
<tr>
<td>SC.8.L.18.3:</td>
<td>Construct a scientific model of the carbon cycle to show how matter and energy are continuously transferred within and between organisms and their physical environment.</td>
</tr>
<tr>
<td>SC.8.L.18.4:</td>
<td>Cite evidence that living systems follow the Laws of Conservation of Mass and Energy.</td>
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<tr>
<td>SC.8.N.3.1:</td>
<td>Describe and investigate how cellular respiration breaks down food to provide energy and releases carbon dioxide.</td>
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<tr>
<td>SC.8.N.3.2:</td>
<td>Select models useful in relating the results of their own investigations.</td>
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<td>SC.8.N.3.3:</td>
<td>Construct a scientific model of the carbon cycle to show how matter and energy are continuously transferred within and between organisms and their physical environment.</td>
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<tr>
<td>SC.8.N.3.4:</td>
<td>Design and conduct a study using repeated trials and replication.</td>
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<td>SC.8.N.3.5:</td>
<td>Construct possible arguments based on evidence.</td>
</tr>
<tr>
<td>SC.8.N.3.6:</td>
<td>Analyze the methods used to develop a scientific explanation as seen in different fields of science.</td>
</tr>
<tr>
<td>SC.8.N.3.7:</td>
<td>Demonstrate understanding by representing problems in multiple ways.</td>
</tr>
<tr>
<td>SC.8.N.3.8:</td>
<td>Complete tasks with mathematical fluency.</td>
</tr>
<tr>
<td>SC.8.N.3.9:</td>
<td>Engage in discussions that reflect on the mathematical thinking of self and others.</td>
</tr>
</tbody>
</table>

Mathematicians who participate in effortful learning both individually and with others:
- Analyze the problem in a way that makes sense given the task.
- Ask questions that will help with solving the task.
- Build perseverance by modifying methods as needed while solving a challenging task.
- Stay engaged and maintain a positive mindset when working to solve tasks.
- Help and support each other when attempting a new method or approach.

Mathematicians who demonstrate understanding by representing problems in multiple ways:
- Build understanding through modeling and using manipulatives.
- Represent solutions to problems in multiple ways using objects, drawings, tables, graphs and equations.
- Progress from modeling problems with objects and drawings to using algorithms and equations.
- Express connections between concepts and representations.
- Choose a representation based on the given context or purpose.

Mathematicians who complete tasks with mathematical fluency:
- Select efficient and appropriate methods for solving problems within the given context.
- Maintain flexibility and accuracy while performing procedures and mental calculations.
- Complete tasks accurately and with confidence.
- Adapt procedures to apply them to a new context.
- Use feedback to improve efficiency when performing calculations.

Mathematicians who engage in discussions that reflect on the mathematical thinking of self and others:
- Communicate mathematical ideas, vocabulary and methods effectively.
- Analyze the mathematical thinking of others.
- Compare the efficiency of a method to those expressed by others.
- Recognize errors and suggest how to correctly solve the task.
- Justify results by explaining methods and processes.
- Construct possible arguments based on evidence.

Clarifications:
- Teachers who encourage students to participate actively in effortful learning both individually and with others:
  - Cultivate a community of growth mindset learners.
  - Foster perseverance in students by choosing tasks that are challenging.
  - Develop students' ability to analyze and problem solve.
  - Recognize students' effort when solving challenging problems.

Clarifications:
- Teachers who encourage students to demonstrate understanding by representing problems in multiple ways:
  - Help students make connections between concepts and representations.
  - Provide opportunities for students to use manipulatives when investigating concepts.
  - Guide students from concrete to pictorial to abstract representations as understanding progresses.
  - Show students that various representations can have different purposes and can be useful in different situations.

Clarifications:
- Teachers who encourage students to complete tasks with mathematical fluency:
  - Provide students with the flexibility to solve problems by selecting a procedure that allows them to solve efficiently and accurately.
  - Offer multiple opportunities for students to practice efficient and generalizable methods.
  - Provide opportunities for students to reflect on the method they used and determine if a more efficient method could have been used.
<table>
<thead>
<tr>
<th><strong>MA.K12.MTR.5.1:</strong> Use patterns and structure to help understand and connect mathematical concepts.</th>
<th><strong>MA.K12.MTR.6.1:</strong> Assess the reasonableness of solutions.</th>
<th><strong>MA.K12.MTR.7.1:</strong> Apply mathematics to real-world contexts.</th>
</tr>
</thead>
</table>
| Teachers who encourage students to engage in discussions that reflect on the mathematical thinking of self and others:  
- Establish a culture in which students ask questions of the teacher and their peers, and error is an opportunity for learning.  
- Create opportunities for students to discuss their thinking with peers.  
- Select, sequence and present student work to advance and deepen understanding of correct and increasingly efficient methods.  
- Develop students' ability to justify methods and compare their responses to the responses of their peers. | **Clarifications:**  
- Focus on relevant details within a problem.  
- Create plans and procedures to logically order events, steps or ideas to solve problems.  
- Decompose a complex problem into manageable parts.  
- Relate previously learned concepts to new concepts.  
- Look for similarities among problems.  
- Connect solutions of problems to more complicated large-scale situations. | **Clarifications:**  
- Connect mathematical concepts to everyday experiences.  
- Use models and methods to understand, represent and solve problems.  
- Perform investigations to gather data or determine if a method is appropriate.  
- Redesign models and methods to improve accuracy or efficiency. |
| **Clarifications:**  
- Read and comprehend grade-level complex texts proficiently.  
- Make inferences to support comprehension. | **ELA.K12.EE.1.1:** Cite evidence to explain and justify reasoning. | **ELA.K12.EE.2.1:** Read and comprehend grade-level complex texts proficiently. |
| **ELA.K12.EE.3.1:** Students will make inferences before the words infer or inference are introduced. Kindergarten students will answer questions like “Why is the girl smiling?” or make predictions about what will happen based on the title page. Students will use the terms and apply them in 2nd grade and beyond. | **Clarifications:**  
- K-1 Students include textual evidence in their oral communication with guidance and support from adults. The evidence can consist of details from the text without naming the text. During 1st grade, students learn how to incorporate the evidence in their writing.  
- 2-3 Students include relevant textual evidence in their written and oral communication. Students should name the text when they refer to it. In 3rd grade, students should use a combination of direct and indirect citations.  
- 4-5 Students continue with previous skills and reference comments made by speakers and peers. Students cite texts that they've directly quoted, paraphrased, or used for information. When writing, students will use the form of citation dictated by the instructor or the style guide referenced by the instructor.  
- 6-8 Students continue with previous skills and use a style guide to create a proper citation.  
- 9-12 Students continue with previous skills and should be aware of existing style guides and the ways in which they differ. | **Clarifications:**  
- See Text Complexity for grade-level complexity bands and a text complexity rubric. |
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### Clarification Table

<table>
<thead>
<tr>
<th>Standard</th>
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<tbody>
<tr>
<td>ELA.K12.EE.4.1</td>
<td>Use appropriate collaborative techniques and active listening skills when engaging in discussions in a variety of situations.</td>
</tr>
<tr>
<td>ELA.K12.EE.5.1</td>
<td>Use the accepted rules governing a specific format to create quality work.</td>
</tr>
<tr>
<td>ELA.K12.EE.6.1</td>
<td>Use appropriate voice and tone when speaking or writing.</td>
</tr>
<tr>
<td>HE.6.C.1.8</td>
<td>Examine the likelihood of injury or illness if engaging in unhealthy/risky behaviors.</td>
</tr>
<tr>
<td>HE.7.C.1.3</td>
<td>Analyze how environmental factors affect personal health.</td>
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<td>HE.7.C.1.7</td>
<td>Describe how heredity can affect personal health.</td>
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<td>ELD.K12.ELL.SI.1</td>
<td>English language learners communicate information, ideas and concepts necessary for academic success in the content area of Science.</td>
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specify a relevant content area concept or topic of study chosen by curriculum developers and teachers which maximizes an ELL's need for communication and social skills. To access an ELL supporting document which delineates performance definitions and descriptors, please click on the following link: https://cpalmsmediaprod.blob.core.windows.net/uploads/docs/standards/eld/sc.pdf

Additional Instructional Resources:
A.V.E. for Success Collection is provided by the Florida Association of School Administrators: http://www.fasa.net/4DCGI/cms/review.html?Action=CMS_Document&DocID=139. Please be aware that these resources have not been reviewed by CPALMS and there may be a charge for the use of some of them in this collection.

Florida's Benchmarks for Excellent Student Thinking (B.E.S.T.) Standards
This course includes Florida's B.E.S.T. ELA Expectations (EE) and Mathematical Thinking and Reasoning Standards (MTRs) for students. Florida educators should intentionally embed these standards within the content and their instruction as applicable. For guidance on the implementation of the EEs and MTRs, please visit https://www.cpalms.org/Standards/BEST_Standards.aspx and select the appropriate B.E.S.T. Standards package.

**GENERAL INFORMATION**

**Course Number:** 2000010
**Course Path:** Grades PreK to 12 Education Courses > Grade Group: Grades 6 to 8 Education Courses > Subject: Science > SubSubject: Biological Sciences
**Abbreviated Title:** M/J LIF SCI
**Course Length:** Year (Y)
**Course Attributes:**
- Class Size Core Required
**Course Level:** 2

**Course Status:** State Board Approved
**Grade Level(s):** 6,7,8

**Educator Certifications**

<table>
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<tr>
<th>Science (Secondary Grades 7-12)</th>
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<td>Biology (Grades 6-12)</td>
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</table>
Determine the probabilities for genotype and phenotype combinations using Punnett Squares and pedigrees.

Recognize that fossil evidence is consistent with the scientific theory of evolution by relating how the diversity of organisms has changed over time.

Explore the scientific theory of evolution by relating how the diversity of organisms has changed over time.

Give several examples of scientific laws.

Explain the difference between an experiment and other types of scientific investigation.

Distinguish between an experiment (which must involve the manipulation of variables) and other types of scientific investigation.

Describe the methods used in the pursuit of a scientific explanation as they relate to the role of hypotheses.

Explain that scientific knowledge is the result of a great deal of debate and confirmation within the science community.

Identify the role of models in the context of the sixth grade science benchmarks.

Explain that scientific knowledge is durable because it is open to change as new evidence or interpretations are encountered.

Describe and identify patterns in the hierarchical organization of organisms from atoms to molecules and cells to tissues to organs to organ systems to organisms.

Discuss, compare, and negotiate methods used, results obtained, and explanations among groups of students conducting the same investigation.

Identify test variables (independent variables) and outcome variables (dependent variables) in an experiment.

Differentiate replication (by others) from repetition (multiple trials).

Compare and contrast the relationships among organisms such as mutualism, predation, parasitism, competition, and commensalism.

Recognize and explore the impact of biotechnology (cloning, genetic engineering, artificial selection) on the individual, society and the environment.

Distinguish science from other activities involving thought.

Recognize and explain the difference between theories and laws and give several examples of scientific theories and the evidence that supports them.

Identify and investigate the general functions of the major systems of the human body (digestive, respiratory, circulatory, reproductive, excretory, immune, nervous, and musculoskeletal) and describe ways these systems interact with each other to maintain homeostasis.

Compare and contrast types of infectious agents that may infect the human body, including viruses, bacteria, fungi, and parasites.

Analyze and describe how and why organisms are classified according to shared characteristics with emphasis on the Linnaean system combined with the concept of Domains.

Recognize and explore the extent to which special interest groups (if any) have contributed to the development of scientific knowledge.

Define a problem from the sixth grade curriculum, use appropriate reference materials to support scientific understanding, plan and carry out scientific investigation of various types, such as systematic observations or experiments, identify variables, collect and organize data, interpret data in charts, tables, and graphics, analyze information, make predictions, and defend conclusions.

SC.6.N.1.1: Define a problem from the sixth grade curriculum, use appropriate reference materials to support scientific understanding, plan and carry out scientific investigation of various types, such as systematic observations or experiments, identify variables, collect and organize data, interpret data in charts, tables, and graphics, analyze information, make predictions, and defend conclusions.

SC.6.N.1.2: Explain why scientific investigations should be replicable.

SC.6.N.1.3: Explain the difference between an experiment and other types of scientific investigation, and explain the relative benefits and limitations of each.

SC.6.N.1.4: Discuss, compare, and negotiate methods used, results obtained, and explanations among groups of students conducting the same investigation.

SC.6.N.1.5: Recognize that science involves creativity, not just in designing experiments, but also in creating explanations that fit evidence.

SC.6.N.2.1: Distinguish science from other activities involving thought.

SC.6.N.2.2: Explain that scientific knowledge is durable because it is open to change as new evidence or interpretations are encountered.

SC.6.N.2.3: Recognize that scientists who make contributions to scientific knowledge come from all kinds of backgrounds and possess varied talents, interests, and goals.

SC.6.N.3.1: Recognize and explain that a scientific theory is a well-supported and widely accepted explanation of nature and is not simply a claim posed by an individual. Thus, the use of the term theory in science is very different than how it is used in everyday life.

SC.6.N.3.2: Recognize and explain that a scientific law is a description of a specific relationship under given conditions in the natural world. Thus, scientific laws are different from societal laws.

SC.6.N.3.3: Give several examples of scientific laws.

SC.6.N.3.4: Identify the role of models in the context of the sixth grade science benchmarks.

SC.7.L.15.1: Recognize that fossil evidence is consistent with the scientific theory of evolution that living things evolved from earlier species.

SC.7.L.15.2: Explore the scientific theory of evolution by recognizing and explaining ways in which genetic variation and environmental factors contribute to evolution by natural selection and diversity of organisms.

SC.7.L.15.3: Explore the scientific theory of evolution by relating how the inability of a species to adapt within a changing environment may contribute to the extinction of that species.

SC.7.L.16.1: Understand and explain that every organism requires a set of instructions that specifies its traits, that this hereditary information (DNA) contains genes located in the chromosomes of each cell, and that heredity is the passage of these instructions from one generation to another.

SC.7.L.16.2: Determine the probabilities for genotype and phenotype combinations using Punnett Squares and pedigrees.

SC.7.L.16.3: Compare and contrast the general processes of sexual reproduction requiring meiosis and asexual reproduction requiring mitosis.

SC.7.L.16.4: Recognize and explore the impact of biotechnology (cloning, genetic engineering, artificial selection) on the individual, society, and the environment.

SC.7.L.17.1: Explain and illustrate the roles of and relationships among producers, consumers, and decomposers in the process of energy transfer in a food web.

SC.7.L.17.2: Compare and contrast the relationships among organisms such as mutualism, predation, parasitism, competition, and commensalism.

SC.7.L.17.3: Describe and illustrate various limiting factors in the local ecosystem and their impact on native populations, including food, shelter, water, space, disease, parasitism, predation, and nesting sites.

SC.7.N.1.1: Define a problem from the seventh grade curriculum, use appropriate reference materials to support scientific understanding, plan and carry out scientific investigation of various types, such as systematic observations or experiments, identify variables, collect and organize data, interpret data in charts, tables, and graphics, analyze information, make predictions, and defend conclusions.

SC.7.N.1.2: Distinguish among an experiment (which must involve the identification and control of variables) and other forms of scientific investigation and explain that not all scientific knowledge is derived from experimentation.

SC.7.N.1.3: Identify test variables (independent variables) and outcome variables (dependent variables) in an experiment.

SC.7.N.1.4: Describe the methods used in the pursuit of a scientific explanation as seen in different fields of science such as biology, geology, and physics.

SC.7.N.1.5: Explain that empirical evidence is the cumulative body of observations of a natural phenomenon on which scientific explanations are based.

SC.7.N.1.6: Explain that scientific knowledge is the result of a great deal of debate and confirmation within the science community.

SC.7.N.2.1: Identify an instance from the history of science in which scientific knowledge has changed when new evidence or new interpretations are encountered.

SC.7.N.3.1: Recognize and explain the difference between theories and laws and give several examples of scientific theories and the evidence that supports them.
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<tr>
<td>LAFS.68.WHST.2.4:</td>
<td>Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.</td>
</tr>
<tr>
<td>LAFS.68.WHST.2.5:</td>
<td>With some guidance and support from peers and adults, develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on how well purpose and audience have been addressed.</td>
</tr>
<tr>
<td>LAFS.68.WHST.2.6:</td>
<td>Use technology, including the Internet, to produce and publish writing and present the relationships between information and ideas clearly and efficiently.</td>
</tr>
<tr>
<td>LAFS.68.WHST.3.7:</td>
<td>Conduct short research projects to answer a question (including a self-generated question), drawing on several sources and generating additional related, focused questions that allow for multiple avenues of exploration.</td>
</tr>
<tr>
<td>LAFS.68.WHST.3.8:</td>
<td>Gather relevant information from multiple print and digital sources, using search terms effectively; assess the credibility and accuracy of each source; and quote or paraphrase the data and conclusions of others while avoiding plagiarism and following a standard format for citation.</td>
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<tr>
<td>LAFS.68.WHST.3.9:</td>
<td>Draw evidence from informational texts to support analysis, reflection, and research.</td>
</tr>
<tr>
<td>LAFS.68.WHST.4.10:</td>
<td>Write routinely over extended time frames (time for reflection and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences.</td>
</tr>
<tr>
<td>LAFS.7.SL.1.2:</td>
<td>Analyze the main ideas and supporting details presented in diverse media and formats (e.g., visually, quantitatively, orally) and explain how the ideas clarify a topic, text, or issue under study.</td>
</tr>
<tr>
<td>LAFS.7.SL.1.3:</td>
<td>Delineate a speaker's argument and specific claims, evaluating the soundness of the reasoning and the relevance and sufficiency of the evidence.</td>
</tr>
<tr>
<td>LAFS.7.SL.2.4:</td>
<td>Present claims and findings, emphasizing salient points in a focused, coherent manner with pertinent descriptions, facts, details, and examples; use appropriate eye contact, adequate volume, and clear pronunciation.</td>
</tr>
<tr>
<td>LAFS.7.SL.2.5:</td>
<td>Include multimedia components and visual displays in presentations to clarify claims and findings and emphasize salient points.</td>
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<tr>
<td>MAFS.6.EE.3.9:</td>
<td>Use variables to represent two quantities in a real-world problem that change in relationship to one another; write an equation to express one quantity, thought of as the dependent variable, in terms of the other quantity, thought of as the independent variable. Analyze the relationship between the dependent and independent variables using graphs and tables, and relate these to the equation. For example, in a problem involving motion at constant speed, list and graph ordered pairs of distances and times, and write the equation d = 65t to represent the relationship between distance and time.</td>
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<tr>
<td>MAFS.6.SP.2.4:</td>
<td>Display numerical data in plots on a number line, including dot plots, histograms, and box plots.</td>
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<tr>
<td>MAFS.6.SP.2.5:</td>
<td>Summarize numerical data sets in relation to their context, such as by:</td>
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<tr>
<td>   a. Reporting the number of observations.</td>
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<tr>
<td>   b. Describing the nature of the attribute under investigation, including how it was measured and its units of measurement.</td>
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<tr>
<td>   c. Giving quantitative measures of center (median and/or mean) and variability (interquartile range and/or mean absolute deviation), as well as describing any overall pattern and any striking deviations from the overall pattern with reference to the context in which the data were gathered.</td>
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<tr>
<td>   d. Relating the choice of measures of center and variability to the shape of the data distribution and the context in which the data were gathered.</td>
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<tr>
<td>MAFS.7.SP.2.4:</td>
<td>Use measures of center and measures of variability for numerical data from random samples to draw informal comparative inferences about two populations. For example, decide whether the words in a chapter of a seventh-grade science book are generally longer than the words in a chapter of a fourth-grade science book.</td>
</tr>
<tr>
<td>MAFS.7.SP.3.5:</td>
<td>Understand that the probability of a chance event is a number between 0 and 1 that expresses the likelihood of the event occurring. Larger numbers indicate greater likelihood. A probability near 0 indicates an unlikely event, a probability around 1/2 indicates an event that is neither unlikely nor likely, and a probability near 1 indicates a likely event.</td>
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<tr>
<td><strong>Make sense of problems and persevere in solving them.</strong></td>
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<tr>
<td>Mathematically proficient students start by explaining to themselves the meaning of a problem and looking for entry points to its solution. They analyze givens, constraints, relationships, and goals. They make conjectures about the form and meaning of the solution and plan a solution pathway rather than simply jumping into a solution attempt. They consider analogous problems, and try special cases and simpler forms of the original problem in order to gain insight into its solution. They monitor and evaluate their progress and change course if necessary. Older students might, depending on the context of the problem, transform algebraic expressions or change the viewing window on their graphing calculator to get the information they need. Mathematically proficient students can explain correspondences between equations, verbal descriptions, tables, and graphs or draw diagrams of important features and relationships, graph data, and search for regularity or trends. Younger students might rely on using concrete objects or pictures to help conceptualize and solve a problem. Mathematically proficient students check their answers to problems using different methods, and they continually ask themselves, “Does this make sense?” They can understand the approaches of others to solving complex problems and identify correspondences between different approaches.</td>
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<tr>
<td><strong>Reason abstractly and quantitatively.</strong></td>
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<td>Mathematically proficient students make sense of quantities and their relationships in problem situations. They bring two complementary abilities to bear on problems involving quantitative relationships: the ability to decontextualize—to abstract a given situation and represent it symbolically and manipulate the representations as if they are a life of their own, without necessarily attending to their referents—and the ability to contextualize, to pause as needed during the manipulation process in order to probe into the referents for the symbols involved. Quantitative reasoning entails habits of creating a coherent representation of the problem at hand; considering the units involved; attending to the meaning of quantities, not just how to compute them; and knowing and flexibly using different properties of operations and objects.</td>
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<tr>
<td><strong>Construct viable arguments and critique the reasoning of others.</strong></td>
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<tr>
<td>Mathematically proficient students understand and use stated assumptions, definitions, and previously established results in constructing arguments. They make conjectures and build a logical progression of statements to explore the truth of their conjectures. They are able to analyze situations by breaking them into cases, and can recognize and use counterexamples. They justify their conclusions, communicate them to others, and respond to the arguments of others. They reason inductively about data, making plausible arguments that take into account the context from which the data arose. Mathematically proficient students are also able to compare the effectiveness of two plausible arguments, distinguish correct logic or reasoning from that which is flawed, and—if there is a flaw in an argument—explain what it is. Elementary students can construct arguments using concrete referents such as objects, drawings, diagrams, and actions. Such arguments can make sense and be correct, even though they are not generalized or made formal until later grades. Later, students learn to determine domains to which an argument applies. Students at all grades can listen or read the arguments of others, decide whether they make sense, and ask useful questions to clarify or improve the arguments.</td>
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<tr>
<td><strong>Model with mathematics.</strong></td>
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Mathematically proficient students can apply the mathematics they know to solve problems arising in everyday life, society, and the workplace. In early grades, this might be as simple as writing an addition equation to describe a situation. In middle grades, a student might apply proportional reasoning to plan a school event or analyze a problem in the community. By high school, a student might use geometry to solve a design problem or use a function to describe how one quantity of interest depends on another. Mathematically proficient students who can apply what they know are comfortable making assumptions and approximations to simplify a complicated situation, realizing that these may need revision later. They are able to identify important quantities in a practical situation and map their relationships using such tools as diagrams, two-way tables, graphs, flowcharts and formulas. They can analyze those relationships mathematically to draw conclusions. They routinely interpret their mathematical results in the context of the situation and reflect on whether the results make sense, possibly improving the model if it has not served its purpose.

**Standard Relation to Course: Supporting**

**MAFS.K12.MP.4.1:** Use appropriate tools strategically.

Mathematically proficient students consider the available tools when solving a mathematical problem. These tools might include pencil and paper, concrete models, a ruler, a protractor, a calculator, a spreadsheet, a computer algebra system, a statistical package, or dynamic geometry software. Proficient students are sufficiently familiar with tools appropriate for their grade or course to make sound decisions about when each of these tools might be helpful, recognizing both the insight to be gained and their limitations. For example, mathematically proficient high school students analyze graphs of functions and solutions generated using a graphing calculator. They detect possible errors by strategically using estimation and other mathematical knowledge. When making mathematical models, they know that technology can enable them to visualize the results of varying assumptions, explore consequences, and compare predictions with data. Mathematically proficient students at various grade levels are able to identify relevant external mathematical resources, such as digital content located on a website, and use them to pose or solve problems. They are able to use technological tools to explore and deepen their understanding of concepts.

**Standard Relation to Course: Supporting**

**MAFS.K12.MP.5.1:** Attend to precision.

Mathematically proficient students try to communicate precisely to others. They try to use clear definitions in discussion with others and in their own reasoning. They state the meaning of the symbols they choose, including using the equal sign consistently and appropriately. They are careful about specifying units of measure, and labeling axes to clarify the correspondence with quantities in a problem. They calculate accurately and efficiently, express numerical answers with a degree of precision appropriate for the problem context. In the elementary grades, students give carefully formulated explanations to each other. By the time they reach high school they have learned to examine claims and make explicit use of definitions.

**Standard Relation to Course: Supporting**

**MAFS.K12.MP.6.1:** Look for and make use of structure.

Mathematically proficient students look closely to discern a pattern or structure. Young students, for example, might notice that three and seven more is the same amount as seven and three more, or they may sort a collection of shapes according to how many sides the shapes have. Later, students will see 7 × 8 equals the well remembered 56, in preparation for learning about the distributive property. In the expression x² + 9x + 14, older students can see the 14 as 2 × 7 and the 9 as 2 + 7. They recognize the significance of an existing line in a geometric figure and can use the strategy of drawing an auxiliary line for solving problems. They also can step back for an overview and shift perspective. They can see complicated things, such as some algebraic expressions, as single objects or as being composed of several objects. For example, they can see 5 – 3(x – y)² as 5 minus a positive number times a square and use that to realize that it’s value cannot be more than 5 for any real numbers x and y.

**Standard Relation to Course: Supporting**

**MAFS.K12.MP.7.1:** Look for and express regularity in repeated reasoning.

Mathematically proficient students notice if calculations are repeated, and look both for general methods and for shortcuts. Upper elementary students might notice when dividing 25 by 11 that they are repeating the same calculations over and over again, and conclude they have a repeating decimal. By paying attention to the calculation of slope as they repeatedly check whether points are on the line through (2, 3) with slope 3, middle school students might abstract the equation (y – 2)/(x – 1) = 3. Noticing the regularity in the way terms cancel when expanding (x – 1)(x + 1), (x – 3)(x² + x + 1), and (x – 1)(x² + x + 1) might lead them to the general formula for the sum of a geometric series. As they work to solve a problem, mathematically proficient students maintain oversight of the process, while attending to the details. They continually evaluate the reasonableness of their intermediate results.

**Standard Relation to Course: Supporting**

**HE.6.C.1:** Examine the likelihood of injury or illness if engaging in unhealthy/risky behaviors.

**Clarifications:**

Obesity related to poor nutrition and inactivity, cancer and chronic lung disease related to tobacco use, injuries caused from failure to use seat restraint, and sexually transmitted diseases caused by sexual activity.

**HE.7.C.1:** Analyze how environmental factors affect personal health.

**Clarifications:**

Food refrigeration, appropriate home heating and cooling, air/water quality, and garbage/trash collection.

**HE.7.C.1:** Describe how heredity can affect personal health.

**Clarifications:**

Sickle-cell anemia, diabetes, and acne.

**ELD.K12.ELL.SC.1:** English language learners communicate information, ideas and concepts necessary for academic success in the content area of Science.

**ELD.K12.ELL.SI.1:** English language learners communicate for social and instructional purposes within the school setting.

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**General Course Information and Notes**

**GENERAL NOTES**

Laboratory investigations that include the use of scientific inquiry, research, measurement, problem solving, laboratory apparatus and technologies, experimental procedures, and safety procedures are an integral part of this course. The National Science Teachers Association (NSTA) recommends that at the middle school level, all students should have multiple opportunities every week to explore science laboratory investigations (labs). School laboratory investigations are defined by the National...
Research Council (NRC) as an experience in the laboratory, classroom, or the field that provides students with opportunities to interact directly with natural phenomena or with data collected by others using tools, materials, data collection techniques, and models (NRC, 2006, p. 3). Laboratory investigations in the middle school classroom should help all students develop a growing understanding of the complexity and ambiguity of empirical work, as well as the skills to calibrate and troubleshoot equipment used to make observations. Learners should understand measurement error; and have the skills to aggregate, interpret, and present the resulting data (NRC 2006, p. 77; NSTA, 2007).

**Honors and Advanced Level Course Note:** Advanced courses require a greater demand on students through increased academic rigor. Academic rigor is obtained through the application, analysis, evaluation, and creation of complex ideas that are often abstract and multi-faceted. Students are challenged to think and collaborate critically on the content they are learning. Honors level rigor will be achieved by increasing text complexity through text selection, focus on high-level qualitative measures, and complexity of task. Instruction will be structured to give students a deeper understanding of conceptual themes and organization within and across disciplines. Academic rigor is more than simply assigning to students a greater quantity of work.

**Special Notes:**

**Instructional Practices**
Teaching from a range of complex text is optimized when teachers in all subject areas implement the following strategies on a routine basis:

1. Ensuring wide reading from complex text that varies in length.
2. Making close reading and rereading of texts central to lessons.
3. Emphasizing text-specific complex questions, and cognitively complex tasks, reinforce focus on the text and cultivate independence.
4. Emphasizing students supporting answers based upon evidence from the text.
5. Providing extensive research and writing opportunities (claims and evidence).

**Science and Engineering Practices** (NRC Framework for K-12 Science Education, 2010)

- Asking questions (for science) and defining problems (for engineering).
- Developing and using models.
- Planning and carrying out investigations.
- Analyzing and interpreting data.
- Using mathematics, information and computer technology, and computational thinking.
- Constructing explanations (for science) and designing solutions (for engineering).
- Engaging in argument from evidence.
- Obtaining, evaluating, and communicating information.

**Literacy Standards in Science**
Secondary science courses include reading standards for literacy in science and technical subjects 6-12 and writing standards for literacy in history/social studies, science, and technical subjects 6-12. The courses also include speaking and listening standards. For a complete list of standards required for this course click on the blue tile labeled course standards. You may also download the complete course including all required standards and notes sections using the export function located at the top of this page.

**English Language Development ELD Standards**
Teachers are required to provide listening, speaking, reading and writing instruction that allows English language learners (ELL) to communicate information, ideas and concepts for academic success in the content area of Science. For the given level of English language proficiency and with visual, graphic, or interactive support, students will interact with grade level words, expressions, sentences and discourse to process or produce language necessary for academic success. The ELD standard should specify a relevant content area concept or topic of study chosen by curriculum developers and teachers which maximizes an ELL's need for communication and social skills.

To access an ELL supporting document which delineates performance definitions and descriptors, please click on the following link: https://cpalmsmediaprod.blob.core.windows.net/uploads/docs/standards/eld/sc.pdf

**Additional Instructional Resources:**
A.V.E. for Success Collection is provided by the Florida Association of School Administrators: http://www.fasa.net/4DCGI/cms/review.html?Action=CMS_Document&DocID=139. Please be aware that these resources have not been reviewed by CPALMS and there may be a charge for the use of some of them in this collection.

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<td>Abbreviated Title: M/J UF SCI ADV</td>
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<tr>
<td>Course Length: Year (1)</td>
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<tr>
<td><strong>Course Attributes:</strong></td>
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<tr>
<td>• Class Size Core Required</td>
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<td>Course Level: 3</td>
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<td>Grade Levels:</td>
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<td>SC.6.N.3.4</td>
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<td>SC.7.L.15.1</td>
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<td>SC.7.N.1.7</td>
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<td>SC.7.N.2.1</td>
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<tr>
<td>SC.7.N.3.1</td>
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</table>
Identify the benefits and limitations of the use of scientific models.

Describe and investigate the process of photosynthesis, such as the roles of light, carbon dioxide, water and chlorophyll; production of food; release of oxygen.

Construct a scientific model of the carbon cycle to show how matter and energy are continuously transferred within and between organisms and their physical environment.

Cite evidence that living systems follow the Laws of Conservation of Mass and Energy.

Define a problem from the eighth grade curriculum using appropriate reference materials to support scientific understanding, plan and carry out scientific investigations of various types, such as systematic observations or experiments, identify variables, collect and organize data, interpret data in charts, tables, and graphics, analyze information, make predictions, and defend conclusions.

Design and conduct a study using repeated trials and replication.

Use phrases such as "results support" or "fail to support" in science, explaining that science does not offer conclusive 'proof' of a knowledge claim.

Explain how hypotheses are valuable if they lead to further investigations, even if they turn out not to be supported by the data.

Analyze the methods used to develop a scientific explanation as seen in different fields of science.

Understand that scientific investigations involve the collection of relevant empirical evidence, the use of logical reasoning, and the application of imagination in devising hypotheses, predictions, explanations and models to make sense of the collected evidence.

Distinguish between scientific and pseudoscientific ideas.

Discuss what characterizes science and its methods.

Select models useful in relating the results of their own investigations.

Discuss why theories may be modified but are rarely discarded.

Explain that science is one of the processes that can be used to inform decision making at the community, state, national, and international levels.

Explain how political, social, and economic concerns can affect science, and vice versa.

Relate structure to function for the components of plant and animal cells. Explain the role of cell membranes as a highly selective barrier (passive and active transport).

Compare and contrast the general structures of plant and animal cells. Compare and contrast the general structures of prokaryotic and eukaryotic cells.

Discuss distinguishing characteristics of the domains and kingdoms of living organisms.

Describe the conditions required for natural selection, including: overproduction of offspring, inherited variation, and the struggle to survive, which result in differential reproductive success.

Discuss observed inheritance patterns caused by various modes of inheritance, including dominant, recessive, codominant, sex-linked, polygenic, and multiple alleles.

Describe the cell cycle, including the process of mitosis. Explain the role of mitosis in the formation of new cells and its importance in maintaining chromosome number during asexual reproduction.

Discuss the process of meiosis, including independent assortment and crossing over. Explain how reduction division results in the formation of haploid gametes or spores.

Compare and contrast the relationships among organisms, including predation, parasitism, competition, commensalism, and mutualism.

Use a food web to identify and distinguish producers, consumers, and decomposers. Explain the pathway of energy transfer through trophic levels and the reduction of available energy at successive trophic levels.

Identify the reactants, products, and basic functions of photosynthesis.

Identify the reactants, products, and basic functions of aerobic and anaerobic cellular respiration.

Explain the interrelated nature of photosynthesis and cellular respiration.

Analyze the problem in a way that makes sense given the task.

Ask questions that will help with solving the task.

Build perseverance by modifying methods as needed while solving a challenging task.

Stay engaged and maintain a positive mindset when working to solve tasks.

Help and support each other when attempting a new method or approach.

Mathematicians who demonstrate understanding by representing problems in multiple ways:

- Build understanding through modeling and using manipulatives.
- Represent solutions to problems in multiple ways using objects, drawings, tables, graphs and equations.
- Progress from modeling problems with objects and drawings to using algorithms and equations.
- Express connections between concepts and representations.
- Choose a representation based on the given context or purpose.

Mathematicians who participate in effortful learning both individually and with others:

- Analyze the problem in a way that makes sense given the task.
- Stay engaged and maintain a positive mindset when working to solve tasks.
- Help and support each other when attempting a new method or approach.

Mathematicians who complete tasks with mathematical fluency:

- Demonstrate understanding by representing problems in multiple ways.
- Help students make connections between concepts and representations.
- Provide opportunities for students to use manipulatives when investigating concepts.
- Guide students from concrete to pictorial to abstract representations as understanding progresses.
- Show students that various representations can have different purposes and be useful in different situations.

Mathematicians who demonstrate understanding by representing problems in multiple ways:

- Analyze the problem in a way that makes sense given the task.
- Ask questions that will help with solving the task.
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- Help and support each other when attempting a new method or approach.

Mathematicians who complete tasks with mathematical fluency:

- Demonstrate understanding by representing problems in multiple ways.
- Help students make connections between concepts and representations.
- Provide opportunities for students to use manipulatives when investigating concepts.
- Guide students from concrete to pictorial to abstract representations as understanding progresses.
- Show students that various representations can have different purposes and be useful in different situations.
MA.K12.MTR.3.1:
- Select efficient and appropriate methods for solving problems within the given context.
- Maintain flexibility and accuracy while performing procedures and mental calculations.
- Complete tasks accurately and with confidence.
- Adapt procedures to apply them to a new context.
- Use feedback to improve efficiency when performing calculations.

**Clarifications:**
Teachers who encourage students to complete tasks with mathematical fluency:
- Provide students with the flexibility to solve problems by selecting a procedure that allows them to solve efficiently and accurately.
- Offer multiple opportunities for students to practice efficient and generalizable methods.
- Provide opportunities for students to reflect on the method they used and determine if a more efficient method could have been used.

**Engage in discussions that reflect on the mathematical thinking of self and others.**
Mathematicians who engage in discussions that reflect on the mathematical thinking of self and others:
- Communicate mathematical ideas, vocabulary and methods effectively.
- Analyze the mathematical thinking of others.
- Compare the efficiency of a method to those expressed by others.
- Recognize errors and suggest how to correctly solve the task.
- Justify results by explaining methods and processes.
- Construct possible arguments based on evidence.

**Clarifications:**
Teachers who encourage students to engage in discussions that reflect on the mathematical thinking of self and others:
- Establish a culture in which students ask questions of the teacher and their peers, and error is an opportunity for learning.
- Create opportunities for students to discuss their thinking with peers.
- Select, sequence and present student work to advance and deepen understanding of correct and increasingly efficient methods.

**Use patterns and structure to help understand and connect mathematical concepts.**
Mathematicians who use patterns and structure to help understand and connect mathematical concepts:
- Focus on relevant details within a problem.
- Create plans and procedures to logically order events, steps or ideas to solve problems.
- Decompose a complex problem into manageable parts.
- Relate previously learned concepts to new concepts.
- Look for similarities among problems.
- Connect solutions of problems to more complicated large-scale situations.

**Clarifications:**
Teachers who encourage students to use patterns and structure to help understand and connect mathematical concepts:
- Help students recognize the patterns in the world around them and connect these patterns to mathematical concepts.
- Support students to develop generalizations based on the similarities found among problems.
- Provide opportunities for students to create plans and procedures to solve problems.
- Develop students' ability to justify methods and compare their responses to the responses of their peers.

**Assess the reasonableness of solutions.**
Mathematicians who assess the reasonableness of solutions:
- Estimate to discover possible solutions.
- Use benchmark quantities to determine if a solution makes sense.
- Check calculations when solving problems.
- Verify possible solutions by explaining the methods used.
- Evaluate results based on the given context.

**Clarifications:**
Teachers who encourage students to assess the reasonableness of solutions:
- Have students estimate or predict solutions prior to solving.
- Prompt students to continually ask, "Does this solution make sense? How do you know?"
- Reinforce that students check their work as they progress within and after a task.
- Strengthen students' ability to verify solutions through justifications.

**Apply mathematics to real-world contexts.**
Mathematicians who apply mathematics to real-world contexts:
- Connect mathematical concepts to everyday experiences.
- Use models and methods to understand, represent and solve problems.
- Perform investigations to gather data or determine if a method is appropriate.
- Redesign models and methods to improve accuracy or efficiency.

**Clarifications:**
Teachers who encourage students to apply mathematics to real-world contexts:
- Provide opportunities for students to create models, both concrete and abstract, and perform investigations.
- Challenge students to question the accuracy of their models and methods.
- Support students as they validate conclusions by comparing them to the given situation.
- Indicate how various concepts can be applied to other disciplines.

Cite evidence to explain and justify reasoning.

**Clarifications:**
K-1 Students include textual evidence in their oral communication with guidance and support from adults. The evidence can consist of details...
ELA.K12.EE.1.1: From the text without naming the text. During 1st grade, students learn how to incorporate the evidence in their writing. 2-3 Students include relevant textual evidence in their written and oral communication. Students should name the text when they refer to it. In 3rd grade, students should use a combination of direct and indirect citations.

4-5 Students continue with previous skills and reference comments made by speakers and peers. Students cite texts that they've directly quoted, paraphrased, or used for information. When writing, students will use the form of citation dictated by the instructor or the style guide referenced by the instructor.

6-8 Students continue with previous skills and use a style guide to create a proper citation.

9-12 Students continue with previous skills and should be aware of existing style guides and the ways in which they differ.

ELA.K12.EE.2.1: Read and comprehend grade-level complex texts proficiently.

Clariﬁcations: See Text Complexity for grade-level complexity bands and a text complexity rubric.

ELA.K12.EE.3.1: Make inferences to support comprehension.

Clariﬁcations: Students will make inferences before the words infer or inference are introduced. Kindergarten students will answer questions like “Why is the girl smiling?” or make predictions about what will happen based on the title page. Students will use the terms and apply them in 2nd grade and beyond.

ELA.K12.EE.4.1: Use appropriate collaborative techniques and active listening skills when engaging in discussions in a variety of situations.

Clariﬁcations: In kindergarten, students learn to listen to one another respectfully. In grades 1-2, students build upon these skills by justifying what they are thinking. For example: “I think ______ because ______.” The collaborative conversations are becoming academic conversations.

In grades 3-12, students engage in academic conversations discussing claims and justifying their reasoning, reﬁning and applying skills. Students build on ideas, propel the conversation, and support claims and counterclaims with evidence.

ELA.K12.EE.5.1: Use the accepted rules governing a specific format to create quality work.

Clariﬁcations: Students will incorporate skills learned into work products to produce quality work. For students to incorporate these skills appropriately, they must receive instruction. A 3rd grade student creating a poster board display must have instruction in how to effectively present information to do quality work.

ELA.K12.EE.6.1: Use appropriate voice and tone when speaking or writing.

Clariﬁcations: In kindergarten and 1st grade, students learn the difference between formal and informal language. For example, the way we talk to our friends differs from the way we speak to adults. In 2nd grade and beyond, students practice appropriate social and academic language to discuss texts.

HE.6.C.1.8: Examine the likelihood of injury or illness if engaging in unhealthy/risky behaviors.

Clariﬁcations: Obesity related to poor nutrition and inactivity, cancer and chronic lung disease related to tobacco use, injuries caused from failure to use seat restraint, and sexually transmitted diseases caused by sexual activity.

HE.7.C.1.3: Analyze how environmental factors affect personal health.

Clariﬁcations: Food refrigeration, appropriate home heating and cooling, air/water quality, and garbage/trash collection.

HE.7.C.1.7: Describe how heredity can affect personal health.

Clariﬁcations: Sickle-cell anemia, diabetes, and acne.

ELD.K12.ELL.SC.1: English language learners communicate information, ideas and concepts necessary for academic success in the content area of Science.

ELD.K12.ELL.SI.1: English language learners communicate for social and instructional purposes within the school setting.

**General Course Information and Notes**

**GENERAL NOTES**

Laboratory investigations that include the use of scientific inquiry, research, measurement, problem solving, laboratory apparatus and technologies, experimental procedures, and safety procedures are an integral part of this course. The National Science Teachers Association (NSTA) recommends that at the middle school level, all students should have multiple opportunities every week to explore science laboratory investigations (labs). School laboratory investigations are defined by the National Research Council (NRC) as an experience in the laboratory, classroom, or the field that provides students with opportunities to interact directly with natural phenomena or with data collected by others using tools, materials, data collection techniques, and models (NRC, 2006, p. 3). Laboratory investigations in the middle school classroom should help all students develop a growing understanding of the complexity and ambiguity of empirical work, as well as the skills to calibrate and troubleshoot equipment used to make observations. Learners should understand measurement error; and have the skills to aggregate, interpret, and present the resulting data (NRC 2006, p. 77; NSTA, 2007).

**Honors and Advanced Level Course Note:** Advanced courses require a greater demand on students through increased academic rigor. Academic rigor is obtained through the application, analysis, evaluation, and creation of complex ideas that are often abstract and multi-faceted. Students are challenged to think and collaborate critically on the content they are learning. Honors level rigor will be achieved by increasing text complexity through text selection, focus on high-level qualitative measures, and complexity of task. Instruction will be structured to give students a deeper understanding of conceptual themes and organization within and across disciplines. Academic rigor is more than simply assigning to students a greater quantity of work.
**Special Notes:**

**Instructional Practices**
Teaching from a range of complex text is optimized when teachers in all subject areas implement the following strategies on a routine basis:

1. Ensuring wide reading from complex text that varies in length.
2. Making close reading and rereading of texts central to lessons.
3. Emphasizing text-specific complex questions, and cognitively complex tasks, reinforce focus on the text and cultivate independence.
4. Emphasizing students supporting answers based upon evidence from the text.
5. Providing extensive research and writing opportunities (claims and evidence).

**Science and Engineering Practices** *(NRC Framework for K-12 Science Education, 2010)*
- Asking questions (for science) and defining problems (for engineering).
- Developing and using models.
- Planning and carrying out investigations.
- Analyzing and interpreting data.
- Using mathematics, information and computer technology, and computational thinking.
- Constructing explanations (for science) and designing solutions (for engineering).
- Engaging in argument from evidence.
- Obtaining, evaluating, and communicating information.

**English Language Development ELD Standards**
Teachers are required to provide listening, speaking, reading and writing instruction that allows English language learners (ELL) to communicate information, ideas and concepts for academic success in the content area of Science. For the given level of English language proficiency and with visual, graphic, or interactive support, students will interact with grade level words, expressions, sentences and discourse to process or produce language necessary for academic success. The ELD standard should specify a relevant content area concept or topic of study chosen by curriculum developers and teachers which maximizes an ELL's need for communication and social skills. To access an ELL supporting document which delineates performance definitions and descriptors, please click on the following link: [https://cpalmsmediaprod.blob.core.windows.net/uploads/docs/standards/eld/sc.pdf](https://cpalmsmediaprod.blob.core.windows.net/uploads/docs/standards/eld/sc.pdf)

**Additional Instructional Resources:**
A.V.E. for Success Collection is provided by the Florida Association of School Administrators: [http://www.fasa.net/4DCGI/cms/review.html?Action=CMS_Document&DocID=139](http://www.fasa.net/4DCGI/cms/review.html?Action=CMS_Document&DocID=139). Please be aware that these resources have not been reviewed by CPALMS and there may be a charge for the use of some of them in this collection.

**Florida's Benchmarks for Excellent Student Thinking (B.E.S.T.) Standards**
This course includes Florida's B.E.S.T. ELA Expectations (EE) and Mathematical Thinking and Reasoning Standards (MTRs) for students. Florida educators should intentionally embed these standards within the content and their instruction as applicable. For guidance on the implementation of the EEs and MTRs, please visit [https://www.cpalms.org/Standards/BEST_Standards.aspx](https://www.cpalms.org/Standards/BEST_Standards.aspx) and select the appropriate B.E.S.T. Standards package.

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**GENERAL INFORMATION**

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<tr>
<td>Courses: &gt; Grade Group: Grades 6 to 8 Education</td>
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<tr>
<td>Courses: &gt; Subject: Science &gt; SubSubject: Biological Sciences</td>
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<tr>
<td>Abbreviated Title: M/J LIF SCI ADV</td>
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<tr>
<td>Course Length: Year (Y)</td>
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<td><strong>Course Level:</strong> 3</td>
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<td><strong>Course Status:</strong> State Board Approved</td>
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<td><strong>Grade Level(s):</strong> 6,7,8</td>
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**Educator Certifications**

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<tr>
<th>Science (Secondary Grades 7-12)</th>
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<td>Middle Grades Integrated Curriculum (Middle Grades 5-9)</td>
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<tr>
<td>Middle Grades General Science (Middle Grades 5-9)</td>
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<tr>
<td>Biology (Grades 6-12)</td>
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## Course Standards

<table>
<thead>
<tr>
<th>Name</th>
<th>Description</th>
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<tbody>
<tr>
<td>SC.N.1.2:</td>
<td>Explain why scientific investigations should be replicable.</td>
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<tr>
<td>SC.N.1.3:</td>
<td>Explain the difference between an experiment and other types of scientific investigation, and explain the relative benefits and limitations of each.</td>
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<tr>
<td>SC.N.1.4:</td>
<td>Discuss, compare, and negotiate methods used, results obtained, and explanations among groups of students conducting the same investigation.</td>
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<tr>
<td>SC.N.1.5:</td>
<td>Recognize that science involves creativity, not just in designing experiments, but also in creating explanations that fit evidence.</td>
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<td>SC.N.2.1:</td>
<td>Distinguish science from other activities involving thought.</td>
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<tr>
<td>SC.N.2.2:</td>
<td>Explain that scientific knowledge is durable because it is open to change as new evidence or interpretations are encountered.</td>
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<tr>
<td>SC.N.2.3:</td>
<td>Recognize that scientists who make contributions to scientific knowledge come from all kinds of backgrounds and possess varied talents, interests, and goals.</td>
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<tr>
<td>SC.N.3.1:</td>
<td>Recognize and explain that a scientific theory is a well-supported and widely accepted explanation of nature and is not simply a claim posed by an individual. Thus, the use of the term theory in science is very different than how it is used in everyday life.</td>
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<td>SC.N.3.2:</td>
<td>Recognize and explain that a scientific law is a description of a specific relationship under given conditions in the natural world. Thus, scientific laws are different from societal laws.</td>
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<tr>
<td>SC.N.3.3:</td>
<td>Give several examples of scientific laws.</td>
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<tr>
<td>SC.N.3.4:</td>
<td>Identify the role of models in the context of the sixth grade science benchmarks.</td>
</tr>
<tr>
<td>SC.L.15.1:</td>
<td>Explore the scientific theory of evolution by recognizing and explaining ways in which genetic variation and environmental factors contribute to evolution by natural selection and diversity of organisms.</td>
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<td>SC.L.15.2:</td>
<td>Explore the scientific theory of evolution by relating how the inability of a species to adapt within a changing environment may contribute to the extinction of that species.</td>
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<td>SC.L.16.1:</td>
<td>Understand and explain that every organism requires a set of instructions that specifies its traits, that this hereditary information (DNA) contains genes located in the chromosomes of each cell, and that heredity is the passage of these instructions from one generation to another.</td>
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<tr>
<td>SC.N.1.2:</td>
<td>Differentiate replication (by others) from repetition (multiple trials).</td>
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<td>SC.N.1.3:</td>
<td>Distinguish between an experiment (which must involve the identification and control of variables) and other forms of scientific investigation and explain that not all scientific knowledge is derived from experimentation.</td>
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<td>SC.N.1.4:</td>
<td>Identify test variables (independent variables) and outcome variables (dependent variables) in an experiment.</td>
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<td>SC.N.1.5:</td>
<td>Describe the methods used in the pursuit of a scientific explanation as seen in different fields of science such as biology, geology, and physics.</td>
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<td>SC.N.1.6:</td>
<td>Explain that empirical evidence is the cumulative body of observations of a natural phenomenon on which scientific explanations are based.</td>
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<td>Explain that scientific knowledge is the result of a great deal of debate and confirmation within the science community.</td>
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<td>Identify an instance from the history of science in which scientific knowledge has changed when new evidence or new interpretations are encountered.</td>
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<td>Recognize and explain the difference between theories and laws and give several examples of scientific theories and the evidence that supports them.</td>
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<td>Identify the benefits and limitations of the use of scientific models.</td>
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<td>SC.L.18.2:</td>
<td>Describe and investigate how cellular respiration breaks down food to provide energy and releases carbon dioxide.</td>
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<td>Construct a scientific model of the carbon cycle to show how matter and energy are continuously transferred within and between organisms and their physical environment.</td>
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<td>Design and conduct a study using repeated trials and replication.</td>
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<td>Use phrases such as “results support” or “fail to support” in science, understanding that science does not offer conclusive ‘proof’ of a knowledge claim.</td>
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<td>MAPS.6.SP.1.1:</td>
<td>Recognize a statistical question as one that anticipates variability in the data related to the question and accounts for it in the answers. For example, “How old am I?” is not a statistical question, but “How old are the students in my school?” is a statistical question because one anticipates variability in students’ ages.</td>
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<td>MAPS.6.SP.1.2:</td>
<td>Understand that a set of data collected to answer a statistical question has a distribution which can be described by its center, spread, and overall shape.</td>
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<td>MAPS.6.SP.1.3:</td>
<td>Recognize that a measure of center for a numerical data set summarizes all of its values with a single number, while a measure of variation describes how its values vary with a single number.</td>
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<tr>
<td>MAPS.6.SP.2.4:</td>
<td>Display numerical data in plots on a number line, including dot plots, histograms, and box plots.</td>
</tr>
<tr>
<td>MAPS.6.SP.2.5:</td>
<td>Summarize numerical data sets in relation to their context, such as by: a. Reporting the number of observations. b. Describing the nature of the attribute under investigation, including how it was measured and its units of measurement. c. Giving quantitative measures of center (median and/or mean) and variability (interquartile range and/or mean absolute deviation), as well as...</td>
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</tbody>
</table>
Mathematically proficient students start by explaining to themselves the meaning of a problem and looking for entry points to its solution. They analyze givens, constraints, relationships, and goals. They make conjectures about the form and meaning of the solution and plan a solution pathway rather than simply jumping into a solution attempt. They consider analogous problems, and try special cases and simpler forms of the original problem in order to gain insight into its solution. They monitor and evaluate their progress and change course if necessary. Older students might, depending on the context of the problem, transform algebraic expressions or change the viewing window on their graphing calculator to get further information they need. Mathematically proficient students can explain correspondences between equations, verbal descriptions, tables, and graphs or draw diagrams of important features and relationships, graph data, and search for regularity or trends. Younger students might rely on using concrete objects or pictures to help conceptualize and solve a problem. Mathematically proficient students check their answers to problems using a different method, and they continually ask themselves, “Does this make sense?” They can understand the approaches of others to solving complex problems and identify correspondences between different approaches.

Reason abstractly and quantitatively.

Mathematically proficient students make sense of quantities and their relationships in problem situations. They bring two complementary abilities to bear on problems involving quantitative relationships: the ability to decontextualize—to abstract a given situation and represent it symbolically and manipulate the representations such as if they have a life of their own, without necessarily attending to their referents—and the ability to contextualize, to pause as needed during the manipulation process in order to probe into the referents for the symbols involved. Quantitative reasoning entails habits of creating a coherent representation of the problem at hand; considering the units involved; attending to the meaning of quantities, not just how to compute them; and knowing and flexibly using different properties of operations and objects.

Construct viable arguments and critique the reasoning of others.

Mathematically proficient students understand and use stated assumptions, definitions, and previously established results in constructing arguments. They make conjectures and build a logical progression of statements to explore the truth of their conjectures. They are able to analyze situations by breaking them into cases, and can recognize and use counterexamples. They justify their conclusions, communicate them to others, and respond to the arguments of others. They reason inductively about data, making plausible arguments that take into account the context from which the data arose. Mathematically proficient students are also able to compare the effectiveness of two plausible arguments, distinguish correct logic or reasoning from that which is flawed, and—if there is a flaw in an argument—explain what it is. Elementary students can construct arguments using concrete referents such as objects, drawings, diagrams, and actions. Such arguments can make sense and be correct, even though they are not generalized or made formal until later grades. Later, students learn to determine domains to which an argument applies. Students at all grades can listen or read the arguments of others, decide whether they make sense, and ask useful questions to clarify or improve the arguments.

Model with mathematics.

Mathematically proficient students can apply the mathematics they know to solve problems arising in everyday life, society, and the workplace. In early grades, this might be as simple as writing an addition equation to describe a situation. In middle grades, a student might apply proportional reasoning to plan a school event or analyze a problem in the community. By high school, a student might use geometry, trigonometry, and calculus to analyze mathematical situations, interpret the results of mathematical and statistical models, and practice algorithms for approximating analytic solutions.

Use appropriate tools strategically.

Mathematically proficient students consider the available tools when solving a mathematical problem. These tools might include pencil and paper, concrete models, a ruler, a protractor, a calculator, a spreadsheet, a computer algebra system, a statistical package, or dynamic geometry software. Proficient students are sufficiently familiar with tools appropriate for their grade or course to make sound decisions about when each of these tools might be helpful, recognizing both the insight to be gained and their limitations. For example, mathematically proficient high school students analyze graphs of functions and solutions generated using a graphing calculator. They detect possible errors by strategically using estimation and other mathematical knowledge. When making mathematical models, they know that technology can enable them to visualize the results of varying assumptions, explore consequences, and compare predictions with data. Mathematically proficient students at various grade levels are able to identify relevant external mathematical resources, such as digital content located on a website, and use them to pose or solve problems. They are able to use technological tools to explore and deepen their understanding of concepts.

Attend to precision.

Mathematically proficient students try to communicate precisely to others. They try to use clear definitions in discussion with others and in their own reasoning. They state the meaning of the symbols they choose, including using the equal sign consistently and appropriately. They are careful about specifying units of measure, and labeling axes to clarify the correspondence with quantities in a problem. They calculate accurately and efficiently, express numerical answers with a degree of precision appropriate for the problem context. In the elementary grades, students give carefully formulated explanations to each other. By the time they reach high school they have learned to examine claims and make explicit use of definitions.

Look for and make use of structure.

Mathematically proficient students look closely to discern a pattern or structure. Young students, for example, might notice that three and seven more is the same amount as seven and three more, or they may sort a collection of shapes according to how many sides the shapes have. Later, students will see 7 + 8 equals the well remembered 7 + 5 = 12 and 8 + 7 = 15, in preparation for learning about the distributive property. In the expression 2 (x + 3), older students can see the 3 will be three times the 3 in parentheses, which is three times 1 or 3 more. They recognize the significance of an existing line in a geometric figure and use the strategy of drawing an auxiliary line for solving problems. They also can step back for an overview and shift perspective. They can see complicated things, such as some algebraic expressions, as single objects or as being composed of several objects. For example, they can see 5 – 3(x - y)² as 5 minus a positive number times a square and use that to realize that its value cannot be more than 5 for any real numbers x and y.

Look for and express regularity in repeated reasoning.
Mathematically proficient students notice if calculations are repeated, and look both for general methods and for shortcuts. Upper elementary students might notice when dividing 25 by 11 that they are repeating the same calculations over and over again, and conclude they have a repeating decimal. By paying attention to the calculation of slope as they repeatedly check whether points are on the line through (1, 2) with slope 3, middle school students might abstract the equation \((y - 2) = 3(x - 1)\). Noticing the regularity in the way terms cancel when expanding \((x - 1)(x + 1)\), \((x - 1)^2 + x + 1\), and \((x - 1)^3 + x^2 + x + 1\) might lead them to the general formula for the sum of a geometric series. As they work to solve a problem, mathematically proficient students maintain oversight of the process, while attending to the details. They continually evaluate the reasonableness of their intermediate results.

<table>
<thead>
<tr>
<th><strong>MAFS.K12.MP.8.1:</strong></th>
<th>Write arguments focused on discipline-specific content.</th>
<th><strong>LAFS.68.WHST.1.1:</strong></th>
<th>Write informative/explanatory texts, including the narration of historical events, scientific procedures/experiments, or technical processes.</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>MAFS.K12.MP.8.1:</strong></td>
<td>a. Introduce claim(s) about a topic or issue, acknowledge and distinguish the claim(s) from alternate or opposing claims, and organize the reasons and evidence logically.</td>
<td><strong>LAFS.68.WHST.1.1:</strong></td>
<td>a. Introduce a topic clearly, previewing what is to follow; organize ideas, concepts, and information into broader categories as appropriate to achieving purpose; include formatting (e.g., headings), graphics (e.g., charts, tables), and multimedia when useful to aiding comprehension.</td>
</tr>
<tr>
<td><strong>MAFS.K12.MP.8.1:</strong></td>
<td>b. Support claim(s) with logical reasoning and relevant, accurate data and evidence that demonstrate an understanding of the topic or text, using credible sources.</td>
<td><strong>LAFS.68.WHST.1.1:</strong></td>
<td>b. Develop the topic with relevant, well-chosen facts, definitions, concrete details, quotations, or other information and examples.</td>
</tr>
<tr>
<td><strong>MAFS.K12.MP.8.1:</strong></td>
<td>c. Use words, phrases, and clauses to create cohesion and clarify the relationships among claim(s), counterclaims, reasons, and evidence.</td>
<td><strong>LAFS.68.WHST.1.1:</strong></td>
<td>c. Use appropriate and varied transitions to create cohesion and clarify the relationships among ideas and concepts.</td>
</tr>
<tr>
<td><strong>MAFS.K12.MP.8.1:</strong></td>
<td>d. Establish and maintain a formal style.</td>
<td><strong>LAFS.68.WHST.1.1:</strong></td>
<td>d. Use precise language and domain-specific vocabulary to inform about or explain the topic.</td>
</tr>
<tr>
<td><strong>MAFS.K12.MP.8.1:</strong></td>
<td>e. Provide a concluding statement or section that follows from and supports the argument presented.</td>
<td><strong>LAFS.68.WHST.1.1:</strong></td>
<td>e. Establish and maintain a formal style and objective tone.</td>
</tr>
<tr>
<td><strong>MAFS.K12.MP.8.1:</strong></td>
<td>f. Provide a concluding statement or section that follows from and supports the information or explanation presented.</td>
<td><strong>LAFS.68.WHST.1.1:</strong></td>
<td>f. Provide a concluding statement or section that follows from and supports the information or explanation presented.</td>
</tr>
</tbody>
</table>

General Course Information and Notes

**GENERAL NOTES**

If this course is to be used in a STEM sequence in place of either the comprehensive or subject specific course sequences, teachers should refer to the test item specifications for the 8th grade SSA for information on tested standards which can be found at: https://www.fidoee.org/core/fileparse.php/5663/url/swatsisG8.pdf.

This course is an integrated Science, Technology, Engineering and Mathematics (STEM) course for middle school students. M/J STEM Life Science includes an integration of standards from science, mathematics, and English language arts (ELA) through the application to STEM problem solving using life science knowledge and science and engineering practices. Life science through applications such as biotechnology and biomedical engineering, are emphasized in this course. Laboratory investigations that include the use of scientific inquiry, research, measurement, problem solving, laboratory apparatus and technologies, experimental procedures, and safety procedures are an integral part of this course. The National Science Teachers Association (NSTA) recommends that at the middle school level, all students should have multiple opportunities every week to explore science laboratory investigations (labs). School laboratory investigations are defined by the National Research Council (NRC) as an experience in the laboratory, classroom, or the field that provides students with opportunities to interact directly with natural phenomena or with data collected by others using tools, materials, data collection techniques, and models (NRC, 2006, p. 3). Laboratory investigations in the middle school classroom should help all students develop a growing understanding of the complexity and ambiguity of empirical work, as well as the skills to calibrate and troubleshoot equipment used to make observations. Learners should understand measurement error; and have the skills to aggregate, interpret, and present the resulting data (NRC 2006, p. 77; NSTA, 2007).

**Special Notes:**

| **HE.6.C.1.8:** | Examine the likelihood of injury or illness if engaging in unhealthy/risky behaviors. |
| **HE.6.C.1.8:** | **Clarifications:** Obesity related to poor nutrition and inactivity, cancer and chronic lung disease related to tobacco use, injuries caused from failure to use seat restraint, and sexually transmitted diseases caused by sexual activity. |
| **HE.7.C.1.3:** | Analyze how environmental factors affect personal health. |
| **HE.7.C.1.3:** | **Clarifications:** Food refrigeration, appropriate home heating and cooling, air/water quality, and garbage/trash collection. |
| **HE.7.C.1.7:** | Describe how heredity can affect personal health. |
| **HE.7.C.1.7:** | **Clarifications:** Sickle-cell anemia, diabetes, and acne. |
| **ELD.K12.ELL.SC.1:** | English language learners communicate information, ideas and concepts necessary for academic success in the content area of Science. |
Instructonal Practices
Teaching from a range of complex text is optimized when teachers in all subject areas implement the following strategies on a routine basis:

1. Ensuring wide reading from complex text that varies in length.
2. Making close reading and rereading of texts central to lessons.
3. Emphasizing text-specific complex questions, and cognitively complex tasks, reinforce focus on the text and cultivate independence.
4. Emphasizing students supporting answers based upon evidence from the text.
5. Providing extensive research and writing opportunities (claims and evidence).

- Asking questions (for science) and defining problems (for engineering).
- Developing and using models.
- Planning and carrying out investigations.
- Analyzing and interpreting data.
- Using mathematics, information and computer technology, and computational thinking.
- Constructing explanations (for science) and designing solutions (for engineering).
- Engaging in argument from evidence.
- Obtaining, evaluating, and communicating information.

ISTE Standards (http://www.iste.org/docs/pdfs/20-14_ISTE_Standards-S_PDF.pdf) should be incorporated in many contexts throughout the course.

Engineering Practices are emphasized in the course

Course Standards

NOTE: Use grade appropriate Nature of Science and mathematics content benchmarks (i.e. if this course is offered to seventh grade students, then the SC.7.N benchmarks should be integrated into the course content, and SC.6.N and SC.8.N benchmarks should be omitted from the seventh grade course).

Literacy Standards in Science
Secondary science courses include reading standards for literacy in science and technical subjects 6-12 and writing standards for literacy in history/social studies, science, and technical subjects 6-12. The courses also include speaking and listening standards. For a complete list of standards required for this course click on the blue tile labeled course standards. You may also download the complete course including all required standards and notes sections using the export function located at the top of this page.

English Language Development ELD Standards
Teachers are required to provide listening, speaking, reading and writing instruction that allows English language learners (ELL) to communicate information, ideas and concepts for academic success in the content area of Science. For the given level of English language proficiency and with visual, graphic, or interactive support, students will interact with grade level words, expressions, sentences and discourse to process or produce language necessary for academic success. The ELD standard should specify a relevant content area concept or topic of study chosen by curriculum developers and teachers which maximizes an ELL’s need for communication and social skills. To access an ELL supporting document which delineates performance definitions and descriptors, please click on the following link:
Course Standards

<table>
<thead>
<tr>
<th>Name</th>
<th>Description</th>
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<tbody>
<tr>
<td>SC.6.N.1.2:</td>
<td>Explain why scientific investigations should be replicable.</td>
</tr>
<tr>
<td>SC.6.N.1.3:</td>
<td>Explain the difference between an experiment and other types of scientific investigation, and explain the relative benefits and limitations of each.</td>
</tr>
<tr>
<td>SC.6.N.1.4:</td>
<td>Discuss, compare, and negotiate methods used, results obtained, and explanations among groups of students conducting the same investigation.</td>
</tr>
<tr>
<td>SC.6.N.1.5:</td>
<td>Recognize that science involves creativity, not just in designing experiments, but also in creating explanations that fit evidence.</td>
</tr>
<tr>
<td>SC.6.N.2.1:</td>
<td>Distinguish science from other activities involving thought.</td>
</tr>
<tr>
<td>SC.6.N.2.2:</td>
<td>Explain that scientific knowledge is durable because it is open to change as new evidence or interpretations are encountered.</td>
</tr>
<tr>
<td>SC.6.N.2.3:</td>
<td>Recognize that scientists who make contributions to scientific knowledge come from all kinds of backgrounds and possess varied talents, interests, and goals.</td>
</tr>
<tr>
<td>SC.6.N.3.1:</td>
<td>Recognize and explain that a scientific theory is a well-supported and widely accepted explanation of nature and is not simply a claim posed by an individual. Thus, the use of the term theory in science is very different than how it is used in everyday life.</td>
</tr>
<tr>
<td>SC.6.N.3.2:</td>
<td>Recognize and explain that a scientific law is a description of a specific relationship under given conditions in the natural world. Thus, scientific laws are different from societal laws.</td>
</tr>
<tr>
<td>SC.6.N.3.3:</td>
<td>Give several examples of scientific laws.</td>
</tr>
<tr>
<td>SC.6.N.3.4:</td>
<td>Identify the role of models in the context of the sixth grade science benchmarks.</td>
</tr>
<tr>
<td>SC.7.L.15.1:</td>
<td>Explore the scientific theory of evolution by recognizing and explaining ways in which genetic variation and environmental factors contribute to evolution by natural selection and diversity of organisms.</td>
</tr>
<tr>
<td>SC.7.L.15.2:</td>
<td>Explore the scientific theory of evolution by relating how the inability of a species to adapt within a changing environment may contribute to the extinction of that species.</td>
</tr>
<tr>
<td>SC.7.L.16.1:</td>
<td>Understand and explain that every organism requires a set of instructions that specifies its traits, that this hereditary information (DNA) contains genes located in the chromosomes of each cell, and that heredity is the passage of these instructions from one generation to another.</td>
</tr>
<tr>
<td>SC.7.N.1.2:</td>
<td>Differentiate replication (by others) from repetition (multiple trials).</td>
</tr>
<tr>
<td>SC.7.N.1.3:</td>
<td>Distinguish between an experiment (which must involve the identification and control of variables) and other forms of scientific investigation and explain that not all scientific knowledge is derived from experimentation.</td>
</tr>
<tr>
<td>SC.7.N.1.4:</td>
<td>Identify test variables (independent variables) and outcome variables (dependent variables) in an experiment.</td>
</tr>
<tr>
<td>SC.7.N.1.5:</td>
<td>Describe the methods used in the pursuit of a scientific explanation as seen in different fields of science such as biology, geology, and physics.</td>
</tr>
<tr>
<td>SC.7.N.1.6:</td>
<td>Explain that empirical evidence is the cumulative body of observations of a natural phenomenon on which scientific explanations are based.</td>
</tr>
<tr>
<td>SC.7.N.1.7:</td>
<td>Explain that scientific knowledge is the result of a scientific theory of evolution that living things evolved from earlier species.</td>
</tr>
<tr>
<td>SC.7.N.2.1:</td>
<td>Identify an instance from the history of science in which scientific knowledge has changed when new evidence or new interpretations are encountered.</td>
</tr>
<tr>
<td>SC.7.N.3.1:</td>
<td>Recognize and explain the difference between theories and laws and give several examples of scientific theories and the evidence that supports them.</td>
</tr>
<tr>
<td>SC.7.N.3.2:</td>
<td>Identify the benefits and limitations of the use of scientific models.</td>
</tr>
<tr>
<td>SC.8.L.18.2:</td>
<td>Describe and investigate how cellular respiration breaks down food to provide energy and releases carbon dioxide.</td>
</tr>
<tr>
<td>SC.8.L.18.3:</td>
<td>Construct a scientific model of the carbon cycle to show how matter and energy are continuously transferred within and between organisms and their physical environment.</td>
</tr>
<tr>
<td>SC.8.L.18.4:</td>
<td>Cite evidence that living systems follow the Laws of Conservation of Mass and Energy.</td>
</tr>
<tr>
<td>SC.8.N.1.2:</td>
<td>Design and conduct a study using repeated trials and replication.</td>
</tr>
<tr>
<td>SC.8.N.1.3:</td>
<td>Use phrases such as “results support” or “fail to support” in science, understanding that science does not offer conclusive ‘proof’ of a knowledge claim.</td>
</tr>
<tr>
<td>SC.8.N.1.4:</td>
<td>Explain how hypotheses are valuable if they lead to further investigations, even if they turn out not to be supported by the data.</td>
</tr>
<tr>
<td>SC.8.N.1.5:</td>
<td>Analyze the methods used to develop a scientific explanation as seen in different fields of science.</td>
</tr>
<tr>
<td>SC.8.N.1.6:</td>
<td>Understand that scientific investigations involve the collection of relevant empirical evidence, the use of logical reasoning, and the application of imagination in devising hypotheses, predictions, explanations and models to make sense of the collected evidence.</td>
</tr>
<tr>
<td>SC.8.N.2.1:</td>
<td>Distinguish between scientific and pseudoscientific ideas.</td>
</tr>
<tr>
<td>SC.8.N.2.2:</td>
<td>Discuss what characterizes science and its methods.</td>
</tr>
<tr>
<td>SC.8.N.3.1:</td>
<td>Select models useful in relating the results of their own investigations.</td>
</tr>
<tr>
<td>SC.8.N.3.2:</td>
<td>Explain why theories may be modified but are rarely discarded.</td>
</tr>
<tr>
<td>SC.8.N.4.1:</td>
<td>Explain that science is one of the processes that can be used to inform decision making at the community, state, national, and international levels.</td>
</tr>
</tbody>
</table>

Mathematicians who participate in effortful learning both individually and with others:
- Analyze the problem in a way that makes sense given the task.
- Ask questions that will help with solving the task.
- Build perseverance by modifying methods as needed while solving a challenging task.
- Stay engaged and maintain a positive mindset when working to solve tasks.
- Help and support each other when attempting a new method or approach.

Teachers who encourage students to participate actively in effortful learning both individually and with others:
- Cultivate a community of growth mindset learners.
- Foster perseverance in students by choosing tasks that are challenging.
- Develop students’ ability to analyze and problem solve.
- Recognize students’ effort when solving challenging problems.
MA.K12.MTR.2.1: Demonstrate understanding by representing problems in multiple ways. Mathematicians who demonstrate understanding by representing problems in multiple ways:

- Build understanding through modeling and using manipulatives.
- Represent solutions to problems in multiple ways using objects, drawings, tables, graphs and equations.
- Progress from modeling problems with objects and drawings to using algorithms and equations.
- Express connections between concepts and representations.
- Choose a representation based on the given context or purpose.

**Clarifications:**
Teachers who encourage students to demonstrate understanding by representing problems in multiple ways:

- Help students make connections between concepts and representations.
- Provide opportunities for students to use manipulatives when investigating concepts.
- Guide students from concrete to pictorial to abstract representations as understanding progresses.
- Show students that various representations can have different purposes and can be useful in different situations.

MA.K12.MTR.3.1: Complete tasks with mathematical fluency. Mathematicians who complete tasks with mathematical fluency:

- Select efficient and appropriate methods for solving problems within the given context.
- Maintain flexibility and accuracy while performing procedures and mental calculations.
- Complete tasks accurately and with confidence.
- Adapt procedures to apply them to a new context.
- Use feedback to improve efficiency when performing calculations.

**Clarifications:**
Teachers who encourage students to complete tasks with mathematical fluency:

- Provide students with the flexibility to solve problems by selecting a procedure that allows them to solve efficiently and accurately.
- Offer multiple opportunities for students to practice efficient and generalizable methods.
- Provide opportunities for students to reflect on the method they used and determine if a more efficient method could have been used.

MA.K12.MTR.4.1: Engage in discussions that reflect on the mathematical thinking of self and others. Mathematicians who engage in discussions that reflect on the mathematical thinking of self and others:

- Communicate mathematical ideas, vocabulary and methods effectively.
- Analyze the mathematical thinking of others.
- Compare the efficiency of a method to those expressed by others.
- Recognize errors and suggest how to correctly solve the task.
- Justify results by explaining methods and processes.
- Construct possible arguments based on evidence.

**Clarifications:**
Teachers who encourage students to engage in discussions that reflect on the mathematical thinking of self and others:

- Establish a culture in which students ask questions of the teacher and their peers, and error is an opportunity for learning.
- Create opportunities for students to discuss their thinking with peers.
- Select, sequence and present student work to advance and deepen understanding of correct and increasingly efficient methods.
- Develop students’ ability to justify methods and compare their responses to the responses of their peers.

MA.K12.MTR.5.1: Use patterns and structure to help understand and connect mathematical concepts. Mathematicians who use patterns and structure to help understand and connect mathematical concepts:

- Focus on relevant details within a problem.
- Create plans and procedures to logically order events, steps or ideas to solve problems.
- Decompose a complex problem into manageable parts.
- Relate previously learned concepts to new concepts.
- Look for similarities among problems.
- Connect solutions of problems to more complicated large-scale situations.

**Clarifications:**
Teachers who encourage students to use patterns and structure to help understand and connect mathematical concepts:

- Help students recognize the patterns in the world around them and connect these patterns to mathematical concepts.
- Support students to develop generalizations based on the similarities found among problems.
- Provide opportunities for students to create plans and procedures to solve problems.
- Develop students’ ability to construct relationships between their current understanding and more sophisticated ways of thinking.

MA.K12.MTR.6.1: Assess the reasonableness of solutions. Mathematicians who assess the reasonableness of solutions:

- Estimate to discover possible solutions.
- Use benchmark quantities to determine if a solution makes sense.
- Check calculations when solving problems.
- Verify possible solutions by explaining the methods used.
- Evaluate results based on the given context.

**Clarifications:**
Teachers who encourage students to assess the reasonableness of solutions:

- Have students estimate or predict solutions prior to solving.
- Prompt students to continually ask, “Does this solution make sense? How do you know?”
- Reinforce that students check their work as they progress within and after a task.
### MA.K12.MTR.7.1:

- Strengthen students' ability to verify solutions through justifications.

#### Clarifications:
- Teachers who encourage students to apply mathematics to real-world contexts:
  - Provide opportunities for students to create models, both concrete and abstract, and perform investigations.
  - Challenge students to question the accuracy of their models and methods.
  - Support students as they validate conclusions by comparing them to the given situation.
  - Indicate how various concepts can be applied to other disciplines.

### ELA.K12.EE.1.1:

- Cite evidence to explain and justify reasoning.

#### Clarifications:
- K-1 Students include textual evidence in their oral communication with guidance and support from adults. The evidence can consist of details from the text without naming the text. During 1st grade, students learn how to incorporate the evidence in their writing.
- 2-3 Students include relevant textual evidence in their written and oral communication. Students should name the text when they refer to it. In 3rd grade, students should use a combination of direct and indirect citations.
- 4-5 Students continue with previous skills and reference comments made by speakers and peers. Students cite texts that they've directly quoted, paraphrased, or used for information. When writing, students will use the form of citation dictated by the instructor or the style guide referenced by the instructor.
- 6-8 Students continue with previous skills and use a style guide to create a proper citation.
- 9-12 Students continue with previous skills and should be aware of existing style guides and the ways in which they differ.

### ELA.K12.EE.2.1:

- Read and comprehend grade-level complex texts proficiently.

#### Clarifications:
- See Text Complexity for grade-level complexity bands and a text complexity rubric.

### ELA.K12.EE.3.1:

- Make inferences to support comprehension.

#### Clarifications:
- Students will make inferences before the words infer or inference are introduced. Kindergarten students will answer questions like "Why is the girl smiling?" or make predictions about what will happen based on the title page. Students will use the terms and apply them in 2nd grade and beyond.

### ELA.K12.EE.4.1:

- Use appropriate collaborative techniques and active listening skills when engaging in discussions in a variety of situations.

#### Clarifications:
- In kindergarten, students learn to listen to one another respectfully.
- In grades 1-2, students build upon these skills by justifying what they are thinking. For example: "I think _____ because ______." The collaborative conversations are becoming academic conversations.
- In grades 3-12, students engage in academic conversations discussing claims and justifying their reasoning, refining and applying skills.
  - Students build on ideas, propel the conversation, and support claims and counterclaims with evidence.
  - Students continue with previous skills and reference comments made by speakers and peers. Students cite texts that they've directly quoted, paraphrased, or used for information. When writing, students will use the form of citation dictated by the instructor or the style guide referenced by the instructor.

### ELA.K12.EE.5.1:

- Use the accepted rules governing a specific format to create quality work.

#### Clarifications:
- Students will incorporate skills learned into work products to produce quality work. For students to incorporate these skills appropriately, they must receive instruction. A 3rd grade student creating a poster board display must have instruction in how to effectively present information to do quality work.

### ELA.K12.EE.6.1:

- Use appropriate voice and tone when speaking or writing.

#### Clarifications:
- In kindergartens and 1st grade, students learn the difference between formal and informal language. For example, the way we talk to our friends differs from the way we speak to adults. In 2nd grade and beyond, students practice appropriate social and academic language to discuss texts.

### HE.6.C.1.8:

- Examine the likelihood of injury or illness if engaging in unhealthy/risky behaviors.

#### Clarifications:
- Obesity related to poor nutrition and inactivity, cancer and chronic lung disease related to tobacco use, injuries caused from failure to use seat restraint, and sexually transmitted diseases caused by sexual activity.

### HE.7.C.1.3:

- Analyze how environmental factors affect personal health.

#### Clarifications:
- Food refrigeration, appropriate home heating and cooling, air/water quality, and garbage/trash collection.

### HE.7.C.1.7:

- Describe how heredity can affect personal health.

#### Clarifications:
- Sickle-cell anemia, diabetes, and acne.

### ELD.K12.ELL.5C.1:

- English language learners communicate information, ideas and concepts necessary for academic success in the content area of Science.

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**General Course Information and Notes**

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GENERAL NOTES

If this course is to be used in a STEM sequence in place of either the comprehensive or subject specific course sequences, teachers should refer to the test item specifications for the 8th grade SSA for information on tested standards which can be found at: https://www.fldoe.org/core/fileparse.php/5663/urlt/swsatisG8.pdf.

This course is an integrated Science, Technology, Engineering and Mathematics (STEM) course for middle school students. M/J STEM Life Science includes an integration of standards from science, mathematics, and English language arts (ELA) through the application to STEM problem solving using life science knowledge and science and engineering practices. Life science through applications such as biotechnology and biomedical engineering, are emphasized in this course. Laboratory investigations that include the use of scientific inquiry, research, measurement, problem solving, laboratory apparatus and technologies, experimental procedures, and safety procedures are an integral part of this course. The National Science Teachers Association (NSTA) recommends that at the middle school level, all students should have multiple opportunities every week to explore science laboratory investigations (labs). School laboratory investigations are defined by the National Research Council (NRC) as an experience in the laboratory, classroom, or the field that provides students with opportunities to interact directly with natural phenomena or with data collected by others using tools, materials, data collection techniques, and models (NRC, 2006, p. 3). Laboratory investigations in the middle school classroom should help all students develop a growing understanding of the complexity and ambiguity of empirical work, as well as the skills to calibrate and troubleshoot equipment used to make observations. Learners should understand measurement error; and have the skills to aggregate, interpret, and present the resulting data (NRC 2006, p. 77; NSTA, 2007).

Special Notes:

Instructional Practices
Teaching from a range of complex text is optimized when teachers in all subject areas implement the following strategies on a routine basis:

1. Ensuring wide reading from complex text that varies in length.
2. Making close reading and rereading of texts central to lessons.
3. Emphasizing text-specific complex questions, and cognitively complex tasks, reinforce focus on the text and cultivate independence.
4. Emphasizing students supporting answers based upon evidence from the text.
5. Providing extensive research and writing opportunities (claims and evidence).


- Asking questions (for science) and defining problems (for engineering).
- Developing and using models.
- Planning and carrying out investigations.
- Analyzing and interpreting data.
- Using mathematics, information and computer technology, and computational thinking.
- Constructing explanations (for science) and designing solutions (for engineering).
- Engaging in argument from evidence.
- Obtaining, evaluating, and communicating information.

ISTE Standards (http://www.iste.org/docs/pdfs/20-14_ISTE_Standards-S_PDF.pdf) should be incorporated in many contexts throughout the course.

Engineering Practices are emphasized in the course

Course Standards

NOTE: Use grade appropriate Nature of Science and mathematics content benchmarks (i.e. if this course is offered to seventh grade students, then the SC.7.N benchmarks should be integrated into the course content, and SC.6.N and SC.8.N benchmarks should be omitted from the seventh grade course).

English Language Development ELD Standards

Teachers are required to provide listening, speaking, reading and writing instruction that allows English language learners (ELL) to communicate information, ideas and concepts for academic success in the content area of Science. For the given level of English language proficiency and with visual, graphic, or interactive support, students will interact with grade level words, expressions, sentences and discourse to process or produce language necessary for academic success. The ELD standard should specify a relevant content area concept or topic of study chosen by curriculum developers and teachers which maximizes an ELL’s need for communication and social skills.

To access an ELL supporting document which delineates performance definitions and descriptors, please click on the following link:
https://cpalmsmediaprod.blob.core.windows.net/uploads/docs/standards/eld/sc.pdf

Florida's Benchmarks for Excellent Student Thinking (B.E.S.T.) Standards

This course includes Florida’s B.E.S.T. ELA Expectations (EE) and Mathematical Thinking and Reasoning Standards (MTRs) for students. Florida educators should intentionally embed these standards within the content and their instruction as applicable. For guidance on the implementation of the EEs and MTRs, please visit https://www.fldoe.org/core/fileparse.php/5663/urlt/swsatisG8.pdf.

GENERAL INFORMATION

Course Number: 20000025
Course Type: Core Academic Course
Course Status: State Board Approved
Grade Levels: 6,7,8

Course Path: Section: Grades PreK to 12 Education
Courses: Grade Group: Grades 6 to 8 Education
Course: Subject: Science
Abbreviated Title: M/J STEM LIFE SCI
Course Length: Year (Y)
Course Attributes: Class Size Core Required
Course Level: 2
<table>
<thead>
<tr>
<th>Educator Certifications</th>
</tr>
</thead>
<tbody>
<tr>
<td>Earth/Space Science (Grades 6-12)</td>
</tr>
<tr>
<td>Chemistry (Grades 6-12)</td>
</tr>
<tr>
<td>Physics (Grades 6-12)</td>
</tr>
<tr>
<td>Middle Grades General Science (Middle Grades 5-9)</td>
</tr>
<tr>
<td>Biology (Grades 6-12)</td>
</tr>
<tr>
<td>Middle Grades Integrated Curriculum (Middle Grades 5-9)</td>
</tr>
</tbody>
</table>
M/J International Baccalaureate MYP Life Science (#2000030) 2014 - And Beyond (current)

General Course Information and Notes

GENERAL NOTES

The curriculum description for this IB course is provided at:
http://www.ibo.org/en/programmes/

GENERAL INFORMATION

Course Number: 2000030
Course Path: Grades PreK to 12 Education Courses > Grade Group: Grades 6 to 8 Education Courses > Subject: Science > SubSubject: Biological Sciences
Abbreviated Title: M/J IB MYP LIFE SCI
Course Length: Year (Y)
Course Attributes:
- International Baccalaureate (IB)
Course Level: 3

Grade Level(s): 6,7,8

Educator Certifications

<table>
<thead>
<tr>
<th>Science (Secondary Grades 7-12)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Middle Grades Integrated Curriculum (Middle Grades 5-9)</td>
</tr>
<tr>
<td>Middle Grades General Science (Middle Grades 5-9)</td>
</tr>
<tr>
<td>Biology (Grades 6-12)</td>
</tr>
</tbody>
</table>
GENERAL NOTES

The curriculum description for this IB course is provided at:
http://www.ibo.org/en/programmes/

GENERAL INFORMATION

Course Number: 2000050

Course Path: Section: Grades PreK to 12 Education
Courses > Grade Group: Grades 6 to 8 Education
Courses > Subject: Science > SubSubject: Biological Sciences

Abbreviated Title: M/J IB MYP BIOLOGY

Course Length: Year (Y)

Course Attributes:
- International Baccalaureate (IB)

Course Level: 3

Grade Level(s): 6, 7, 8

Educator Certifications

<table>
<thead>
<tr>
<th>Middle Grades General Science (Middle Grades 5-9)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Biology (Grades 6-12)</td>
</tr>
<tr>
<td>Middle Grades Integrated Curriculum (Middle Grades 5-9)</td>
</tr>
<tr>
<td>Science (Secondary Grades 7-12)</td>
</tr>
</tbody>
</table>
**Course Standards**

<table>
<thead>
<tr>
<th>Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>ELD.K12.ELL.SC.1</td>
<td>English language learners communicate information, ideas and concepts necessary for academic success in the content area of Science.</td>
</tr>
<tr>
<td>ELD.K12.ELL.SI.1</td>
<td>English language learners communicate for social and instructional purposes within the school setting.</td>
</tr>
</tbody>
</table>

**General Course Information and Notes**

**GENERAL NOTES**

**SUBJECT AREA TRANSFER NUMBERS**

Each course transferred into a Florida public school by an out-of-state or non-public school student should be matched with a course title and number when such course provides substantially the same content. However, a few transfer courses may not be close enough in content to be matched. For those courses a subject area transfer number is provided.

**GENERAL INFORMATION**

- **Course Number:** 2000220
- **Course Path:** Grades PreK to 12 Education
- **Course Section:** Grades 6 to 8 Education
- **Subject:** Science
- **SubSubject:** Physical Sciences
- **Abbreviated Title:** M/J SCI TRAN
- **Course Length:** Not Applicable
- **Course Type:** Transfer Course
- **Course Status:** Course Approved
- **Grade Level(s):** 6,7,8
### MA.K12.MTR.1.1
Mathematicians who participate in effortful learning both individually and with others:
- Analyze the problem in a way that makes sense given the task.
- Ask questions that will help with solving the task.
- Build perseverance by modifying methods as needed while solving a challenging task.
- Stay engaged and maintain a positive mindset when working to solve tasks.
- Help and support each other when attempting a new method or approach.

**Clarifications:**
Teachers who encourage students to participate actively in effortful learning both individually and with others:
- Cultivate a community of growth mindset learners.
- Foster perseverance in students by choosing tasks that are challenging.
- Develop students' ability to analyze and problem solve.
- Recognize students' effort when solving challenging problems.

### MA.K12.MTR.2.1
Mathematicians who demonstrate understanding by representing problems in multiple ways:
- Build understanding through modeling and using manipulatives.
- Represent solutions to problems in multiple ways using objects, drawings, tables, graphs and equations.
- Progress from modeling problems with objects and drawings to using algorithms and equations.
- Express connections between concepts and representations.
- Choose a representation based on the given context or purpose.

**Clarifications:**
Teachers who encourage students to demonstrate understanding by representing problems in multiple ways:
- Help students make connections between concepts and representations.
- Provide opportunities for students to use manipulatives when investigating concepts.
- Guide students from concrete to pictorial to abstract representations as understanding progresses.
- Show students that various representations can have different purposes and can be useful in different situations.

### MA.K12.MTR.3.1
Mathematicians who complete tasks with mathematical fluency:
- Select efficient and appropriate methods for solving problems within the given context.
- Maintain flexibility and accuracy while performing procedures and mental calculations.
- Complete tasks accurately and with confidence.
- Adapt procedures to apply them to a new context.
- Use feedback to improve efficiency when performing calculations.

**Clarifications:**
Teachers who encourage students to complete tasks with mathematical fluency:
- Provide students with the flexibility to solve problems by selecting a procedure that allows them to solve efficiently and accurately.
- Offer multiple opportunities for students to practice efficient and generalizable methods.
- Provide opportunities for students to reflect on the method they used and determine if a more efficient method could have been used.

### MA.K12.MTR.4.1
Mathematicians who engage in discussions that reflect on the mathematical thinking of self and others:
- Communicate mathematical ideas, vocabulary and methods effectively.
- Analyze the mathematical thinking of others.
- Compare the efficiency of a method to those expressed by others.
- Recognize errors and suggest how to correctly solve the task.
- Justify results by explaining methods and processes.
- Construct possible arguments based on evidence.

**Clarifications:**
Teachers who encourage students to engage in discussions that reflect on the mathematical thinking of self and others:
- Establish a culture in which students ask questions of the teacher and their peers, and error is an opportunity for learning.
- Create opportunities for students to discuss their thinking with peers.
- Select, sequence and present student work to advance and deepen understanding of correct and increasingly efficient methods.
- Develop students' ability to justify methods and compare their responses to the responses of their peers.

### MA.K12.MTR.5.1
Mathematicians who use patterns and structure to help understand and connect mathematical concepts:
- Focus on relevant details within a problem.
- Create plans and procedures to logically order events, steps or ideas to solve problems.
- Decompose a complex problem into manageable parts.

Use patterns and structure to help understand and connect mathematical concepts.
- Relate previously learned concepts to new concepts.
- Look for similarities among problems.
- Connect solutions of problems to more complicated large-scale situations.

MATH.K12.MTR.5.1:

Clariﬁcations:
Teachers who encourage students to use patterns and structure to help understand and connect mathematical concepts:
- Help students recognize the patterns in the world around them and connect these patterns to mathematical concepts.
- Support students to develop generalizations based on the similarities found among problems.
- Provide opportunities for students to create plans and procedures to solve problems.
- Develop students' ability to construct relationships between their current understanding and more sophisticated ways of thinking.

Mathematics who assess the reasonableness of solutions:
- Estimate to discover possible solutions.
- Use benchmark quantities to determine if a solution makes sense.
- Check calculations when solving problems.
- Verify possible solutions by explaining the methods used.
- Evaluate results based on the given context.

MATH.K12.MTR.6.1:

Clariﬁcations:
Teachers who encourage students to assess the reasonableness of solutions:
- Promote students estimate or predict solutions prior to solving.
- Prompt students to continually ask, “Does this solution make sense? How do you know?”
- Reinforce that students check their work as they progress within and after a task.
- Strengthen students' ability to verify solutions through justifications.

Mathematicians who apply mathematics to real-world contexts:
- Connect mathematical concepts to everyday experiences.
- Use models and methods to understand, represent and solve problems.
- Perform investigations to gather data or determine if a method is appropriate.
- Redesign models and methods to improve accuracy or efficiency.

MATH.K12.MTR.7.1:

Clariﬁcations:
Teachers who encourage students to apply mathematics to real-world contexts:
- Provide opportunities for students to create models, both concrete and abstract, and perform investigations.
- Challenge students to question the accuracy of their models and methods.
- Support students as they validate conclusions by comparing them to the given situation.
- Indicate how various concepts can be applied to other disciplines.

ELA.K12.EE.1.1:

Clariﬁcations:
- Students include textual evidence in their oral communication with guidance and support from adults. The evidence can consist of details from the text without naming the text. During 1st grade, students learn how to incorporate the evidence in their writing.
- Students include relevant textual evidence in their written and oral communication. Students should name the text when they refer to it. In 3rd grade, students should use a combination of direct and indirect citations.

- 4-5 Students continue with previous skills and reference comments made by speakers and peers. Students cite texts that they’ve directly quoted, paraphrased, or used for information. When writing, students will use the form of citation dictated by the instructor or the style guide referenced by the instructor.

- 6-8 Students continue with previous skills and use a style guide to create a proper citation.

- 9-12 Students continue with previous skills and should be aware of existing style guides and the ways in which they differ.

ELA.K12.EE.2.1:

Clariﬁcations:
See Text Complexity for grade-level complexity bands and a text complexity rubric.

ELA.K12.EE.3.1:

Clariﬁcations:
Students will make inferences before the words infer or inference are introduced. Kindergarten students will answer questions like “Why is the girl smiling?” or make predictions about what will happen based on the title page. Students will use the terms and apply them in 2nd grade and beyond.

Use appropriate collaborative techniques and active listening skills when engaging in discussions in a variety of situations.

ELA.K12.EE.4.1:

Clariﬁcations:
In kindergarten, students learn to listen to one another respectfully.
In grades 1-2, students build upon these skills by justifying what they are thinking. For example: “I think ______ because ______.” The collaborative conversations are becoming academic conversations.

In grades 3-12, students engage in academic conversations discussing claims and justifying their reasoning, refining and applying skills. Students build on ideas, propel the conversation, and support claims and counterclaims with evidence.

Use the accepted rules governing a specific format to create quality work.

ELA.K12.EE.5.1:

Clariﬁcations:
Students will incorporate skills learned into work products to produce quality work. For students to incorporate these skills appropriately, they must receive instruction. A 3rd grade student creating a poster board display must have instruction in how to effectively present information to
ELA.K12.EE.6.1: Use appropriate voice and tone when speaking or writing.

Clarifications: In kindergarten and 1st grade, students learn the difference between formal and informal language. For example, the way we talk to our friends differs from the way we speak to adults. In 2nd grade and beyond, students practice appropriate social and academic language to discuss texts.

ELD.K12.ELL.SC.1: English language learners communicate information, ideas and concepts necessary for academic success in the content area of Science.

ELD.K12.ELL.SI.1: English language learners communicate for social and instructional purposes within the school setting.

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GENERAL INFORMATION

Course Number: 2000220

Course Path: Section: Grades PreK to 12 Education
Course > Grade Group: Grades 6 to 8 Education
Course > Subject: Science > SubSubject: Physical Sciences
Abbreviated Title: M/J SCI TRAN
Course Length: Not Applicable

Course Type: Transfer Course
Course Status: State Board Approved
Grade Level(s): 6, 7, 8
<table>
<thead>
<tr>
<th>Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>SC.6.N.1.1</td>
<td>Describe and give examples of ways in which Earth's surface is built up and torn down by physical and chemical weathering, erosion, and deposition.</td>
</tr>
<tr>
<td>SC.6.N.1.2</td>
<td>Recognize that there are a variety of different landforms on Earth's surface such as coastlines, dunes, rivers, mountains, glaciers, deltas, and lakes and relate these landforms as they apply to Florida.</td>
</tr>
<tr>
<td>SC.6.N.1.3</td>
<td>Differentiate among radiation, conduction, and convection, the three mechanisms by which heat is transferred through Earth's system.</td>
</tr>
<tr>
<td>SC.6.N.1.4</td>
<td>Investigate and apply how the cycling of water between the atmosphere and hydrosphere has an effect on weather patterns and climate.</td>
</tr>
<tr>
<td>SC.6.N.1.5</td>
<td>Describe how global patterns such as the jet stream and ocean currents influence local weather in measurable terms such as temperature, air pressure, wind direction and speed, and humidity and precipitation.</td>
</tr>
<tr>
<td>SC.6.N.1.6</td>
<td>Differentiate and show interactions among the geosphere, hydrosphere, cryosphere, atmosphere, and biosphere.</td>
</tr>
<tr>
<td>SC.6.N.1.7</td>
<td>Explain how energy provided by the sun influences global patterns of atmospheric movement and the temperature differences between air, water, and land.</td>
</tr>
<tr>
<td>SC.6.N.1.8</td>
<td>Differentiate between weather and climate.</td>
</tr>
<tr>
<td>SC.6.N.1.9</td>
<td>Investigate how natural disasters have affected human life in Florida.</td>
</tr>
<tr>
<td>SC.6.N.2.1</td>
<td>Describe ways human beings protect themselves from hazardous weather and sun exposure.</td>
</tr>
<tr>
<td>SC.6.N.2.2</td>
<td>Describe how the composition and structure of the atmosphere protects life and insulates the planet.</td>
</tr>
<tr>
<td>SC.6.N.2.3</td>
<td>Define a problem from the sixth grade curriculum, use appropriate reference materials to support scientific understanding, plan and carry out scientific investigation of various types, such as systematic observations or experiments, identify variables, collect and organize data, interpret data in charts, tables, and graphics, analyze information, make predictions, and defend conclusions.</td>
</tr>
<tr>
<td>SC.6.N.3.1</td>
<td>Recognize that science involves creativity, not just in designing experiments, but also in creating explanations that fit evidence.</td>
</tr>
<tr>
<td>SC.6.N.3.2</td>
<td>Differentiate replication (by others) from repetition (multiple trials).</td>
</tr>
<tr>
<td>SC.6.N.3.3</td>
<td>Distinguish science from other activities involving thought.</td>
</tr>
<tr>
<td>SC.6.N.3.4</td>
<td>Explain the difference between an experiment and other types of scientific investigation, and explain the relative benefits and limitations of each.</td>
</tr>
<tr>
<td>SC.6.N.3.5</td>
<td>Discuss, compare, and negotiate methods used, results obtained, and explanations among groups of students conducting the same investigation.</td>
</tr>
<tr>
<td>SC.6.N.3.6</td>
<td>Recognize that scientists who make contributions to scientific knowledge come from all kinds of backgrounds and possess varied talents, interests, and goals.</td>
</tr>
<tr>
<td>SC.6.N.3.7</td>
<td>Recognize and explain that a scientific theory is a well-supported and widely accepted explanation of nature and is not simply a claim posed by an individual. Thus, the use of the term theory in science is very different than how it is used in everyday life.</td>
</tr>
<tr>
<td>SC.6.N.3.8</td>
<td>Recognize and explain that a scientific law is a description of a specific relationship under given conditions in the natural world. Thus, scientific laws are different from societal laws.</td>
</tr>
<tr>
<td>SC.6.N.3.9</td>
<td>Give several examples of scientific laws.</td>
</tr>
<tr>
<td>SC.6.N.4.1</td>
<td>Identify the role of models in the context of the sixth grade science benchmarks.</td>
</tr>
<tr>
<td>SC.7.E.6.1</td>
<td>Describe the layers of the solid Earth, including the lithosphere, the hot convecting mantle, and the dense metallic liquid and solid cores.</td>
</tr>
<tr>
<td>SC.7.E.6.2</td>
<td>Identify the patterns within the rock cycle and relate them to surface events (weathering and erosion) and sub-surface events (plate tectonics and mountain building).</td>
</tr>
<tr>
<td>SC.7.E.6.3</td>
<td>Identify current methods for measuring the age of Earth and its parts, including the law of superposition and radioactive dating.</td>
</tr>
<tr>
<td>SC.7.E.6.4</td>
<td>Identify and explain how physical evidence supports scientific theories that Earth has evolved over geologic time due to natural processes.</td>
</tr>
<tr>
<td>SC.7.E.6.5</td>
<td>Explore the scientific theory of plate tectonics by describing how the movement of Earth's crustal plates causes both slow and rapid changes in Earth's surface, including volcanic eruptions, earthquakes, and mountain building.</td>
</tr>
<tr>
<td>SC.7.E.6.6</td>
<td>Identify the impact that humans have had on Earth, such as deforestation, urbanization, desertification, erosion, air and water quality, changing the flow of water.</td>
</tr>
<tr>
<td>SC.7.E.6.7</td>
<td>Recognize that heat flow and movement of material within Earth causes earthquakes and volcanic eruptions, and creates mountains and ocean basins.</td>
</tr>
<tr>
<td>SC.7.N.1.1</td>
<td>Define a problem from the seventh grade curriculum, use appropriate reference materials to support scientific understanding, plan and carry out scientific investigation of various types, such as systematic observations or experiments, identify variables, collect and organize data, interpret data in charts, tables, and graphics, analyze information, make predictions, and defend conclusions.</td>
</tr>
<tr>
<td>SC.7.N.1.2</td>
<td>Differentiate replication (by others) from repetition (multiple trials).</td>
</tr>
<tr>
<td>SC.7.N.1.3</td>
<td>Distinguish between an experiment (which must involve the identification and control of variables) and other forms of scientific investigation and explain that not all scientific knowledge is derived from experimentation.</td>
</tr>
<tr>
<td>SC.7.N.1.4</td>
<td>Identify test variables (independent variables) and outcome variables (dependent variables) in an experiment.</td>
</tr>
<tr>
<td>SC.7.N.1.5</td>
<td>Describe the methods used in the pursuit of a scientific explanation as seen in different fields of science such as biology, geology, and physics.</td>
</tr>
<tr>
<td>SC.7.N.1.6</td>
<td>Explain that empirical evidence is the cumulative body of observations of a natural phenomenon on which scientific explanations are based.</td>
</tr>
<tr>
<td>SC.7.N.1.7</td>
<td>Explain that scientific knowledge is the result of a great deal of debate and verification within the science community.</td>
</tr>
<tr>
<td>SC.7.N.2.1</td>
<td>Identify an instance from the history of science in which scientific knowledge has changed when new evidence or new interpretations are encountered.</td>
</tr>
<tr>
<td>SC.7.N.3.1</td>
<td>Recognize and explain the difference between theories and laws and give several examples of scientific theories and the evidence that supports them.</td>
</tr>
<tr>
<td>SC.7.N.3.2</td>
<td>Identify the benefits and limitations of the use of scientific models.</td>
</tr>
</tbody>
</table>
Recognize that there are enormous distances between objects in space and apply our knowledge of light and space travel to understand this distance.

Analyze the author's purpose in providing an explanation, describing a procedure, or discussing an experiment in a text.

Compare and contrast the properties of objects in the Solar System

Identify and compare characteristics of the electromagnetic spectrum

Design and conduct a study using repeated trials and replication.

Cite specific textual evidence to support analysis of science and technical texts.

Recognize that the universe contains many billions of galaxies and that each galaxy contains many billions of stars.

Explain how political, social, and economic concerns can affect science, and vice versa.

Understand that scientific investigations involve the collection of information, make predictions, and defend conclusions.

Explain why theories may be modified but are rarely discarded.

Distinguish the hierarchical relationships between planets and other objects in the solar system such as moons, meteoroids, and asteroids.

Compare various historical models of the Solar System, including geocentric and heliocentric.

Create models of solar properties including: rotation, structure of the Sun, convection, sunspots, solar flares, and prominences.

Compare the properties of objects in the Sun, planets, and moons to those of Earth, such as gravitational force, distance from the Sun, speed, movement, temperature, and atmospheric conditions.

Compare various historical models of the Solar System, including geocentric and heliocentric.

Determine the meaning of symbols, key terms, and other domain-specific content.

Distinguish among facts, reasoned judgment based on research findings, and speculation in a text.

Analyze the methods used to develop a scientific explanation as seen in different fields of science.

Interpret the structure an author uses to organize a text, including how ideas are shaped by considerations of shape, sequence, and information.

Interpret information presented in diverse media and formats (e.g., visually, quantitatively, orally) and explain how it contributes to a topic, text, or issue under study.

Delineate a speaker's argument and specific claims, distinguishing claims that are supported by reasons and evidence from claims that are not.

Present claims and findings, sequencing ideas logically and using pertinent descriptions, facts, and details to accentuate main ideas or themes; use appropriate eye contact, adequate volume, and clear pronunciation.

Include multimedia components (e.g., graphics, images, music, sound) and visual displays in presentations to clarify information.

Cite specific textual evidence to support analysis of science and technical texts.

Determine the central ideas or conclusions of a text; provide an accurate summary of the text distinct from prior knowledge or opinions.

Cite specific textual evidence to support analysis of science and technical texts.

Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to gradients 6-8 and topics.

Analyze the structure an author uses to organize a text, including how the major sections contribute to the whole and to an understanding of the topic.

Analyze the author's purpose in providing an explanation, describing a procedure, or discussing an experiment in a text.

Integrate quantitative or technical information expressed in words in a text with a version of that information expressed visually (e.g., in a flowchart, diagram, model, graph, or table).

Distinguish among facts, reasoned judgment based on research findings, and speculation in a text.

Compare and contrast the information gained from experiments, simulations, video, or multimedia sources with that gained from reading a text on the same topic.

Write arguments focused on discipline-specific content.

a. Introduce claim(s) about a topic or issue, acknowledge and distinguish the claim(s) from alternate or opposing claims, and organize the reasons and evidence logically.

b. Support claim(s) with logical reasoning and relevant, accurate data and evidence that demonstrate an understanding of the topic or text, using credible sources.

c. Use words, phrases, and clauses to create cohesion and clarify the relationships among claim(s), counterclaims, reasons, and evidence.
<table>
<thead>
<tr>
<th>LAFS.68.WHST.1.2:</th>
<th>Write informative/explanatory texts, including the narration of historical events, scientific procedures/experiments, or technical processes.</th>
</tr>
</thead>
<tbody>
<tr>
<td>a.</td>
<td>Introduce a topic clearly, previewing what is to follow; organize ideas, concepts, and information into broader categories as appropriate to achieving purpose; include formatting (e.g., headings), graphics (e.g., charts, tables), and multimedia when useful to aiding comprehension.</td>
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<tr>
<td>b.</td>
<td>Develop the topic with relevant, well-chosen facts, definitions, concrete details, quotations, or other information and examples.</td>
</tr>
<tr>
<td>c.</td>
<td>Use appropriate and varied transitions to create cohesion and clarify the relationships among ideas and concepts.</td>
</tr>
<tr>
<td>d.</td>
<td>Use precise language and domain-specific vocabulary to inform about or explain the topic.</td>
</tr>
<tr>
<td>e.</td>
<td>Establish and maintain a formal style and objective tone.</td>
</tr>
<tr>
<td>f.</td>
<td>Provide a concluding statement or section that follows from and supports the information or explanation presented.</td>
</tr>
</tbody>
</table>

| LAFS.68.WHST.2.4: | Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience. |
| LAFS.68.WHST.2.5: | With some guidance and support from peers and adults, develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on how well purpose and audience have been addressed. |
| LAFS.68.WHST.2.6: | Use technology, including the Internet, to produce and publish writing and present the relationships between information and ideas clearly and efficiently. |
| LAFS.68.WHST.3.7: | Conduct short research projects to answer a question (including a self-generated question), drawing on several sources and generating additional related, focused questions that allow for multiple avenues of exploration. |
| LAFS.68.WHST.3.8: | Gather relevant information from multiple print and digital sources, using search terms effectively; assess the credibility and accuracy of each source; and quote or paraphrase the data and conclusions of others while avoiding plagiarism and following a standard format for citation. |
| LAFS.68.WHST.3.9: | Draw evidence from informational texts to support analysis, reflection, and research. |
| LAFS.68.WHST.4.10: | Write routinely over extended time frames (time for reflection and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences. |

| MAFS.6.EE.3.9: | Use variables to represent two quantities in a real-world problem that change in relationship to one another; write an equation to express one quantity, thought of as the dependent variable, in terms of the other quantity, thought of as the independent variable. Analyze the relationship between the dependent and independent variables using graphs and tables, and relate these to the equation. For example, in a problem involving motion at constant speed, list and graph ordered pairs of distances and times, and write the equation d = 65t to represent the relationship between distance and time. |

| MAFS.6.SP.2.4: | Display numerical data in plots on a number line, including dot plots, histograms, and box plots. |
| MAFS.6.SP.2.5: | Summarize numerical data sets in relation to their context, such as by: |
| a. | Reporting the number of observations. |
| b. | Describing the nature of the attribute under investigation, including how it was measured and its units of measurement. |
| c. | Giving quantitative measures of center (median and/or mean) and variability (interquartile range and/or mean absolute deviation), as well as describing any overall pattern and any striking deviations from the overall pattern with reference to the context in which the data were gathered. |
| d. | Relating the choice of measures of center and variability to the shape of the data distribution and the context in which the data were gathered. |

**Make sense of problems and persevere in solving them.**

Mathematically proficient students start by explaining to themselves the meaning of a problem and looking for entry points to its solution. They analyze givens, constraints, relationships, and goals. They make conjectures about the form and meaning of the solution and plan a solution pathway rather than simply jumping into a solution attempt. They consider analogous problems, and try special cases and simpler forms of the original problem in order to gain insight into its solution. They monitor and evaluate their progress and change course if necessary. Older students might, depending on the context of the problem, transform algebraic expressions or change the viewing window on their graphing calculator to get the information they need. Mathematically proficient students can explain correspondences between equations, verbal descriptions, tables, and graphs or draw diagrams of important features and relationships, graph data, and search for regularity or trends. Younger students might rely on using concrete objects or pictures to help conceptualize and solve a problem. Mathematically proficient students check their answers to problems using a different method, and they continually ask themselves, “Does this make sense?” They can understand the approaches of others to solving complex problems and identify correspondences between different approaches.

**Standard Relation to Course: Supporting**

**Reason abstractly and quantitatively.**

Mathematically proficient students make sense of quantities and their relationships in problem situations. They bring two complementary abilities to bear on problems involving quantitative relationships: the ability to decontextualize—to abstract a given situation and represent it symbolically and manipulate the representing symbols as if they have a life of their own, without necessarily attending to their referents—and the ability to contextualize, to pause as needed during the manipulation process in order to probe into the referents for the symbols involved. Quantitative reasoning entails habits of creating a coherent representation of the problem at hand; considering the units involved; attending to the meaning of quantities, not just how to compute them; and knowing and flexibly using different properties of operations and objects.

**Standard Relation to Course: Supporting**

**Construct viable arguments and critique the reasoning of others.**

Mathematically proficient students understand and use stated assumptions, definitions, and previously established results in constructing arguments. They make conjectures and build a logical progression of statements to explore the truth of their conjectures. They are able to analyze situations by breaking them into cases, and can recognize and use counterexamples. They justify their conclusions, communicate them to others, and respond to the arguments of others. They reason inductively about data, making plausible arguments that take into account the context from which the data arose. Mathematically proficient students are also able to compare the effectiveness of two plausible arguments, distinguish correct logic or reasoning from that which is flawed, and—if there is a flaw in an argument—explain what it is. Elementary students can construct arguments using concrete referents such as objects, drawings, diagrams, and actions. Such arguments can make sense and be correct, even though they are not generalized or made formal until later grades. Later, students learn to determine domains to which an argument applies. Students at all grades can listen or read the arguments of others, decide whether they make sense, and ask useful questions to clarify or improve the arguments.

**Standard Relation to Course: Supporting**

Model with mathematics.

Mathematically proficient students can apply the mathematics they know to solve problems arising in everyday life, society, and the workplace. In
early grades, this might be as simple as writing an addition equation to describe a situation. In middle grades, a student might apply proportional reasoning to plan a school event or analyze a problem in the community. By high school, a student might use geometry to solve a design problem or use a function to describe how one quantity of interest depends on another. Mathematically proficient students who can apply what they know are comfortable making assumptions and approximations to simplify a complicated situation, realizing that these may need revision later. They are able to identify important quantities in a practical situation and map their relationships using such tools as diagrams, two-way tables, graphs, flowcharts and formulas. They can analyze those relationships mathematically to draw conclusions. They routinely interpret their mathematical results in the context of the situation and reflect on whether the results make sense, possibly improving the model if it has not served its purpose.

**Standard Relation to Course: Supporting**

**Use appropriate tools strategically.**

Mathematically proficient students consider the available tools when solving a mathematical problem. These tools might include pencil and paper, concrete models, a ruler, a protractor, a calculator, a spreadsheet, a computer algebra system, a statistical package, or dynamic geometry software. Proficient students are sufficiently familiar with tools appropriate for their grade or course to make sound decisions about when each of these tools might be helpful, recognizing both the insight to be gained and their limitations. For example, mathematically proficient high school students analyze graphs of functions and solutions generated using a graphing calculator. They detect possible errors by strategically using estimation and other mathematical knowledge. When making mathematical models, they know that technology can enable them to visualize the results of varying assumptions, explore consequences, and compare predictions with data. Mathematically proficient students at various grade levels are able to identify relevant external mathematical resources, such as digital content located on a website, and use them to pose or solve problems. They are able to use technological tools to explore and deepen their understanding of concepts.

**Standard Relation to Course: Supporting**

**Attend to precision.**

Mathematically proficient students try to communicate precisely to others. They try to use clear definitions in discussion with others and in their own reasoning. They state the meaning of the symbols they choose, including using the equal sign consistently and appropriately. They are careful about distinguishing conventions associated with the equal sign from properties implying equality of expressions. For example, they might use a slash to indicate division, as in 10 ÷ 2 × 3, or they might write 3(2x + 1) instead of 3 × (2x + 1), or they might use a colon to indicate ratio, as in 2:3. They recognize the significance of an existing line in a geometric figure and can use the strategy of drawing an auxiliary line for solving problems. They also can step back for an overview and shift perspective. They can see complicated things, such as some algebraic expressions, as single objects or as being composed of several objects. For example, they can see 5 − 3(x − y)² as 5 minus a positive number times a square and use that to realize that its value cannot be more than 5 for any real numbers x and y.

**Standard Relation to Course: Supporting**

**Look for and express regularity in repeated reasoning.**

Mathematically proficient students notice if calculations are repeated, and look both for general methods and for shortcuts. Upper elementary students might notice when dividing 25 by 11 that they are repeating the same calculations over and over again, and conclude they have a repeating decimal. By paying attention to the calculation of slope as they repeatedly check whether points are on the line through (1, 2) with slope 3, middle school students might abstract the equation (y − 2)/(x − 1) = 3. Noticing the regularity in the way terms cancel when expanding (x − 1)(x + 1), (x − 1)(x² + x + 1), and (x − 1)(x³ + x² + x + 1) might lead them to the general formula for the sum of a geometric series. As they work to solve a problem, mathematically proficient students maintain oversight of the process, while attending to the details. They continually evaluate the reasonableness of their intermediate results.

**Standard Relation to Course: Supporting**

**General Course Information and Notes**

**GENERAL NOTES**

Laboratory investigations that include the use of scientific inquiry, research, measurement, problem solving, laboratory apparatus and technologies, experimental procedures, and safety procedures are an integral part of this course. The National Science Teachers Association (NSTA) recommends that at the middle school level, all students should have multiple opportunities every week to explore science laboratory investigations (labs). School laboratory investigations are defined by the National Research Council (NRC) as an experience in the laboratory, classroom, or the field that provides students with opportunities to interact directly with natural phenomena or with data collected by others using tools, materials, data collection techniques, and models (NRC, 2006, p. 3). Laboratory investigations in the middle school classroom should help all students develop a growing understanding of the complexity and ambiguity of empirical work, as well as the skills to calibrate and troubleshoot equipment used to make observations. Learners should understand measurement error; and have the skills to aggregate, interpret, and present the resulting data (NRC 2006, p. 77; NSTA, 2007).

**Special Notes:**

**Instructional Practices**

Teaching from a range of complex text is optimized when teachers in all subject areas implement the following strategies on a routine basis:
1. Ensuring wide reading from complex text that varies in length.
2. Making close reading and rereading of texts central to lessons.
3. Emphasizing text-specific complex questions, and cognitively complex tasks, reinforce focus on the text and cultivate independence.
4. Emphasizing students supporting answers based upon evidence from the text.
5. Providing extensive research and writing opportunities (claims and evidence).

**Science and Engineering Practices** (NRC Framework for K-12 Science Education, 2010)

- Asking questions (for science) and defining problems (for engineering).
- Developing and using models.
- Planning and carrying out investigations.
- Analyzing and interpreting data.
- Using mathematics, information and computer technology, and computational thinking.
- Constructing explanations (for science) and designing solutions (for engineering).
- Engaging in argument from evidence.
- Obtaining, evaluating, and communicating information.

**Literacy Standards in Science**

Secondary science courses include reading standards for literacy in science and technical subjects 6-12 and writing standards for literacy in history/social studies, science, and technical subjects 6-12. The courses also include speaking and listening standards. For a complete list of standards required for this course click on the blue tile labeled course standards. You may also download the complete course including all required standards and notes sections using the export function located at the top of this page.

**English Language Development ELD Standards Special Notes Section:**

Teachers are required to provide listening, speaking, reading and writing instruction that allows English language learners (ELL) to communicate information, ideas and concepts for academic success in the content area of Science. For the given level of English language proficiency and with visual, graphic, or interactive support, students will interact with grade level words, expressions, sentences and discourse to process or produce language necessary for academic success in the content area of Science. The ELD standard should specify a relevant content area concept or topic of study chosen by curriculum developers and teachers which maximizes an ELL's need for communication and social skills. To access an ELL supporting document which delineates performance definitions and descriptors, please click on the following link: https://cpalmsmediaprod.blob.core.windows.net/uploads/docs/standards/eld/sc.pdf

**Additional Instructional Resources:**

A.V.E. for Success Collection is provided by the Florida Association of School Administrators: http://www.fasa.net/4DCGI/cms/review.html?Action=CMS_Document&DocID=139. Please be aware that these resources have not been reviewed by CPALMS and there may be a charge for the use of some of them in this collection.

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**GENERAL INFORMATION**

**Course Number:** 2001010

**Course Path:** Section: Grades PreK to 12 Education
Courses: Grade Group: Grades 6 to 8 Education
Courses: Subject: Science > SubSubject: Earth/Space Sciences
Abbreviated Title: M/J EARTH/SPA SCI
Course Length: Year (Y)
Course Attributes:
- Class Size Core Required

**Course Status:** Course Approved

**Grade Level(s):** 6,7,8

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**Educator Certifications**

<table>
<thead>
<tr>
<th>Science (Secondary Grades 7-12)</th>
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<tbody>
<tr>
<td>Middle Grades Integrated Curriculum (Middle Grades 5-9)</td>
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<tr>
<td>Earth/Space Science (Grades 6-12)</td>
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<tr>
<td>Middle Grades General Science (Middle Grades 5-9)</td>
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<td>Chemistry (Grades 6-12)</td>
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Recognize that there are enormous distances between objects in space and apply our knowledge of light and space travel to understand this distance.

SC.B.E.5.2: Recognize that the universe contains many billions of galaxies and that each galaxy contains many billions of stars.

SC.B.E.5.3: Distinguish the hierarchical relationships between planets and other astronomical bodies relative to solar system, galaxy, and universe, including distance, size, and composition.

SC.B.E.5.4: Explore the Law of Universal Gravitation by explaining the role that gravity plays in the formation of planets, stars, and solar systems and in determining their motions.

SC.B.E.5.5: Describe and classify specific physical properties of stars: apparent magnitude (brightness), temperature (color), size, and luminosity (absolute brightness).

SC.B.E.5.6: Create models of solar properties including: rotation, structure of the Sun, convection, sunspots, solar flares, and prominences.

SC.B.E.5.7: Compare and contrast the properties of objects in the Solar System including the Sun, planets, and moons to those of Earth, such as gravitational force, distance from the Sun, speed, movement, temperature, and atmospheric conditions.

SC.B.E.5.8: Compare various historical models of the Solar System, including geocentric and heliocentric.

SC.B.E.5.9: Explain the impact of objects in space on each other including:
1. the Sun on the Earth including seasons and gravitational attraction
2. the Moon on the Earth, including phases, tides, and eclipses, and the relative position of each body.

SC.B.E.5.10: Assess how technology is essential to science for such purposes as access to outer space and other remote locations, sample collection, measurement, data collection and storage, computation, and communication of information.

SC.B.E.5.11: Identify and compare characteristics of the electromagnetic spectrum such as wavelength, frequency, use, and hazards and recognize its application to an understanding of planetary images and satellite photographs.

SC.B.E.5.12: Summarize the effects of space exploration on the economy and culture of Florida.

SC.B.N.1.1: Define a problem from the eighth grade curriculum using appropriate reference materials to support scientific understanding, plan and carry out scientific investigations of various types, such as systematic observations or experiments, identify variables, collect and organize data, interpret data in charts, tables, and graphics, analyze information, make predictions, and defend conclusions.

SC.B.N.1.2: Design and conduct a study using repeated trials and replication.

SC.B.N.1.3: Use phrases such as "results support" or "fail to support" in science, understanding that science does not offer conclusive "proof" of a knowledge claim.

SC.B.N.1.4: Explain how hypotheses are valuable if they lead to further investigations, even if they turn out not to be supported by the data.

SC.B.N.1.5: Analyze the methods used to develop a scientific explanation as seen in different fields of science.

SC.B.N.1.6: Understand that scientific investigations involve the collection of relevant empirical evidence, the use of logical reasoning, and the application of imagination in devising hypotheses, predictions, explanations and models to make sense of the collected evidence.

SC.B.N.2.1: Distinguish between scientific and pseudoscientific ideas.

SC.B.N.2.2: Discuss what characterizes science and its methods.

SC.B.N.3.1: Select models useful in relating the results of their own investigations.

SC.B.N.3.2: Explain why theories may be modified but are rarely discarded.

SC.B.N.4.1: Explain that science is one of the processes that can be used to inform decision making at the community, state, national, and international levels.

SC.B.N.4.2: Explain how political, social, and economic concerns can affect science, and vice versa.

Mathematicians who participate in effortful learning both individually and with others:
- Analyze the problem in a way that makes sense given the task.
- Ask questions that will help with solving the task.
- Build perseverance by modifying methods as needed while solving a challenging task.
- Stay engaged and maintain a positive mindset when working to solve tasks.
- Help and support each other when attempting a new method or approach.

Clarifications:
Teachers who encourage students to participate actively in effortful learning both individually and with others:
- Cultivate a community of growth mindset learners.
- Foster perseverance in students by choosing tasks that are challenging.
- Develop students' ability to analyze and problem solve.
- Recognize students' effort when solving challenging problems.

Demonstrate understanding by representing problems in multiple ways. Mathematicians who demonstrate understanding by representing problems in multiple ways:
- Build understanding through modeling and using manipulatives.
- Represent solutions to problems in multiple ways using objects, drawings, tables, graphs and equations.
- Progress from modeling problems with objects and drawings to using algorithms and equations.
- Express connections between concepts and representations.
- Choose a representation based on the given context or purpose.

Clarifications:
Teachers who encourage students to demonstrate understanding by representing problems in multiple ways:
- Help students make connections between concepts and representations.
- Provide opportunities for students to use manipulatives when investigating concepts.
- Guide students from concrete to pictorial to abstract representations as understanding progresses.
- Show students that various representations can have different purposes and can be useful in different situations.

Complete tasks with mathematical fluency. Mathematicians who complete tasks with mathematical fluency:
- Select efficient and appropriate methods for solving problems within the given context.
- Maintain flexibility and accuracy while performing procedures and mental calculations.
- Complete tasks accurately and with confidence.
### MA.K12.MTR.3.1:
- Adapt procedures to apply them to a new context.
- Use feedback to improve efficiency when performing calculations.

**Clarifications:**
- Teachers who encourage students to complete tasks with mathematical fluency:
  - Provide students with the flexibility to solve problems by selecting a procedure that allows them to solve efficiently and accurately.
  - Offer multiple opportunities for students to practice efficient and generalizable methods.
- Teachers who encourage students to reflect on the method they used and determine if a more efficient method could have been used.

### MA.K12.MTR.7.1:
- Teachers who encourage students to engage in discussions that reflect on the mathematical thinking of self and others:
  - Communicate mathematical ideas, vocabulary and methods effectively.
  - Analyze the mathematical thinking of others.
  - Compare the efficiency of a method to those expressed by others.
- Teachers who encourage students to assess the reasonableness of solutions:
  - Establish a culture in which students ask questions of the teacher and their peers, and error is an opportunity for learning.
  - Create opportunities for students to discuss their thinking with peers.
- Teachers who encourage students to use patterns and structure to help understand and connect mathematical concepts:
  - Select, sequence and present student work to advance and deepen understanding of correct and increasingly efficient methods.
- Teachers who encourage students to engage in discussions that reflect on the mathematical thinking of self and others:
  - Develop students’ ability to justify methods and compare their responses to the responses of their peers.

### MA.K12.MTR.4.1:
- Use patterns and structure to help understand and connect mathematical concepts.
- Use evidence to explain and justify reasoning.

**Clarifications:**
- Teachers who encourage students to assess the reasonableness of solutions:
  - Help students recognize the patterns in the world around them and connect these patterns to mathematical concepts.
- Teachers who encourage students to use patterns and structure to help understand and connect mathematical concepts:
  - Support students to develop generalizations based on the similarities found among problems.
  - Provide opportunities for students to create plans and procedures to solve problems.
- Teachers who encourage students to engage in discussions that reflect on the mathematical thinking of self and others.

### MA.K12.MTR.5.1:
- Assess the reasonableness of solutions.
- Use patterns and structure to help understand and connect mathematical concepts.

**Clarifications:**
- Teachers who encourage students to assess the reasonableness of solutions:
  - Have students estimate or predict solutions prior to solving.
  - Prompt students to continually ask, “Does this solution make sense? How do you know?”
  - Reinforce that students check their work as they progress within and after a task.
- Teachers who encourage students to complete tasks with mathematical fluency:
  - Strengthen students’ ability to verify solutions through justifications.

### MA.K12.MTR.1.1:
- Apply mathematics to real-world contexts.
- Cite evidence to explain and justify reasoning.

**Clarifications:**
- K-1 Students include textual evidence in their oral communication with guidance and support from adults. The evidence can consist of details from the text without naming the text. During 1st grade, students learn how to incorporate the evidence in their writing.
- 2-3 Students include relevant textual evidence in their written and oral communication. Students should name the text when they refer to it. In 3rd grade, students should use a combination of direct and indirect citations.
ELA.K12.EE.1.1: 4-5 Students continue with previous skills and reference comments made by speakers and peers. Students cite texts that they've directly quoted, paraphrased, or used for information. When writing, students will use the form of citation dictated by the instructor or the style guide referenced by the instructor.

6-8 Students continue with previous skills and use a style guide to create a proper citation.

9-12 Students continue with previous skills and should be aware of existing style guides and the ways in which they differ.

ELA.K12.EE.2.1: **Clari**fications: Read and comprehend grade-level complex texts proficiently.

Make inferences to support comprehension.

ELA.K12.EE.3.1: **Clari**fications: Students will make inferences before the words infer or inference are introduced. Kindergarten students will answer questions like "Why is the girl smiling?" or make predictions about what will happen based on the title page. Students will use the terms and apply them in 2nd grade and beyond.

Use appropriate collaborative techniques and active listening skills when engaging in discussions in a variety of situations.

ELA.K12.EE.4.1: **Clari**fications: Students with opportunities to interact directly with natural phenomena experience in the laboratory, classroom, or the field that provides understanding of the complexity and ambiguity of empirical work, as well as the skills to calibrate and troubleshoot equipment used to make observations. Learners should understand measurement error; and have the skills to aggregate, interpret, and present the resulting data (NRC 2006, p. 77; NSTA, 2007).

Special Notes:

**Instructional Practices**

Teaching from a range of complex text is optimized when teachers in all subject areas implement the following strategies on a routine basis:

1. Ensuring wide reading from complex text that varies in length.
2. Making close reading and rereading of texts central to lessons.
3. Emphasizing text-specific complex questions, and cognitively complex tasks, reinforce focus on the text and cultivate independence.
4. Emphasizing students supporting answers based upon evidence from the text.
5. Providing extensive research and writing opportunities (claims and evidence).

**Science and Engineering Practices** (NRC Framework for K-12 Science Education, 2010)

- Asking questions (for science) and defining problems (for engineering).
- Developing and using models.
- Planning and carrying out investigations.
- Analyzing and interpreting data.
- Using mathematics, information and computer technology, and computational thinking.

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**GENERAL NOTES**

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Constructing explanations (for science) and designing solutions (for engineering).
Engaging in argument from evidence.
Obtaining, evaluating, and communicating information.

**Florida's Benchmarks for Excellent Student Thinking (B.E.S.T.) Standards**

This course includes Florida's B.E.S.T. ELA Expectations (EE) and Mathematical Thinking and Reasoning Standards (MTRs) for students. Florida educators should intentionally embed these standards within the content and their instruction as applicable. For guidance on the implementation of the EEs and MTRs, please visit https://www.cpalms.org/Standards/BEST_Standards.aspx and select the appropriate B.E.S.T. Standards package.

**English Language Development ELD Standards Special Notes Section:**

Teachers are required to provide listening, speaking, reading and writing instruction that allows English language learners (ELL) to communicate information, ideas and concepts for academic success in the content area of Science. For the given level of English language proficiency and with visual, graphic, or interactive support, students will interact with grade level words, expressions, sentences and discourse to process or produce language necessary for academic success. The ELD standard should specify a relevant content area concept or topic of study chosen by curriculum developers and teachers which maximizes an ELL's need for communication and social skills. To access an ELL supporting document which delineates performance definitions and descriptors, please click on the following link: https://cpalmsmediaprod.blob.core.windows.net/uploads/docs/standards/eld/sc.pdf

**Additional Instructional Resources:**

A.V.E. for Success Collection is provided by the Florida Association of School Administrators: http://www.fasa.net/4DCGI/cms/review.html?Action=CM5_Document&DocID=139. Please be aware that these resources have not been reviewed by CPALMS and there may be a charge for the use of some of them in this collection.

**GENERAL INFORMATION**

**Course Number:** 2001010

**Course Path:** Grades PreK to 12 Education
Courses > **Grade Group:** Grades 6 to 8 Education
Courses > **Subject:** Science > **SubSubject:** Earth/Space Sciences

**Abbreviated Title:** M/J EARTH/SPA SCI

**Course Length:** Year (Y)

**Course Attributes:**
- Class Size Core Required

**Course Level:** 2

**Course Status:** State Board Approved

**Grade Level(s):** 6,7,8

**Educator Certifications**

<table>
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<td>Physics (Grades 6-12)</td>
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Course Standards

Use grade appropriate Nature of Science benchmarks (i.e. if this course is offered to seventh grade students, then the SC.7.N benchmarks should be integrated into the course content, and SC.6.N and SC.8.N benchmarks should be omitted from the seventh grade course).

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<td>Describe and give examples of ways in which Earth's surface is built up and torn down by physical and chemical weathering, erosion, and deposition.</td>
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<td>SC.6.E.6.2:</td>
<td>Recognize that there are a variety of different landforms on Earth's surface such as coastlines, dunes, rivers, mountains, glaciers, deltas, and lakes and relate these landforms as they apply to Florida.</td>
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<td>SC.6.E.7.1:</td>
<td>Differentiate among radiation, conduction, and convection, the three mechanisms by which heat is transferred through Earth's system.</td>
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<td>Investigate and apply how the cycling of water between the atmosphere and hydrosphere has an effect on weather patterns and climate.</td>
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<td>SC.6.E.7.3:</td>
<td>Describe how global patterns such as the jet stream and ocean currents influence local weather in measurable terms such as temperature, air pressure, wind direction and speed, and humidity and precipitation.</td>
</tr>
<tr>
<td>SC.6.E.7.4:</td>
<td>Differentiate and show interactions among the geosphere, hydrosphere, cryosphere, atmosphere, and biosphere.</td>
</tr>
<tr>
<td>SC.6.E.7.5:</td>
<td>Explain how energy provided by the sun influences global patterns of atmospheric movement and the temperature differences between air, water, and land.</td>
</tr>
<tr>
<td>SC.6.E.7.6:</td>
<td>Differentiate between weather and climate.</td>
</tr>
<tr>
<td>SC.6.E.7.7:</td>
<td>Investigate how natural disasters have affected human life in Florida.</td>
</tr>
<tr>
<td>SC.6.E.7.8:</td>
<td>Describe ways human beings protect themselves from hazardous weather and sun exposure.</td>
</tr>
<tr>
<td>SC.6.E.7.9:</td>
<td>Describe how the composition and structure of the atmosphere protects life and insulates the planet.</td>
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<tr>
<td>SC.7.E.6.1:</td>
<td>Describe the layers of the solid Earth, including the lithosphere, the hot convection mantle, and the dense metallic liquid and solid cores.</td>
</tr>
<tr>
<td>SC.7.E.6.2:</td>
<td>Identify the patterns within the rock cycle and relate them to surface events (weathering and erosion) and sub-surface events (plate tectonics and mountain building).</td>
</tr>
<tr>
<td>SC.7.E.6.3:</td>
<td>Identify current methods for measuring the age of Earth and its parts, including the law of superposition and radioative dating.</td>
</tr>
<tr>
<td>SC.7.E.6.4:</td>
<td>Explain and give examples of how physical evidence supports scientific theories that Earth has evolved over geologic time due to natural processes.</td>
</tr>
<tr>
<td>SC.7.E.6.5:</td>
<td>Explore the scientific theory of plate tectonics by describing how the movement of Earth's crustal plates causes slow and rapid changes in Earth's surface, including volcanic eruptions, earthquakes, and mountain building.</td>
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<tr>
<td>SC.7.E.6.6:</td>
<td>Identify the impact that humans have had on Earth, such as deforestation, urbanization, desertification, erosion, air and water quality, changing the flow of water.</td>
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<tr>
<td>SC.7.E.6.7:</td>
<td>Recognize that heat flow and movement of material within Earth causes earthquakes and volcanic eruptions, and creates mountains and ocean basins.</td>
</tr>
<tr>
<td>SC.7.N.1.1:</td>
<td>Define a problem from the seventh grade curriculum, use appropriate reference materials to support scientific understanding, plan and carry out scientific investigation of various types, such as systematic observations or experiments, identify variables, collect and organize data, interpret data in charts, tables, and graphics, analyze information, make predictions, and defend conclusions.</td>
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<td>SC.7.N.1.2:</td>
<td>Differentiate replication (by others) from repetition (multiple trials).</td>
</tr>
<tr>
<td>SC.7.N.1.3:</td>
<td>Distinguish between an experiment (which must involve the identification and control of variables) and other forms of scientific investigation and explain that not all scientific knowledge is derived from experimentation.</td>
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<td>SC.7.N.1.4:</td>
<td>Identify test variables (independent variables) and outcome variables (dependent variables) in an experiment.</td>
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<td>SC.7.N.1.5:</td>
<td>Describe the methods used in the pursuit of a scientific explanation as seen in different fields of science such as biology, geology, and physics.</td>
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<td>SC.7.N.1.6:</td>
<td>Explain that empirical evidence is the cumulative body of observations of a natural phenomenon or scientific explanation is based.</td>
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<tr>
<td>SC.7.N.1.7:</td>
<td>Explain that scientific knowledge is the result of a great deal of debate and confirmation within the science community.</td>
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<td>SC.7.N.2.1:</td>
<td>Identify an instance from the history of science in which scientific knowledge has changed when new evidence or new interpretations are encountered.</td>
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<td>SC.7.N.3.1:</td>
<td>Recognize and explain the difference between theories and laws and give several examples of scientific theories and the evidence that supports them.</td>
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<td>SC.7.N.3.2:</td>
<td>Identify the benefits and limitations of the use of scientific models.</td>
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<td>SC.8.E.5.1:</td>
<td>Recognize that there are enormous distances between objects in space and apply our knowledge of light and space travel to understand this distance.</td>
</tr>
<tr>
<td>SC.8.E.5.2:</td>
<td>Recognize that the universe contains many billions of galaxies and that each galaxy contains many billions of stars.</td>
</tr>
<tr>
<td>SC.8.E.5.3:</td>
<td>Distinguish the hierarchical relationships between planets and other astronomical bodies relative to solar system, galaxy, and universe, including distance, size, and composition.</td>
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<tr>
<td>SC.8.E.5.4:</td>
<td>Explore the Law of Universal Gravitation by explaining the role that gravity plays in the formation of planets, stars, and solar systems and in determining their motions.</td>
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<td>SC.8.E.5.5:</td>
<td>Describe and classify specific physical properties of stars: apparent magnitude (brightness), temperature (color), size, and luminosity (absolute brightness).</td>
</tr>
<tr>
<td>SC.8.E.5.6:</td>
<td>Create models of solar properties including: rotation, structure of the Sun, convection, sunspots, solar flares, and prominences.</td>
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<tr>
<td>SC.8.E.5.7:</td>
<td>Compare and contrast the properties of objects in the Solar System including the Sun, planets, and moons to those of Earth, such as gravitational force, distance from the Sun, speed, movement, temperature, and atmospheric conditions.</td>
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<tr>
<td>SC.8.E.5.8:</td>
<td>Compare various historical models of the Solar System, including geocentric and heliocentric.</td>
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<td></td>
<td>Explain the impact of objects in space on each other including:</td>
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</tbody>
</table>
Analyze the author's purpose in providing an explanation, describing a procedure, or discussing an experiment in a text.

Cite specific textual evidence to support analysis of science and technical texts.

Design and conduct a study using repeated trials and replication.

Discuss what characterizes science and its methods.

Conduct short research projects to answer a question (including a self-generated question), drawing on several sources and generating additional, focused questions that allow for multiple avenues of exploration.

Explain how political, social, and economic concerns can affect science, and vice versa.

Determine the meaning of symbols, key terms, and other domain-specific words, phrases, and clauses to create cohesion and clarify the relationships among claim(s), counterclaims, reasons, and evidence.

Analyze the structure an author uses to organize a text, including how the topic and the central purpose are developed and a sense of temporal order are conveyed.

Analyze the scientific theory of plate tectonics and identify related major processes and features as a result of moving plates.

Compare and contrast the information gained from experiments, simulations, video, or multimedia sources with that gained from reading a text on the same topic.

Write arguments focused on discipline-specific content.
  a. Introduce claim(s) about a topic or issue, acknowledge and distinguish the claim(s) from alternate or opposing claims, and organize the reasons and evidence logically.
  b. Support claim(s) with logical reasoning and relevant, accurate data and evidence that demonstrate an understanding of the topic or text, using credible sources.
  c. Use words, phrases, and clauses to create cohesion and clarify the relationships among claim(s), counterclaims, reasons, and evidence.
  d. Establish and maintain a formal style.
  e. Provide a concluding statement or section that follows from and supports the argument presented.

Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes.
  a. Introduce a topic clearly, previewing what is to follow; organize ideas, concepts, and information into broader categories as appropriate to achieving purpose; include formatting (e.g., headings), graphics (e.g., charts, tables), and multimedia when useful to aiding comprehension.
  b. Develop the topic with relevant, well-chosen facts, definitions, concrete details, quotations, or other information and examples.
  c. Use appropriate and varied transitions to create cohesion and clarify the relationships among ideas and concepts.
  d. Use precise language and domain-specific vocabulary to inform about or explain the topic.
  e. Establish and maintain a formal style and objective tone.
  f. Provide a concluding statement or section that follows from and supports the information or explanation presented.

Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.

With some guidance and support from peers and adults, develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on how well purpose and audience have been addressed.

Use technology, including the Internet, to produce and publish writing and present the relationships between information and ideas clearly and efficiently.

Conduct short research projects to answer a question (including a self-generated question), drawing on several sources and generating additional related, focused questions that allow for multiple avenues of exploration.
Gather relevant information from multiple print and digital sources, using search terms effectively; assess the credibility and accuracy of each source; and quote or paraphrase the data and conclusions of others while avoiding plagiarism and following a standard format for citation.

Draw evidence from informational texts to support analysis, reflection, and research.

Write routinely over extended time frames (time for reflection and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences.

Engage effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grade 7 topics, texts, and issues, building on others' ideas and expressing their own clearly.

a. Come to discussions prepared, having read or researched material under study; explicitly draw on that preparation by referring to evidence on the topic, text, or issue to probe and reflect on ideas under discussion.

b. Follow rules for collegial discussions, track progress toward specific goals and deadlines, and define individual roles as needed.

c. Pose questions that elicit elaboration and respond to others' questions and comments with relevant observations and ideas that bring the discussion back on topic as needed.

d. Acknowledge new information expressed by others and, when warranted, modify their own views.

Analyze the main ideas and supporting details presented in diverse media and formats (e.g., visually, quantitatively, orally) and explain how the ideas clarify a topic, text, or issue under study.

Delineate a speaker's argument and specific claims, evaluating the soundness of the reasoning and the relevance and sufficiency of the evidence.

Present claims and findings, emphasizing salient points in a focused, coherent manner with pertinent descriptions, facts, details, and examples; use appropriate eye contact, adequate volume, and clear pronunciation.

Include multimedia components and visual displays in presentations to clarify claims and findings and emphasize salient points.

Use variables to represent two quantities in a real-world problem that change in relationship to one another; write an equation to express one quantity, thought of as the dependent variable, in terms of the other quantity, thought of as the independent variable. Analyze the relationship between the dependent and independent variables using graphs and tables, and relate these to the equation. For example, in a problem involving motion at constant speed, list and graph ordered pairs of distances and times, and write the equation \( d = 65t \) to represent the relationship between distance and time.

Display numerical data in plots on a number line, including dot plots, histograms, and box plots.

Summarize numerical data sets in relation to their context, such as by:

a. Reporting the number of observations.

b. Describing the nature of the attribute under investigation, including how it was measured and its units of measurement.

c. Giving quantitative measures of center (median and/or mean) and variability (interquartile range and/or mean absolute deviation), as well as describing any overall pattern and any striking deviations from the overall pattern with reference to the context in which the data were gathered.

d. Relating the choice of measures of center and variability to the shape of the data distribution and the context in which the data were gathered.

Use measures of center and measures of variability for numerical data from random samples to draw informal comparative inferences about two populations. For example, decide whether the words in a chapter of a seventh-grade science book are generally longer than the words in a chapter of a fourth-grade science book.

Understand that the probability of a chance event is a number between 0 and 1 that expresses the likelihood of the event occurring. Larger numbers indicate greater likelihood. A probability near 0 indicates an unlikely event, a probability around 1/2 indicates an event that is neither unlikely nor likely, and a probability near 1 indicates a likely event.

Make sense of problems and persevere in solving them.

Mathematically proficient students start by explaining to themselves the meaning of a problem and looking for entry points to its solution. They analyze givens, constraints, relationships, and goals. They make conjectures about the form and meaning of the solution and plan a solution pathway rather than simply jumping into a solution attempt. They consider analogous problems, and try special cases and simpler forms of the original problem in order to gain insight into its solution. They monitor and evaluate their progress and change course if necessary. Older students might, depending on the context of the problem, transform algebraic expressions or change the viewing window on their graphing calculator to get the information they need. Mathematically proficient students can explain correspondences between equations, verbal descriptions, tables, and graphs or draw diagrams of important features and relationships, graph data, and search for regularity or trends. Younger students might rely on using concrete objects or pictures to help conceptualize and solve a problem. Mathematically proficient students check their answers to problems using a different method, and they continually ask themselves, “Does this make sense?” They can understand the approaches of others to solving complex problems and identify correspondences between different approaches.

Reason abstractly and quantitatively.

Mathematically proficient students make sense of quantities and their relationships in problem situations. They bring two complementary abilities to bear on problems involving quantitative relationships: the ability to decontextualize—to abstract a given situation and represent it symbolically and manipulate the representing symbols as if they have a life of their own, without necessarily attending to their referents—and the ability to contextualize, to pause as needed during the manipulation process in order to probe into the referents for the symbols involved. Quantitative reasoning entails habits of creating a coherent representation of the problem at hand; considering the units involved; attending to the meaning of quantities, not just how to compute them; and knowing and flexibly using different properties of operations and objects.

Construct viable arguments and critique the reasoning of others.

Mathematically proficient students understand and use stated assumptions, definitions, and previously established results in constructing arguments. They make conjectures and build a logical progression of statements to explore the truth of their conjectures. They are able to analyze situations by breaking them into cases, and can recognize and use counterexamples. They justify their conclusions, communicate them to others, and respond to the arguments of others. They reason inductively about data, making plausible arguments that take into account the context from which the data arose. Mathematically proficient students are also able to compare the effectiveness of two plausible arguments, distinguish correct logic or reasoning from that which is flawed, and—if there is a flaw in an argument—explain what it is. Elementary students can construct arguments using concrete referents such as objects, drawings, diagrams, and actions. Such arguments can make sense and be correct, even though they are not generalized or made formal until later grades. Later, students learn to determine domains to which an argument applies. Students at all grades can listen or read the arguments of others, decide whether they make sense, and ask useful questions to clarify or improve the arguments.

Model with mathematics.
Mathematically proficient students can apply the mathematics they know to solve problems arising in everyday life, society, and the workplace. In early grades, this might be as simple as writing an addition equation to describe a situation. In middle grades, a student might apply proportional reasoning to plan a school event or analyze a problem in the community. By high school, a student might use geometry to solve a design problem or use a function to describe how one quantity of interest depends on another. Mathematically proficient students who can apply what they know are comfortable making assumptions and approximations to simplify a complicated situation, realizing that these may need revision later. They are able to identify important quantities in a practical situation and map their relationships using such tools as diagrams, two-way tables, graphs, flowcharts and formulas. They can analyze those relationships mathematically to draw conclusions. They routinely interpret their mathematical results in the context of the situation and reflect on whether the results make sense, possibly improving the model if it has not served its purpose.

**Standard Relation to Course: Supporting**

**Use appropriate tools strategically.**

Mathematically proficient students consider the available tools when solving a mathematical problem. These tools might include pencil and paper, concrete models, a ruler, a protractor, a calculator, a spreadsheet, a computer algebra system, a statistical package, or dynamic geometry software. Proficient students are sufficiently familiar with tools appropriate for their grade or course to make sound decisions about when each of these tools might be helpful, recognizing both the insight to be gained and their limitations. For example, mathematically proficient high school students analyze graphs of functions and solutions generated using a graphing calculator. They detect possible errors by strategically using estimation and other mathematical knowledge. When making mathematical models, they know that technology can enable them to visualize the results of varying assumptions, explore consequences, and compare predictions with data. Mathematically proficient students at various grade levels are able to identify relevant external mathematical resources, such as digital content located on a website, and use them to pose or solve problems. They are able to use technological tools to explore and deepen their understanding of concepts.

**Standard Relation to Course: Supporting**

**Attend to precision.**

Mathematically proficient students try to communicate precisely to others. They try to use clear definitions in discussion with others and in their own reasoning. They state the meaning of the symbols they choose, including using the equal sign consistently and appropriately. They are careful about specifying units of measure, and labeling axes to clarify the correspondence with quantities in a problem. They calculate accurately and efficiently, express numerical answers with a degree of precision appropriate for the problem context. In the elementary grades, students give carefully formulated explanations to each other. By the time they reach high school they have learned to examine claims and make explicit use of definitions.

**Standard Relation to Course: Supporting**

**Look for and make use of structure.**

Mathematically proficient students look closely to discern a pattern or structure. Young students, for example, might notice that three and seven more is the same amount as seven and three more, or they may sort a collection of shapes according to how many sides the shapes have. Later, students will see 7 × 8 equals the well remembered 7 × 5 + 7, in preparation for learning about the distributive property. In the expression x² + 9x + 14, older students can see the 14 as 2 × 7 and the 9 as 2 + 7. They recognize the significance of an existing line in a geometric figure and can use the strategy of drawing an auxiliary line for solving problems. They also can step back for an overview and shift perspective. They can see complicated things, such as some algebraic expressions, as single objects or as being composed of several objects. For example, they can see 5 - 3(3x - y)² as 5 minus a positive number times a square and use that to realize that its value cannot be more than 5 for any real numbers x and y.

**Standard Relation to Course: Supporting**

**Look for and express regularity in repeated reasoning.**

Mathematically proficient students notice if calculations are repeated, and look both for general methods and for shortcuts. Upper elementary students might notice when dividing 25 by 11 that they are repeating the same calculations over and over again, and conclude they have a repeating decimal. By paying attention to the calculation of slope as they repeatedly check whether points are on the line through (1, 2) with slope 3, middle school students might abstract the equation (y - 2)/(x - 1) = 3. Noticing the regularity in the way terms cancel when expanding (x - 1)(x + 1), (x - 1)(x² + x + 1), and (x - 1)(x³ + x² + x + 1) might lead them to the general formula for the sum of a geometric series. As they work to solve a problem, mathematically proficient students maintain oversight of the process, while attending to the details. They continually evaluate the reasonableness of their intermediate results.

**Standard Relation to Course: Supporting**

**English language learners communicate information, ideas and concepts necessary for academic success in the content area of Science.**

**English language learners communicate for social and instructional purposes within the school setting.**

**Identify environmental factors that affect personal health.**

**Clarifications:**

- Air and water quality, availability of sidewalks, contaminated food, and road hazards.

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**General Course Information and Notes**

**GENERAL NOTES**

Laboratory investigations that include the use of scientific inquiry, research, measurement, problem solving, laboratory apparatus and technologies, experimental procedures, and safety procedures are an integral part of this course. The National Science Teachers Association (NSTA) recommends that at the middle school level, all students should have multiple opportunities every week to explore science laboratory investigations (labs). School laboratory investigations are defined by the National Research Council (NRC) as an experience in the laboratory, classroom, or the field that provides students with opportunities to interact directly with natural phenomena or with data collected by others using tools, materials, data collection techniques, and models (NRC, 2006, p. 3). Laboratory investigations in the middle school classroom should help all students develop a growing understanding of the complexity and ambiguity of empirical work, as well as the skills to calibrate and troubleshoot equipment used to make observations. Learners should understand measurement error; and have the skills to aggregate, interpret, and present the resulting data (NRC 2006, p. 77; NSTA, 2007).

**Honors and Advanced Level Course Notes:** Advanced courses require a greater demand on students through increased academic rigor. Academic rigor is obtained through the application, analysis, evaluation, and creation of complex ideas that are often abstract and multi-faceted. Students are challenged to think and collaborate...
critically on the content they are learning. Honors level rigor will be achieved by increasing text complexity through text selection, focus on high-level qualitative measures, and complexity of task. Instruction will be structured to give students a deeper understanding of conceptual themes and organization within and across disciplines. Academic rigor is more than simply assigning to students a greater quantity of work.

Special Notes:

**Instructional Practices**
Teaching from a range of complex text is optimized when teachers in all subject areas implement the following strategies on a routine basis:

1. Ensuring wide reading from complex text that varies in length.
2. Making close reading and rereading of texts central to lessons.
3. Emphasizing text-specific complex questions, and cognitively complex tasks, reinforce focus on the text and cultivate independence.
4. Emphasizing students supporting answers based upon evidence from the text.
5. Providing extensive research and writing opportunities (claims and evidence).

**Science and Engineering Practices** (NRC Framework for K-12 Science Education, 2010)
- Asking questions (for science) and defining problems (for engineering).
- Developing and using models.
- Planning and carrying out investigations.
- Analyzing and interpreting data.
- Using mathematics, information and computer technology, and computational thinking.
- Constructing explanations (for science) and designing solutions (for engineering).
- Engaging in argument from evidence.
- Obtaining, evaluating, and communicating information.

**Literacy Standards in Science**
Secondary science courses include reading standards for literacy in science and technical subjects 6-12 and writing standards for literacy in history/social studies, science, and technical subjects 6-12. The courses also include speaking and listening standards. For a complete list of standards required for this course click on the blue tile labeled course standards. You may also download the complete course including all required standards and notes sections using the export function located at the top of this page.

**English Language Development ELD Standards Special Notes Section:**
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### GENERAL INFORMATION

**Course Number:** 2001020

**Course Path:** Section: Grades PreK to 12 Education
Courses > Grade Group: Grades 6 to 8 Education
Courses > Subject: Science > SubSubject:
Earth/Space Sciences >
**Abbreviated Title:** M/J EARTH/SPA SCI ADV

**Course Length:** Year (Y)

**Course Attributes:**
- Class Size Core Required
- Course Level: 3

**Course Status:** Course Approved

**Grade Level(s):** 6,7,8

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<tr>
<td>SC.6.E.7.1:</td>
<td>Describe how global patterns such as the jet stream and ocean currents influence local weather in measurable terms such as temperature, air pressure, wind direction and speed, and humidity and precipitation.</td>
</tr>
<tr>
<td>SC.6.E.7.4:</td>
<td>Differentiate and show interactions among the geosphere, hydrosphere, cryosphere, atmosphere, and biosphere.</td>
</tr>
<tr>
<td>SC.6.E.7.5:</td>
<td>Explain how energy provided by the sun influences global patterns of atmospheric movement and the temperature differences between air, water, and land.</td>
</tr>
<tr>
<td>SC.6.E.7.6:</td>
<td>Differentiate between weather and climate.</td>
</tr>
<tr>
<td>SC.6.E.7.7:</td>
<td>Investigate how natural disasters have affected human life in Florida.</td>
</tr>
<tr>
<td>SC.6.E.7.8:</td>
<td>Describe ways human beings protect themselves from hazardous weather and sun exposure.</td>
</tr>
<tr>
<td>SC.6.E.7.9:</td>
<td>Describe how the composition and structure of the atmosphere protects life and insulates the planet.</td>
</tr>
<tr>
<td>SC.7.E.6.1:</td>
<td>Describe the layers of the solid Earth, including the lithosphere, the hot convecting mantle, and the dense metallic liquid and solid cores.</td>
</tr>
<tr>
<td>SC.7.E.6.2:</td>
<td>Identify the patterns within the rock cycle and relate them to surface events (weathering and erosion) and sub-surface events (plate tectonics and mountain building).</td>
</tr>
<tr>
<td>SC.7.E.6.3:</td>
<td>Identify current methods for measuring the age of Earth and its parts, including the law of superposition and radioactive dating.</td>
</tr>
<tr>
<td>SC.7.E.6.4:</td>
<td>Explain and give examples of how physical evidence supports scientific theories that Earth has evolved over geologic time due to natural processes.</td>
</tr>
<tr>
<td>SC.7.E.6.5:</td>
<td>Explore the scientific theory of plate tectonics by describing how the movement of Earth's crustal plates causes both slow and rapid changes in Earth's surface, including volcanic eruptions, earthquakes, and mountain building.</td>
</tr>
<tr>
<td>SC.7.E.6.6:</td>
<td>Identify the impact that humans have had on Earth, such as deforestation, urbanization, desertification, erosion, air and water quality, changing the flow of water.</td>
</tr>
<tr>
<td>SC.7.E.6.7:</td>
<td>Recognize that heat flow and movement of material within Earth causes earthquakes and volcanic eruptions, and creates mountains and ocean basins.</td>
</tr>
<tr>
<td>SC.7.N.1.1:</td>
<td>Define a problem from the seventh grade curriculum, use appropriate reference materials to support scientific understanding, plan and carry out scientific investigation of various types, such as systematic observations or experiments, identify variables, collect and organize data, interpret data in charts, tables, and graphics, analyze information, make predictions, and defend conclusions.</td>
</tr>
<tr>
<td>SC.7.N.1.2:</td>
<td>Differentiate replication (by others) from repetition (multiple trials).</td>
</tr>
<tr>
<td>SC.7.N.1.3:</td>
<td>Distinguish between an experiment (which must involve the identification and control of variables) and other forms of scientific investigation and explain that not all scientific knowledge is derived from experimentation.</td>
</tr>
<tr>
<td>SC.7.N.1.4:</td>
<td>Identify test variables (independent variables) and outcome variables (dependent variables) in an experiment.</td>
</tr>
<tr>
<td>SC.7.N.1.5:</td>
<td>Describe the methods used in the pursuit of a scientific explanation as seen in different fields of science such as biology, geology, and physics.</td>
</tr>
<tr>
<td>SC.7.N.1.6:</td>
<td>Explain that empirical evidence is the cumulative body of observations of a natural phenomenon on which scientific explanations are based.</td>
</tr>
<tr>
<td>SC.7.N.1.7:</td>
<td>Explain that scientific knowledge is the result of a great deal of debate and confirmation within the science community.</td>
</tr>
<tr>
<td>SC.7.N.2.1:</td>
<td>Identify an instance from the history of science in which scientific knowledge has changed when new evidence or new interpretations are encountered.</td>
</tr>
<tr>
<td>SC.7.N.3.1:</td>
<td>Recognize and explain the difference between theories and laws and give several examples of scientific theories and the evidence that supports them.</td>
</tr>
<tr>
<td>SC.7.N.3.2:</td>
<td>Identify the benefits and limitations of the use of scientific models.</td>
</tr>
<tr>
<td>SC.8.E.5.1:</td>
<td>Recognize that there are enormous distances between objects in space and apply our knowledge of light and space travel to understand this distance.</td>
</tr>
<tr>
<td>SC.8.E.5.2:</td>
<td>Recognize that the universe contains many billions of galaxies and that each galaxy contains many billions of stars.</td>
</tr>
<tr>
<td>SC.8.E.5.3:</td>
<td>Distinguish the hierarchical relationships between planets and other astronomical bodies relative to solar system, galaxy, and universe, including distance, size, and composition.</td>
</tr>
<tr>
<td>SC.8.E.5.4:</td>
<td>Explore the Law of Universal Gravitation by explaining the role that gravity plays in the formation of planets, stars, and solar systems and in determining their motions.</td>
</tr>
<tr>
<td>SC.8.E.5.5:</td>
<td>Describe and classify specific physical properties of stars: apparent magnitude (brightness), temperature (color), size, and luminosity (absolute brightness).</td>
</tr>
<tr>
<td>SC.8.E.5.6:</td>
<td>Create models of solar properties including: rotation, structure of the Sun, convection, sunspots, solar flares, and prominences.</td>
</tr>
<tr>
<td>SC.8.E.5.7:</td>
<td>Compare and contrast the properties of objects in the Solar System including the Sun, planets, and moons to those of Earth, such as gravitational force, distance from the Sun, speed, movement, temperature, and atmospheric conditions.</td>
</tr>
<tr>
<td>SC.8.E.5.8:</td>
<td>Compare various historical models of the Solar System, including geocentric and heliocentric.</td>
</tr>
</tbody>
</table>

Explain the impact of objects in space on each other including:
Differentiate and describe the various interactions among Earth.

Identify and compare characteristics of the electromagnetic spectrum such as wavelength, frequency, use, and hazards and recognize its application to an understanding of planetary images and satellite photographs.

Summarize the effects of space exploration on the economy and culture of Florida.

Define a problem from the eighth grade curriculum using appropriate reference materials to support scientific understanding, plan and carry out scientific investigations of various types, such as systematic observations or experiments, identify variables, collect and organize data, interpret data in charts, tables, and graphics, analyze information, make predictions, and defend conclusions.

Design and conduct a study using repeated trials and replication.

Use phrases such as “results support” or “fail to support” in science, understanding that science does not offer conclusive ‘proof’ of a knowledge claim.

Explain how hypotheses are valuable if they lead to further investigations, even if they turn out not to be supported by the data.

Analyze the methods used to develop a scientific explanation as seen in different fields of science.

Distinguish between scientific and pseudoscientific ideas.

Select models useful in relating the results of their own investigations.

Explain why theories may be modified but are rarely discarded.

Describe and differentiate the layers of Earth and the interactions among them.

Analyze the scientific theory of plate tectonics and identify related major processes and features as a result of moving plates.

Differentiate and describe the various interactions among Earth systems, including: atmosphere, hydrosphere, cryosphere, geosphere, and biosphere.

Predict future weather conditions based on present observations and conceptual models and recognize limitations and uncertainties of such predictions.

Relate the formation of severe weather to the various physical factors.

Explain the physical properties of the Sun and its dynamic nature and connect them to conditions and events on Earth.

Develop students’ ability to analyze and problem solve.

Recognize students’ effort when solving challenging problems.

Clarifications:
Teachers who encourage students to participate actively in effortful learning both individually and with others:
- Cultivate a community of growth mindset learners.
- Foster perseverance in students by choosing tasks that are challenging.
- Help and support each other when attempting a new method or approach.

Clarifications:
Teachers who encourage students to demonstrate understanding by representing problems in multiple ways:
- Build understanding through modeling and using manipulatives.
- Represent solutions to problems in multiple ways using objects, drawings, tables, graphs, and equations.
- Progress from modeling problems with objects and drawings to using algorithms and equations.
- Express connections between concepts and representations.
- Choose a representation based on the given context or purpose.

Clarifications:
Teachers who encourage students to complete tasks with mathematical fluency:
- Provide students with the flexibility to solve problems by selecting a procedure that allows them to solve efficiently and accurately.
- Offer multiple opportunities for students to practice efficient and generalizable methods.

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Clarifications:
Teachers who encourage students to complete tasks with mathematical fluency:
- Provide students with the flexibility to solve problems by selecting a procedure that allows them to solve efficiently and accurately.
- Offer multiple opportunities for students to practice efficient and generalizable methods.
Engage in discussions that reflect on the mathematical thinking of self and others.
Mathematicians who engage in discussions that reflect on the mathematical thinking of self and others:
- Communicate mathematical ideas, vocabulary and methods effectively.
- Analyze the mathematical thinking of others.
- Compare the efficiency of a method to those expressed by others.
- Recognize errors and suggest how to correctly solve the task.
- Justify results by explaining methods and processes.
- Construct possible arguments based on evidence.

Clarifications:
Teachers who encourage students to engage in discussions that reflect on the mathematical thinking of self and others:
- Establish a culture in which students ask questions of the teacher and their peers, and error is an opportunity for learning.
- Create opportunities for students to discuss their thinking with peers.
- Select, sequence and present student work to advance and deepen understanding of correct and increasingly efficient methods.
- Develop students’ ability to justify methods and compare their responses to the responses of their peers.

Use patterns and structure to help understand and connect mathematical concepts. 
Mathematicians who use patterns and structure to help understand and connect mathematical concepts:
- Focus on relevant details within a problem.
- Create plans and procedures to logically order events, steps or ideas to solve problems.
- Decompose a complex problem into manageable parts.
- Relate previously learned concepts to new concepts.
- Look for similarities among problems.
- Connect solutions of problems to more complicated large-scale situations.

Clarifications:
Teachers who encourage students to use patterns and structure to help understand and connect mathematical concepts:
- Help students recognize the patterns in the world around them and connect these patterns to mathematical concepts.
- Support students to develop generalizations based on the similarities found among problems.
- Provide opportunities for students to create plans and procedures to solve problems.
- Develop students’ ability to construct relationships between their current understanding and more sophisticated ways of thinking.

Assess the reasonableness of solutions. 
Mathematicians who assess the reasonableness of solutions:
- Estimate to discover possible solutions.
- Use benchmark quantities to determine if a solution makes sense.
- Check calculations when solving problems.
- Verify possible solutions by explaining the methods used.
- Evaluate results based on the given context.

Clarifications:
Teachers who encourage students to assess the reasonableness of solutions:
- Have students estimate or predict solutions prior to solving.
- Prompt students to continually ask, “Does this solution make sense? How do you know?”
- Reinforce that students check their work as they progress within and after a task.
- Strengthen students’ ability to verify solutions through justifications.

Apply mathematics to real-world contexts. 
Mathematicians who apply mathematics to real-world contexts:
- Connect mathematical concepts to everyday experiences.
- Use models and methods to understand, represent and solve problems.
- Perform investigations to gather data or determine if a method is appropriate. • Redesign models and methods to improve accuracy or efficiency.

Clarifications:
Teachers who encourage students to apply mathematics to real-world contexts:
- Provide opportunities for students to create models, both concrete and abstract, and perform investigations.
- Challenge students to question the accuracy of their models and methods.
- Support students as they validate conclusions by comparing them to the given situation.
- Indicate how various concepts can be applied to other disciplines.

Cite evidence to explain and justify reasoning.

Clarifications:
K-1 Students include textual evidence in their oral communication with guidance and support from adults. The evidence can consist of details from the text without naming the text. During 1st grade, students learn how to incorporate the evidence in their writing.
2-3 Students include relevant textual evidence in their written and oral communication. Students should name the text when they refer to it. In 3rd grade, students should use a combination of direct and indirect citations.
4-5 Students continue with previous skills and reference comments made by speakers and peers. Students cite texts that they’ve directly quoted, paraphrased, or used for information. When writing, students will use the form of citation dictated by the instructor or the style guide referenced by the instructor.
6-8 Students continue with previous skills and use a style guide to create a proper citation.
9-12 Students continue with previous skills and should be aware of existing style guides and the ways in which they differ.
### ELA.K12.EE.2.1:
**Read and comprehend grade-level complex texts proficiently.**

**Clarifications:**
See Text Complexity for grade-level complexity bands and a text complexity rubric.

### ELA.K12.EE.3.1:
**Make inferences to support comprehension.**

**Clarifications:**
Students will make inferences before the words infer or inference are introduced. Kindergarten students will answer questions like "Why is the girl smiling?" or make predictions about what will happen based on the title page. Students will use the terms and apply them in 2nd grade and beyond.

### ELA.K12.EE.4.1:
**Use appropriate collaborative techniques and active listening skills when engaging in discussions in a variety of situations.**

**Clarifications:**
In kindergarten, students learn to listen to one another respectfully. In grades 1-2, students build upon these skills by justifying what they are thinking. For example: "I think ______ because _______." The collaborative conversations are becoming academic conversations.

In grades 3-12, students engage in academic conversations discussing claims and justifying their reasoning, refining and applying skills. Students build on ideas, propel the conversation, and support claims and counterclaims with evidence.

### ELA.K12.EE.4.1:
**Use the accepted rules governing a specific format to create quality work.**

**Clarifications:**
Students will incorporate skills learned into work products to produce quality work. For students to incorporate these skills appropriately, they must receive instruction. A 3rd grade student creating a poster board display must have instruction in how to effectively present information to do quality work.

### ELA.K12.EE.6.1:
**Use appropriate voice and tone when speaking or writing.**

**Clarifications:**
In kindergarten and 1st grade, students learn the difference between formal and informal language. For example, the way we talk to our friends differs from the way we speak to adults. In 2nd grade and beyond, students practice appropriate social and academic language to discuss texts.

### ELD.K12.ELL.SC.1:
**English language learners communicate information, ideas and concepts necessary for academic success in the content area of Science.**

### ELD.K12.ELL.SI.1:
**English language learners communicate for social and instructional purposes within the school setting.**

### HE.6.C.1.3:
**Identify environmental factors that affect personal health.**

**Clarifications:**
Air and water quality, availability of sidewalks, contaminated food, and road hazards.

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### General Course Information and Notes

#### GENERAL NOTES

Laboratory investigations that include the use of scientific inquiry, research, measurement, problem solving, laboratory apparatus and technologies, experimental procedures, and safety procedures are an integral part of this course. The National Science Teachers Association (NSTA) recommends that at the middle school level, all students should have multiple opportunities every week to explore science laboratory investigations (labs). School laboratory investigations are defined by the National Research Council (NRC) as an experience in the laboratory, classroom, or the field that provides students with opportunities to interact directly with natural phenomena or with data collected by others using tools, materials, data collection techniques, and models (NRC, 2006, p. 3). Laboratory investigations in the middle school classroom should help all students develop a growing understanding of the complexity and ambiguity of empirical work, as well as the skills to calibrate and troubleshoot equipment used to make observations. Learners should understand measurement error; and have the skills to aggregate, interpret, and present the resulting data (NRC 2006, p. 77; NSTA, 2007).

**Honors and Advanced Level Course Note:** Advanced courses require a greater demand on students through increased academic rigor. Academic rigor is obtained through the application, analysis, evaluation, and creation of complex ideas that are often abstract and multi-faceted. Students are challenged to think and collaborate critically on the content they are learning. Honors level rigor will be achieved by increasing text complexity through text selection, focus on high-level qualitative measures, and complexity of task. Instruction will be structured to give students a deeper understanding of conceptual themes and organization within and across disciplines. Academic rigor is more than simply assigning to students a greater quantity of work.

**Special Notes:**

**Instructional Practices**

Teaching from a range of complex text is optimized when teachers in all subject areas implement the following strategies on a routine basis:

1. Ensuring wide reading from complex text that varies in length.
2. Making close reading and rereading of texts central to lessons.
3. Emphasizing text-specific complex questions, and cognitively complex tasks, reinforce focus on the text and cultivate independence.
4. Emphasizing students supporting answers based upon evidence from the text.
5. Providing extensive research and writing opportunities (claims and evidence).

**Science and Engineering Practices (NRC Framework for K-12 Science Education, 2010)**

- Asking questions (for science) and defining problems (for engineering).
- Developing and using models.
- Planning and carrying out investigations.
- Analyzing and interpreting data.
- Using mathematics, information and computer technology, and computational thinking.
- Constructing explanations (for science) and designing solutions (for engineering).
Education Certifications
Science (Secondary Grades 7-12)
Middle Grades Integrated Curriculum (Middle Grades 5-9)
Earth/Space Science (Grades 6-12)
Middle Grades General Science (Middle Grades 5-9)
Chemistry (Grades 6-12)
Physics (Grades 6-12)

Florida's Benchmarks for Excellent Student Thinking (B.E.S.T.) Standards
This course includes Florida’s B.E.S.T. ELA Expectations (EE) and Mathematical Thinking and Reasoning Standards (MTRs) for students. Florida educators should intentionally embed these standards within the content and their instruction as applicable. For guidance on the implementation of the EEs and MTRs, please visit https://www.cpalms.org/Standards/BEST_Standards.aspx and select the appropriate B.E.S.T. Standards package.

English Language Development ELD Standards Special Notes Section:
Teachers are required to provide listening, speaking, reading and writing instruction that allows English language learners (ELL) to communicate information, ideas and concepts for academic success in the content area of Science. For the given level of English language proficiency and with visual, graphic, or interactive support, students will interact with grade level words, expressions, sentences and discourse to process or produce language necessary for academic success. The ELD standard should specify a relevant content area concept or topic of study chosen by curriculum developers and teachers which maximizes an ELL’s need for communication and social skills. To access an ELL supporting document which delineates performance definitions and descriptors, please click on the following link: https://cpalmsmediaprod.blob.core.windows.net/uploads/docs/standards/eld/sc.pdf

Additional Instructional Resources:
A.V.E. for Success Collection is provided by the Florida Association of School Administrators: http://www.fasa.net/4DCGI/cms-review.html?Action=CMS_Document&DocID=139. Please be aware that these resources have not been reviewed by CPALMS and there may be a charge for the use of some of them in this collection.

**GENERAL INFORMATION**

**Course Number:** 2001020

**Course Path:** Grades PreK to 12 Education
Courses > Grade Group: Grades 6 to 8 Education
Courses > Subject: Science > SubSubject: Earth/Space Sciences

**Abbreviated Title:** M/J EARTH/SPA SCI ADV

**Course Length:** Year (Y)

**Course Attributes:**
- Class Size Core Required

**Course Level:** 3

**Course Status:** State Board Approved

**Grade Level(s):** 6,7,8

**Educator Certifications**

- Science (Secondary Grades 7-12)
- Middle Grades Integrated Curriculum (Middle Grades 5-9)
- Earth/Space Science (Grades 6-12)
- Middle Grades General Science (Middle Grades 5-9)
- Chemistry (Grades 6-12)
- Physics (Grades 6-12)
Explain that scientific knowledge is durable because it is open to change as new evidence or interpretations are encountered.

Explain why scientific investigations should be replicable.

Distinguish between scientific and pseudoscientific ideas.

Assess how technology is essential to science for such purposes as measuring distance, size, and composition.

Describe how the composition and structure of the atmosphere protects life and insulates the planet.

Summarize the effects of space exploration on the economy and culture of Florida.

Identify an instance from the history of science in which scientific knowledge has changed when new evidence or new interpretations are encountered.

Distinguish science from other activities involving thought.

Recognize and explain that a scientific theory is a well-supported and widely accepted explanation of nature that is not simply a claim posed by an individual. Thus, the use of the term theory in science is very different than how it is used in everyday life.

Explain that empirical evidence is the cumulative body of observations and relevant empirical evidence, the use of logical reasoning, and the application of scientific knowledge has changed when new evidence or new interpretations are encountered.

Identify and compare characteristics of the electromagnetic spectrum including the Sun, planets, and moons to those of Earth, such as gravitational force, distance from the Sun, speed, movement, temperature, and atmospheric conditions.

Compare various historical models of the Solar System, including geocentric and heliocentric.

Compare and contrast the properties of objects in the Solar System including the Sun, planets, and moons to those of Earth, such as gravitational force, distance from the Sun, speed, movement, temperature, and atmospheric conditions.

Explore the Law of Universal Gravitation by explaining the role that gravity plays in the formation of planets, stars, and solar systems and in determining their motions.

Distinguish the hierarchical relationships between planets and other astronomical bodies relative to the solar system, galaxy, and universe, including distance, size, and composition.

Create models of solar properties including rotation, structure of the Sun, convection, sunspots, solar flares, and prominences.

Recognize that the universe contains many billions of galaxies and that each galaxy contains many billions of stars.

Recognize that there are enormous distances between objects in space and apply our knowledge of light and space travel to understand this distance.

Recognize the role of models in the context of the sixth grade science benchmarks.

Select models useful in relating the results of their own investigations.

Differentiate replication (by others) from repetition (multiple trials).

Discuss, compare, and negotiate methods used, results obtained, and explanations among groups of students conducting the same investigation.

Discuss what characterizes science and its methods.

Explain the difference between an experiment and other types of investigation.

Understand that scientific investigations involve the collection of relevant empirical evidence, the use of logical reasoning, and the application of imagination in devising hypotheses, predictions, explanations and models to make sense of the collected evidence.

Distinguish between scientific and pseudoscientific ideas.

Discuss what characterizes science and its methods.

Select models useful in relating the results of their own investigations.
Explain why theories may be modified but are rarely discarded.

Describe qualitatively the functional relationship between two quantities by analyzing a graph (e.g., where the function is increasing or decreasing, or use a function to describe how one quantity relates to another).

Understand that science is one of the processes that can be used to inform decision making at the community, state, national, and international levels.

Know that straight lines are widely used to model relationships between two quantitative variables. For scatter plots that suggest a linear association, informally fit a straight line, and informally assess the model fit by judging the closeness of the data points to the line.

Recognize a statistical question as one that anticipates variability in the data related to the question and accounts for it in the answers. For example, “How old am I?” is not a statistical question, but “How old are the students in my school?” is a statistical question because one anticipates variability in students’ ages.

Understand that a set of data collected to answer a statistical question has a distribution which can be described by its center, spread, and overall shape.

Recognize that a measure of center for a numerical data set summarizes all of its values with a single number, while a measure of variation describes how its values vary with a single number.

Display numerical data in plots on a number line, including dot plots, histograms, and box plots.

Summarize numerical data sets in relation to their context, such as by:
   a. Reporting the number of observations.
   b. Describing the nature of the attribute under investigation, including how it was measured and its units of measurement.
   c. Giving quantitative measures of center (median and/or mean) and variability (interquartile range and/or mean absolute deviation), as well as describing any overall pattern and any striking deviations from the overall pattern with reference to the context in which the data were gathered.
   d. Relating the choice of measures of center and variability to the shape of the data distribution and the context in which the data were gathered.

Understand that statistics can be used to gain information about a population by examining a sample of the population; generalizations about a population from a sample are valid only if the sample is representative of that population. Understand that random sampling tends to produce representative samples and support valid inferences.

Describe qualitatively the functional relationship between two quantities by analyzing a graph (e.g., where the function is increasing or decreasing, linear or nonlinear). Sketch a graph that exhibits the qualitative features of a function that has been described verbally.

Know that straight lines are widely used to model relationships between two quantitative variables. For scatter plots that suggest a linear association, informally fit a straight line, and informally assess the model fit by judging the closeness of the data points to the line.

Make sense of problems and persevere in solving them.

Mathematically proficient students start by explaining to themselves the meaning of a problem and looking for entry points to its solution. They analyze given conditions, constraints, relationships, and goals. They make conjectures about the form and meaning of the solution and plan a solution pathway rather than simply jumping into a solution attempt. They consider analogous problems, and try special cases and simpler forms of the original problem in order to gain insight into its solution. They monitor and evaluate their progress and change course if necessary. Older students might, depending on the context of the problem, transform algebraic expressions or change the viewing window on their graphing calculator to get the information they need. Mathematically proficient students can explain correspondences between equations, verbal descriptions, tables, and graphs or draw diagrams of important features and relationships, graph data, and search for regularity or trends. Younger students might rely on using concrete objects or pictures to help conceptualize and solve a problem. Mathematically proficient students check their answers to problems using a different method, and they continually ask themselves, “Does this make sense?” They can understand the approaches of others to solving complex problems and identify correspondences between different approaches.

Reason abstractly and quantitatively.

Mathematically proficient students make sense of quantities and their relationships in problem situations. They bring two complementary abilities to bear on problems involving quantitative relationships: the ability to decontextualize—to abstract a given situation and represent it symbolically and manipulate the representing symbols as if they have a life of their own, without necessarily attending to their referents—and the ability to contextualize, to pause as needed during the manipulation process in order to probe into the referents for the symbols involved. Quantitative reasoning entails habits of creating a coherent representation of the problem at hand; considering the units involved; attending to the meaning of quantities, not just how to compute them; and knowing and flexibly using different properties of operations and objects.

Construct viable arguments and critique the reasoning of others.

Mathematically proficient students understand and use stated assumptions, definitions, and previously established results in constructing arguments. They make conjectures and build a logical progression of statements to explore the truth of their conjectures. They are able to analyze situations by breaking them into cases, and can recognize and use counterexamples. They justify their conclusions, communicate them to others, and respond to the arguments of others. They reason inductively about data, making plausible arguments that take into account the context from which the data arose. Mathematically proficient students are also able to compare the effectiveness of two plausible arguments, distinguish correct logic or reasoning from that which is flawed, and—if there is a flaw in an argument—explain what it is. Elementary students can construct arguments using concrete referents such as objects, drawings, diagrams, and actions. Such arguments can make sense and be correct, even though they are not generalized or made formal until later grades. Later, students learn to determine domains to which an argument applies. Students at all grades can listen or read the arguments of others, decide whether they make sense, and ask useful questions to clarify or improve the arguments.

Model with mathematics.

Mathematically proficient students can apply the mathematics they know to solve problems arising in everyday life, society, and the workplace. In early grades, this might be as simple as writing an addition equation to describe a situation. In middle grades, a student might apply proportional reasoning to plan a school event or analyze a problem in the community. By high school, a student might use geometry to solve a design problem or use a function to describe how one quantity of interest depends on another. Mathematically proficient students who can apply what they know are comfortable making assumptions and approximations to simplify a complicated situation, realizing that these may need revision later. They are able to identify important quantities in a practical situation and map their relationships using such tools as diagrams, two-way tables, graphs, flowcharts and formulas. They can analyze those relationships mathematically to draw conclusions. They routinely interpret their mathematical results in the context of the situation and reflect on whether the results make sense, possibly improving the model if it has not served its purpose.

Use appropriate tools strategically.

Mathematically proficient students consider the available tools when solving a mathematical problem. These tools might include pencil and paper,
No natural text can be generated from this image.
Write routinely over extended time frames (time for reflection and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences.

English language learners communicate information, ideas and concepts necessary for academic success in the content area of Science.

General Course Information and Notes

General Information

If this course is to be used in a STEM sequence in place of either the comprehensive or subject specific course sequences, teachers should refer to the test item specifications for the 8th grade SSA for information on tested standards which can be found at: https://www.fldoe.org/core/fileparse.php/5663/urlt/swsatisG8.pdf.

This course is an integrated Science, Technology, Engineering and Mathematics (STEM) course for middle school students. M/J STEM Physical Science includes an integration of standards from science, mathematics, and English/language arts (ELA) through the application to STEM problem solving using physical science knowledge and science and engineering practices. Physical sciences through applications such as aeronautics, robotics, rocketry, mechanical, electrical, and civil engineering, are emphasized in this course. Laboratory investigations that include the use of scientific inquiry, research, measurement, problem solving, laboratory apparatus and technologies, experimental procedures, and safety procedures are an integral part of this course. The National Science Teachers Association (NSTA) recommends that at the middle school level, all students should have multiple opportunities every week to explore science laboratory investigations (labs). School laboratory investigations are defined by the National Research Council (NRC) as an experience in the laboratory, classroom, or the field that provides students with opportunities to interact directly with natural phenomena or with data collected by other using tools, materials, data collection techniques, and models (NRC, 2006, p. 3). Laboratory investigations in the middle school classroom should help all students develop a growing understanding of the complexity and ambiguity of empirical work, as well as the skills to calibrate and troubleshoot equipment used to make observations. Learners should understand measurement error; and have the skills to aggregate, interpret, and present the resulting data (NRC, 2006, p. 77; NSTA, 2007).

Special Notes:

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1. Ensuring wide reading from complex text that varies in length.
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4. Emphasizing students supporting answers based upon evidence from the text.
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- Asking questions (for science) and defining problems (for engineering).
- Developing and using models.
- Planning and carrying out investigations.
- Analyzing and interpreting data.
- Using mathematics, information and computer technology, and computational thinking.
- Constructing explanations (for science) and designing solutions (for engineering).
- Engaging in argument from evidence.
- Obtaining, evaluating, and communicating information.

ISTE Standards (http://www.iste.org/docs/pdfs20-14_ISTE_Standards-S_PDF.pdf) should be incorporated in many contexts throughout the course.

Course Standards

Use grade appropriate Nature of Science and Mathematics Content (MAFS) benchmarks (i.e., if this course is offered to seventh grade students, then the SC.7.N benchmarks should be integrated into the course content, and SC.6.N and SC.8.N benchmarks should be omitted from the seventh grade course).

Literacy Standards in Science

Secondary science courses include reading standards for literacy in science and technical subjects 6-12 and writing standards for literacy in history/social studies, science, and technical subjects 6-12. The courses also include speaking and listening standards. For a complete list of standards required for this course click on the blue tile labeled course standards. You may also download the complete course including all required standards and notes sections using the export function located at the top of this page.

English Language Development ELD Standards Special Notes Section:

Teachers are required to provide listening, speaking, reading and writing instruction that allows English language learners (ELL) to communicate information, ideas and concepts for academic success in the content area of Science. For the given level of English language proficiency and with visual, graphic, or interactive support, students will interact with grade level words, expressions, sentences and discourse to produce or produce language necessary for academic success The ELD standard should specify a relevant content area concept or topic of study chosen by curriculum developers and teachers which maximizes an ELL's need for communication and social skills. To access an ELL supporting document which delineates performance definitions and descriptors, please click on the following link: https://cpalmsmediaprod.blob.core.windows.net/uploads/docs/standards/eld/sc.pdf.

Additional Instructional Resources:


General Information
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<td>(Grades 6-12)</td>
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<tr>
<td>Middle Grades Integrated Curriculum (Middle Grades 5-9)</td>
<td>(Middle Grades 5-9)</td>
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<tr>
<td>Middle Grades General Science (Middle Grades 5-9)</td>
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### Course Standards

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<td>SC.6.E.7.9:</td>
<td>Describe how the composition and structure of the atmosphere protects life and insulates the planet.</td>
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<td>SC.6.N.1.2:</td>
<td>Explain why scientific investigations should be replicable.</td>
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<tr>
<td>SC.6.N.1.3:</td>
<td>Explain the difference between an experiment and other types of scientific investigation, and explain the relative benefits and limitations of each.</td>
</tr>
<tr>
<td>SC.6.N.1.4:</td>
<td>Discuss, compare, and negotiate methods used, results obtained, and explanations among groups of students conducting the same investigation.</td>
</tr>
<tr>
<td>SC.6.N.1.5:</td>
<td>Recognize that science involves creativity, not just in designing experiments, but also in creating explanations that fit evidence.</td>
</tr>
<tr>
<td>SC.6.N.2.1:</td>
<td>Distinguish science from other activities involving thought.</td>
</tr>
<tr>
<td>SC.6.N.2.2:</td>
<td>Explain that scientific knowledge is durable because it is open to change as new evidence or interpretations are encountered.</td>
</tr>
<tr>
<td>SC.6.N.2.3:</td>
<td>Recognize that scientists who make contributions to scientific knowledge come from all kinds of backgrounds and possess varied talents, interests, and goals.</td>
</tr>
<tr>
<td>SC.6.N.3.1:</td>
<td>Recognize and explain that a scientific theory is a well-supported and widely accepted explanation of nature and is not simply a claim posed by an individual. Thus, the use of the term theory in science is very different than how it is used in everyday life.</td>
</tr>
<tr>
<td>SC.6.N.3.2:</td>
<td>Recognize and explain that a scientific law is a description of a specific relationship under given conditions in the natural world. Thus, scientific laws are different from societal laws.</td>
</tr>
<tr>
<td>SC.6.N.3.3:</td>
<td>Give several examples of scientific laws.</td>
</tr>
<tr>
<td>SC.6.N.3.4:</td>
<td>Identify the role of models in the context of the sixth grade science benchmarks.</td>
</tr>
<tr>
<td>SC.7.N.1.2:</td>
<td>Differentiate replication (by others) from repetition (multiple trials).</td>
</tr>
<tr>
<td>SC.7.N.1.3:</td>
<td>Distinguish between an experiment (which must involve the identification and control of variables) and other forms of scientific investigation and explain that not all scientific knowledge is derived from experimentation.</td>
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<td>SC.7.N.1.4:</td>
<td>Identify test variables (independent variables) and outcome variables (dependent variables) in an experiment.</td>
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<td>SC.7.N.1.5:</td>
<td>Describe the methods used in the pursuit of a scientific explanation as seen in different fields of science such as biology, geology, and physics.</td>
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<td>SC.7.N.1.6:</td>
<td>Explain that empirical evidence is the cumulative body of observations of a natural phenomenon on which scientific explanations are based.</td>
</tr>
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<td>SC.7.N.1.7:</td>
<td>Explain that scientific knowledge is the result of a great deal of debate and confirmation within the science community.</td>
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<td>SC.7.N.2.1:</td>
<td>Identify an instance from the history of science in which scientific knowledge has changed when new evidence or new interpretations are encountered.</td>
</tr>
<tr>
<td>SC.7.N.3.1:</td>
<td>Recognize and explain the difference between theories and laws and give several examples of scientific theories and the evidence that supports them.</td>
</tr>
<tr>
<td>SC.7.N.3.2:</td>
<td>Identify the benefits and limitations of the use of scientific models.</td>
</tr>
<tr>
<td>SC.8.E.5.1:</td>
<td>Recognize that the universe contains many billions of galaxies and that each galaxy contains many billions of stars.</td>
</tr>
<tr>
<td>SC.8.E.5.2:</td>
<td>Distinguish the hierarchical relationships between planets and other astronomical bodies relative to solar system, galaxy, and universe, including distance, size, and composition.</td>
</tr>
<tr>
<td>SC.8.E.5.3:</td>
<td>Explore the Law of Universal Gravitation by explaining the role that gravity plays in the formation of planets, stars, and solar systems and in determining their motions.</td>
</tr>
<tr>
<td>SC.8.E.5.4:</td>
<td>Describe and classify specific physical properties of stars: apparent magnitude (brightness), temperature (color), size, and luminosity (absolute brightness).</td>
</tr>
<tr>
<td>SC.8.E.5.5:</td>
<td>Create models of solar properties including: rotation, structure of the Sun, convection, sunspots, solar flares, and prominences.</td>
</tr>
<tr>
<td>SC.8.E.5.6:</td>
<td>Compare and contrast the properties of objects in the Solar System including the Sun, planets, and moons to those of Earth, such as gravitational force, distance from the Sun, speed, movement, temperature, and atmospheric conditions.</td>
</tr>
<tr>
<td>SC.8.E.5.7:</td>
<td>Compare various historical models of the Solar System, including geocentric and heliocentric.</td>
</tr>
<tr>
<td>SC.8.E.5.8:</td>
<td>Explain the impact of objects in space on each other including: 1. the Sun on the Earth including seasons and gravitational attraction 2. the Moon on the Earth, including phases, tides, and eclipses, and the relative position of each body.</td>
</tr>
<tr>
<td>SC.8.E.5.9:</td>
<td>Assess how technology is essential to science for such purposes as access to outer space and other remote locations, sample collection, measurement, data collection and storage, computation, and communication of information.</td>
</tr>
<tr>
<td>SC.8.E.5.10:</td>
<td>Identify and compare characteristics of the electromagnetic spectrum such as wavelength, frequency, use, and hazards and recognize its application to an understanding of planetary images and satellite photographs.</td>
</tr>
<tr>
<td>SC.8.E.5.11:</td>
<td>Summarize the effects of space exploration on the economy and culture of Florida.</td>
</tr>
<tr>
<td>SC.8.E.5.12:</td>
<td>Design and conduct a study using repeated trials and replication.</td>
</tr>
<tr>
<td>SC.8.E.5.13:</td>
<td>Use phrases such as “results support” or “fail to support” in science, understanding that science does not offer conclusive “proof” of a knowledge claim.</td>
</tr>
<tr>
<td>SC.8.E.5.14:</td>
<td>Explain how hypotheses are valuable if they lead to further investigations, even if they turn out not to be supported by the data.</td>
</tr>
<tr>
<td>SC.8.E.5.15:</td>
<td>Analyze the methods used to develop a scientific explanation as seen in different fields of science.</td>
</tr>
<tr>
<td>SC.8.E.5.16:</td>
<td>Understand that scientific investigations involve the collection of relevant empirical evidence, the use of logical reasoning, and the application of imagination in devising hypotheses, predictions, explanations and models to make sense of the collected evidence.</td>
</tr>
<tr>
<td>SC.8.N.1.2:</td>
<td>Distinguish between scientific and pseudoscientific ideas.</td>
</tr>
<tr>
<td>SC.8.N.2.2:</td>
<td>Discuss what characterizes science and its methods.</td>
</tr>
<tr>
<td>SC.8.N.3.1:</td>
<td>Select models useful in relating the results of their own investigations.</td>
</tr>
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</table>
Explain why theories may be modified but are rarely discarded.

Explain that science is one of the processes that can be used to inform decision making at the community, state, national, and international levels.

Explain how political, social, and economic concerns can affect science, and vice versa.

Mathematicians who participate in effortful learning both individually and with others:
- Analyze the problem in a way that makes sense given the task.
- Ask questions that will help with solving the task.
- Build perseverance by modifying methods as needed while solving a challenging task.
- Stay engaged and maintain a positive mindset when working to solve tasks.
- Help and support each other when attempting a new method or approach.

**Clarifications:**
Teachers who encourage students to participate actively in effortful learning both individually and with others:
- Cultivate a community of growth mindset learners.
- Foster perseverance in students by choosing tasks that are challenging.
- Develop students' ability to analyze and problem solve.
- Recognize students' effort when solving challenging problems.

Demonstrate understanding by representing problems in multiple ways.
Mathematicians who demonstrate understanding by representing problems in multiple ways:
- Build understanding through modeling and using manipulatives.
- Represent solutions to problems in multiple ways using objects, drawings, tables, graphs and equations.
- Progress from modeling problems with objects and drawings to using algorithms and equations.
- Express connections between concepts and representations.
- Choose a representation based on the given context or purpose.

**Clarifications:**
Teachers who encourage students to demonstrate understanding by representing problems in multiple ways:
- Help students make connections between concepts and representations.
- Provide opportunities for students to use manipulatives when investigating concepts.
- Guide students from concrete to pictorial to abstract representations as understanding progresses.
- Show students that various representations can have different purposes and can be useful in different situations.

Complete tasks with mathematical fluency.
Mathematicians who complete tasks with mathematical fluency:
- Select efficient and appropriate methods for solving problems within the given context.
- Maintain flexibility and accuracy while performing procedures and mental calculations.
- Complete tasks accurately and with confidence.
- Adapt procedures to apply them to a new context.
- Use feedback to improve efficiency when performing calculations.

**Clarifications:**
Teachers who encourage students to complete tasks with mathematical fluency:
- Provide students with the flexibility to solve problems by selecting a procedure that allows them to solve efficiently and accurately.
- Offer multiple opportunities for students to practice efficient and generalizable methods.
- Provide opportunities for students to reflect on the method they used and determine if a more efficient method could have been used.

Engage in discussions that reflect on the mathematical thinking of self and others.
Mathematicians who engage in discussions that reflect on the mathematical thinking of self and others:
- Communicate mathematical ideas, vocabulary and methods effectively.
- Analyze the mathematical thinking of others.
- Compare the efficiency of a method to those expressed by others.
- Recognize errors and suggest how to correctly solve the task.
- Justify results by explaining methods and processes.
- Construct possible arguments based on evidence.

**Clarifications:**
Teachers who encourage students to engage in discussions that reflect on the mathematical thinking of self and others:
- Establish a culture in which students ask questions of the teacher and their peers, and error is an opportunity for learning.
- Create opportunities for students to discuss their thinking with peers.
- Select, sequence and present student work to advance and deepen understanding of correct and increasingly efficient methods.
- Develop students' ability to justify methods and compare their responses to the responses of their peers.

Use patterns and structure to help understand and connect mathematical concepts.
Mathematicians who use patterns and structure to help understand and connect mathematical concepts:
- Focus on relevant details within a problem.
- Create plans and procedures to logically order events, steps or ideas to solve problems.
- Decompose a complex problem into manageable parts.
- Relate previously learned concepts to new concepts.
- Look for similarities among problems.
- Connect solutions of problems to more complicated large-scale situations.

**Clarifications:**
Teachers who encourage students to use patterns and structure to help understand and connect mathematical concepts:
- Help students recognize the patterns in the world around them and connect these patterns to mathematical concepts.
- Support students to develop generalizations based on the similarities found among problems.
• Provide opportunities for students to create plans and procedures to solve problems.
• Develop students’ ability to construct relationships between their current understanding and more sophisticated ways of thinking.

Assess the reasonableness of solutions.
Mathematicians who assess the reasonableness of solutions:
• Estimate to discover possible solutions.
• Use benchmark quantities to determine if a solution makes sense.
• Check calculations when solving problems.
• Verify possible solutions by explaining the methods used.
• Evaluate results based on the given context.

Clarifications:
Teachers who encourage students to assess the reasonableness of solutions:
• Have students estimate or predict solutions prior to solving.
• Prompt students to continually ask, “Does this solution make sense? How do you know?”
• Reinforce that students check their work as they progress within and after a task.
• Strengthen students’ ability to verify solutions through justifications.

Apply mathematics to real-world contexts.
Mathematicians who apply mathematics to real-world contexts:
• Connect mathematical concepts to everyday experiences.
• Use models and methods to understand, represent and solve problems.
• Perform investigations to gather data or determine if a method is appropriate. • Redesign models and methods to improve accuracy or efficiency.

Clarifications:
Teachers who encourage students to apply mathematics to real-world contexts:
• Provide opportunities for students to create models, both concrete and abstract, and perform investigations.
• Challenge students to question the accuracy of their models and methods.
• Support students as they validate conclusions by comparing them to the given situation.
• Indicate how various concepts can be applied to other disciplines.

Cite evidence to explain and justify reasoning.

Clarifications:
K-1 Students include textual evidence in their oral communication with guidance and support from adults. The evidence can consist of details from the text without naming the text. During 1st grade, students learn how to incorporate the evidence in their writing. 2-3 Students include relevant textual evidence in their written and oral communication. Students should name the text when they refer to it. In 3rd grade, students should use a combination of direct and indirect citations.
4-5 Students continue with previous skills and reference comments made by speakers and peers. Students cite texts that they've directly quoted, paraphrased, or used for information. When writing, students will use the form of citation dictated by the instructor or the style guide referenced by the instructor.
6-8 Students continue with previous skills and use a style guide to create a proper citation.
9-12 Students continue with previous skills and should be aware of existing style guides and the ways in which they differ.

Read and comprehend grade-level complex texts proficiently.

Clarifications:
See Text Complexity for grade-level complexity bands and a text complexity rubric.

Make inferences to support comprehension.

Clarifications:
Students will make inferences before the words infer or inference are introduced. Kindergarten students will answer questions like “Why is the girl smiling?” or make predictions about what will happen based on the title page. Students will use the terms and apply them in 2nd grade and beyond.

Use appropriate collaborative techniques and active listening skills when engaging in discussions in a variety of situations.

Clarifications:
In kindergarten, students learn to listen to one another respectfully. In grades 1-2, students build upon these skills by justifying what they are thinking. For example: “I think ______ because ______.” The collaborative conversations are becoming academic conversations.
In grades 3-12, students engage in academic conversations discussing claims and justifying their reasoning, refining and applying skills. Students build on ideas, propel the conversation, and support claims and counterclaims with evidence.

Use the accepted rules governing a specific format to create quality work.

Clarifications:
Students will incorporate skills learned into work products to produce quality work. For students to incorporate these skills appropriately, they must receive instruction. A 3rd grade student creating a poster board display must have instruction in how to effectively present information to do quality work.

Use appropriate voice and tone when speaking or writing.

Clarifications:
In kindergarten and 1st grade, students learn the difference between formal and informal language. For example, the way we talk to our friends differs from the way we speak to adults. In 2nd grade and beyond, students practice appropriate social and academic language to discuss texts.

English language learners communicate information, ideas and concepts necessary for academic success in the content area of Science.
GENERAL NOTES

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Florida's Benchmarks for Excellent Student Thinking (B.E.S.T.) Standards

This course includes Florida’s B.E.S.T. ELA Expectations (EE) and Mathematical Thinking and Reasoning Standards (MTRs) for students. Florida educators should intentionally embed these standards within the content and their instruction as applicable. For guidance on the implementation of the EE and MTRs, please visit https://www.cpalms.org/Standards/BEST_Standards.aspx and select the appropriate B.E.S.T. Standards package.

English Language Development ELD Standards Special Notes Section:

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Additional Instructional Resources:

GENERAL INFORMATION

Course Number: 2001025

Course Path: Section: Grades PreK to 12 Education
Courses > Grade Group: Grades 6 to 8 Education
Courses > Subject: Science > SubSubject:
Earth/Space Sciences >
Abbreviated Title: M/J STEM ASTRO/SPACE
Course Length: Year (Y)
Course Attributes:
## Educator Certifications

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General Course Information and Notes

GENERAL NOTES

The curriculum description for this IB course is provided at:
http://www.ibo.org/en/programmes/

GENERAL INFORMATION

Course Number: 2001030
Course Path: Section: Grades PreK to 12 Education
Courses > Grade Group: Grades 6 to 8 Education
Courses > Subject: Science > SubSubject: Earth/Space Sciences >
Abbreviated Title: M/J IB MYP ERT/SP SC
Course Length: Year (Y)
Course Attributes:
  • International Baccalaureate (IB)
Course Level: 3

Grade Level(s): 6,7,8

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<td>SC.6.E.6.1:</td>
<td>Describe and give examples of ways in which Earth's surface is built up and torn down by physical and chemical weathering, erosion, and deposition.</td>
</tr>
<tr>
<td>SC.6.E.6.2:</td>
<td>Recognize that there are a variety of different landforms on Earth's surface such as coastlines, dunes, rivers, mountains, glaciers, deltas, and lakes and relate these landforms as they apply to Florida.</td>
</tr>
<tr>
<td>SC.6.E.7.1:</td>
<td>Differentiate among radiation, conduction, and convection, the three mechanisms by which heat is transferred through Earth's system.</td>
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<tr>
<td>SC.6.E.7.2:</td>
<td>Investigate and apply how the cycling of water between the atmosphere and hydrosphere has an effect on weather patterns and climate.</td>
</tr>
<tr>
<td>SC.6.E.7.3:</td>
<td>Describe how global patterns such as the jet stream and ocean currents influence local weather in measurable terms such as temperature, air pressure, wind direction and speed, and humidity and precipitation.</td>
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<tr>
<td>SC.6.E.7.4:</td>
<td>Differentiate and show interactions among the geosphere, hydrosphere, cryosphere, atmosphere, and biosphere.</td>
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<td>SC.6.E.7.5:</td>
<td>Explain why scientific investigations should be replicable.</td>
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<td>SC.6.E.7.6:</td>
<td>Explain that scientific knowledge is durable because it is open to change as new evidence or interpretations are encountered.</td>
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<tr>
<td>SC.6.E.7.7:</td>
<td>Explain how energy provided by the sun influences global patterns of atmospheric movement and the temperature differences between air, water, and land.</td>
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<td>SC.6.E.7.8:</td>
<td>Explain how the composition and structure of the atmosphere protects life and insulates the planet.</td>
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<td>SC.6.L.14.1:</td>
<td>Investigate and explain the components of the scientific theory of cells (cell theory): all organisms are composed of cells (single-celled or multi-cellular), all cells come from pre-existing cells, and cells are the basic unit of life.</td>
</tr>
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<td>SC.6.L.14.2:</td>
<td>Investigate and explain how cells of all organisms undergo similar processes to maintain homeostasis, including extracting energy from food, getting rid of waste, and reproducing.</td>
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<td>SC.6.L.14.3:</td>
<td>Describe and identify patterns in the hierarchical organization of organisms from atoms to molecules and cells to tissues to organs to organ systems to organisms.</td>
</tr>
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<td>SC.6.L.14.4:</td>
<td>Compare and contrast the structure and function of major organelles of plant and animal cells, including cell wall, cell membrane, nucleus, cytoplasm, chloroplasts, mitochondria, and vacuoles.</td>
</tr>
<tr>
<td>SC.6.L.14.5:</td>
<td>Identify and investigate the general functions of the major systems of the human body (digestive, respiratory, circulatory, reproductive, excretory, immune, nervous, and musculoskeletal) and describe ways these systems interact with each other to maintain homeostasis.</td>
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<td>SC.6.L.14.6:</td>
<td>Describe how the scientific theory of cells (cell theory): all organisms are composed of cells (single-celled or multi-cellular), all cells come from pre-existing cells, and cells are the basic unit of life.</td>
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<td>SC.6.N.3.2:</td>
<td>Recognize and explain that a scientific law is a description of a specific relationship under given conditions in the natural world. Thus, scientific laws are different from societal laws.</td>
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<tr>
<td>SC.6.N.3.3:</td>
<td>Give several examples of scientific laws.</td>
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<td>SC.6.N.3.4:</td>
<td>Identify the role of models in the context of the sixth grade science benchmarks.</td>
</tr>
<tr>
<td>SC.6.P.11.1:</td>
<td>Explore the Law of Conservation of Energy by differentiating between potential and kinetic energy. Identify situations where kinetic energy is transformed into potential energy and vice versa.</td>
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<td>SC.6.P.12.1:</td>
<td>Measure and graph distance versus time for an object moving at a constant speed. Interpret this relationship.</td>
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<td>Explore the Law of Gravity by recognizing that every object exerts gravitational force on every other object and that the force depends on how much mass the objects have and how far apart they are.</td>
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<td>SC.6.P.13.2:</td>
<td>Investigate and describe that an unbalanced force acting on an object changes its speed, or direction of motion, or both.</td>
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<td>SC.6.P.13.3:</td>
<td>Investigate effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grade 6 topics, texts, and issues, building on others' ideas and expressing their own clearly.</td>
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<td>a. Come to discussions prepared, having read or studied required material; explicitly draw on that preparation by referring to evidence on the topic, text, or issue to probe and reflect on ideas under discussion.</td>
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<td>b. Follow rules for collegial discussions, set specific goals and deadlines, and define individual roles as needed.</td>
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<td>d. Review the key ideas expressed and demonstrate understanding of multiple perspectives through reflection and paraphrasing.</td>
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<td>SC.6.SL.1.1:</td>
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Delineate a speaker's argument and specific claims, distinguishing claims that are supported by reasons and evidence from claims that are not.

Conduct short research projects to answer a question (including a self-generated question), drawing on several sources and generating additional focused, relevant, accurate data and evidence that demonstrate an understanding of the topic or text, using credible sources.

Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.

Include multimedia components (e.g., graphics, images, music, sound) and visual displays in presentations to clarify information.

Cite specific textual evidence to support analysis of science and technical texts.

Determine the central ideas or conclusions of a text; provide an accurate summary of the text distinct from prior knowledge or opinions.

Follow a précis of a multistep procedure when carrying out experiments, taking measurements, or performing technical tasks.

Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 6–8 texts and topics.

Analyze the structure an author uses to organize a text, including how the major sections contribute to the whole and to an understanding of the topic.

Analyze the author's purpose in providing an explanation, describing a procedure, or discussing an experiment in a text.

Integrate quantitative or technical information expressed in words in a text with a version of that information expressed visually (e.g., in a flowchart, diagram, model, graph, or table).

Distinguish among facts, reasoned judgment based on research findings, and speculation in a text.

Compare and contrast the information gained from experiments, simulations, video, or multimedia sources with that gained from reading a text on the same topic.

Write arguments focused on discipline-specific content.

- Introduce claim(s) about a topic or issue, acknowledge and distinguish the claim(s) from alternate or opposing claims, and organize the reasons and evidence logically.
- Support claim(s) with logical reasoning and relevant, accurate data and evidence that demonstrate an understanding of the topic or text, using credible sources.
- Use words, phrases, and clauses to create cohesion and clarify the relationships among claim(s), counterclaims, reasons, and evidence.
- Establish and maintain a formal style.
- Provide a concluding statement or section that follows from and supports the argument presented.

Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes.

- Introduce a topic clearly, previewing what is to follow; organize ideas, concepts, and information into broader categories as appropriate to achieving purpose; include formatting (e.g., headings), graphics (e.g., charts, tables), and multimedia when useful to aiding comprehension.
- Develop the topic with relevant, well-chosen facts, definitions, concrete details, quotations, or other information and examples.
- Use appropriate and varied transitions to create cohesion and clarify the relationships among ideas and concepts.
- Use precise language and domain-specific vocabulary to inform about or explain the topic.
- Establish and maintain a formal style and objective tone.
- Provide a concluding statement or section that follows from and supports the information or explanation presented.

Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.

With some guidance and support from peers and adults, develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on how well purpose and audience have been addressed.

Use technology, including the Internet, to produce and publish writing and present the relationships between information and ideas clearly and efficiently.

Conduct short research projects to answer a question (including a self-generated question), drawing on several sources and generating additional related, focused questions that allow for multiple avenues of exploration.

Gather relevant information from multiple print and digital sources, using search terms effectively; assess the credibility and accuracy of each source; and quote or paraphrase the data and conclusions of others while avoiding plagiarism and following a standard format for citation.

Draw evidence from informational texts to support analysis reflection, and research.

Write routinely over extended time frames (time for reflection and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences.

Use variables to represent two quantities in a real-world problem that change in relationship to one another; write an equation to express one quantity, thought of as the dependent variable, in terms of the other quantity, thought of as the independent variable. Analyze the relationship between the dependent and independent variables using graphs and tables, and relate these to the equation. For example, in a problem involving motion at constant speed, list and graph ordered pairs of distances and times, and write the equation $d = 65t$ to represent the relationship between distance and time.

Display numerical data in plots on a number line, including dot plots, histograms, and box plots.

Summarize numerical data sets in relation to their context, such as by:

- Reporting the number of observations.
- Describing the nature of the attribute under investigation, including how it was measured and its units of measurement.
- Giving quantitative measures of center (median and/or mean) and variability (interquartile range and/or mean absolute deviation), as well as describing any overall pattern and any striking deviations from the overall pattern with reference to the context in which the data were gathered.
- Relating the choice of measures of center and variability to the shape of the data distribution and the context in which the data were gathered.

Make sense of problems and persevere in solving them.

Mathematically proficient students start by explaining to themselves the meaning of a problem and looking for entry points to its solution. They analyze givens, constraints, relationships, and goals. They make conjectures about the form and meaning of the solution and plan a solution pathway rather than simply jumping into a solution attempt. They consider analogous problems, and try special cases and simpler forms of the original problem in order to gain insight into its solution. They monitor and evaluate their progress and change course if necessary. Older students might, depending on the context of the problem, transform algebraic expressions or change the viewing window on their graphing calculator to get the information they need. Mathematically proficient students can explain correspondences between equations, verbal descriptions, tables, and graphs or draw diagrams of important features and relationships, graph data, and search for regularity or trends. Younger students might rely on using concrete objects or pictures to help conceptualize and solve a problem. Mathematically proficient students check their answers to problems using a different method, and they continually ask themselves, “Does this make sense?” They can understand the approaches of others to solving complex problems and identify correspondences between different approaches.
Reason abstractly and quantitatively.
Mathematically proficient students make sense of quantities and their relationships in problem situations. They bring two complementary abilities to bear on problems involving quantitative relationships: the ability to decontextualize—to abstract a given situation and represent it symbolically and manipulate the representing symbols as if they have a life of their own, without necessarily attending to their referents—and the ability to contextualize, to pause as needed during the manipulation process in order to probe into the referents for the symbols involved. Quantitative reasoning entails habits of creating a coherent representation of the problem at hand; considering the units involved; attending to the meaning of quantities, not just how to compute them; and knowing and flexibly using different forms of operations and objects.

Standard Relation to Course: Supporting

Construct viable arguments and critique the reasoning of others.
Mathematically proficient students understand and use stated assumptions, definitions, and previously established results in constructing arguments. They make conjectures and build a logical progression of statements to explore the truth of their conjectures. They are able to analyze situations by breaking them into cases, and can recognize and use counterexamples. They justify their conclusions, communicate them to others, and respond to the arguments of others. They reason inductively about data, making plausible arguments that take into account the context from which the data arose. Mathematically proficient students are also able to compare the effectiveness of two plausible arguments, distinguish correct logic or reasoning from that which is flawed, and—if there is a flaw in an argument—explain what it is. Elementary students can construct arguments using concrete referents such as objects, drawings, diagrams, and actions. Such arguments can make sense and be correct, even though they are not generalized or made formal until later grades. Upper elementary students learn to determine to which an argument applies. Students at all grades can listen or read the arguments of others, decide whether they make sense, and ask useful questions to clarify or improve the arguments.

Standard Relation to Course: Supporting

Model with mathematics.
Mathematically proficient students can apply the mathematics they know to solve problems arising in everyday life, society, and the workplace. In early grades, this might be as simple as writing an addition equation to describe a situation. In middle grades, a student might apply proportional reasoning to plan a school event or analyze a problem in the community. By high school, a student might use geometry to solve a design problem or use a function to describe how one quantity of interest depends on another. Mathematically proficient students who can apply what they know are comfortable making assumptions and approximations to simplify a complicated situation, realizing that these may need revision later. They are able to identify important quantities in a practical situation and map their relationships using such tools as diagrams, two-way tables, graphs, flowcharts and formulas. They can analyze those relationships mathematically to draw conclusions. They routinely interpret their mathematical results in the context of the situation and reflect on whether the results make sense, possibly improving the model if it has not served its purpose.

Standard Relation to Course: Supporting

Use appropriate tools strategically.
Mathematically proficient students consider the available tools when solving a mathematical problem. These tools might include pencil and paper, concrete models, a ruler, a protractor, a calculator, a spreadsheet, a computer algebra system, a statistical package, or dynamic geometry software. Proficient students are sufficiently familiar with tools appropriate for their grade or course to make sound decisions about when each of these tools might be helpful, recognizing both the insight to be gained and their limitations. For example, mathematically proficient high school students analyze graphs of functions and solutions generated using a graphing calculator. They detect possible errors by strategically using estimation and other mathematical knowledge. When making mathematical models, they know that technology can enable them to visualize the results of varying assumptions, explore consequences, and compare predictions with data. Mathematically proficient students at various grade levels are able to identify relevant external mathematical resources, such as digital content located on a website, and use them to pose or solve problems. They are able to use technological tools to explore and deepen their understanding of concepts.

Standard Relation to Course: Supporting

Attend to precision.
Mathematically proficient students try to communicate precisely to others. They try to use clear definitions in discussion with others and in their own reasoning. They state the meaning of the symbols they choose, including using the equal sign consistently and appropriately. They are careful about specifying units of measure, and labeling axes to clarify the correspondence with quantities in a problem. They calculate accurately and efficiently, express numerical answers with a degree of precision appropriate for the problem context. In the elementary grades, students give carefully formulated explanations to each other. By the time they reach high school they have learned to examine claims and make explicit use of definitions.

Standard Relation to Course: Supporting

Look for and make use of structure.
Mathematically proficient students look closely to discern a pattern or structure. Young students, for example, might notice that three and seven more is the same amount as seven and three more, or they may sort a collection of shapes according to how many sides the shapes have. Later, students will see 7 × 8 equals the well remembered 7 × 5 + 7 × 3, in preparation for learning about the distributive property. In the expression 2 × 9 + 1, older students can see the 14 as 2 × 7 and the 9 as 2 × 7 + 2 × 7. They recognize the significance of an existing line in a geometric figure and can use the strategy of drawing an auxiliary line for solving problems. They also can step back for an overview and shift perspective. They can see complicated things, such as some algebraic expressions, as single objects or as being composed of several objects. For example, they can see 5 – (x – 2)² as 5 minus a positive number times a square and use that to realize that its value cannot be more than 5 for any real numbers x and y.

Standard Relation to Course: Supporting

Look and for express regularity in repeated reasoning.
Mathematically proficient students notice if calculations are repeated, and look both for general methods and for shortcuts. Upper elementary students might notice when dividing 25 by 11 that they are repeating the same calculations over and over again, and conclude they have a repeating decimal. By paying attention to the calculation of slope as they repeatedly check whether points are on the line through (1, 2) with slope 3, middle school students might abstract the equation (y – 2) = 3. Noticing the regularity in the way terms cancel when expanding (x – 1)(x + 1), (x – 1)(x² + x + 1), and (x – 1)(x³ + x² + x + 1) might lead them to the general formula for the sum of a geometric series. As they work to solve a problem, mathematically proficient students maintain oversight of the process, while attending to the details. They continually evaluate the reasonableness of their intermediate results.

Standard Relation to Course: Supporting

ELD.K12.ELL.SC.1: English language learners communicate information, ideas and concepts necessary for academic success in the content area of Science.
English language learners communicate for social and instructional purposes within the school setting.

<table>
<thead>
<tr>
<th>ELD.K12.ELL.SI.1:</th>
<th>Identify environmental factors that affect personal health.</th>
</tr>
</thead>
<tbody>
<tr>
<td>HE.6.C.1.3:</td>
<td>Clarifications: Air and water quality, availability of sidewalks, contaminated food, and road hazards.</td>
</tr>
<tr>
<td>HE.6.C.1.5:</td>
<td>Explain how body systems are impacted by hereditary factors and infectious agents.</td>
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<td>Clarifications:</td>
<td>Cystic fibrosis affects respiratory and a digestive system, sickle-cell anemia affects the circulatory system, and influenza affects the respiratory system.</td>
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</table>

General Course Information and Notes

**GENERAL NOTES**

Laboratory investigations that include the use of scientific inquiry, research, measurement, problem solving, laboratory apparatus and technologies, experimental procedures, and safety procedures are an integral part of this course. The National Science Teachers Association (NSTA) recommends that at the middle school level, all students should have multiple opportunities every week to explore science laboratory investigations (labs). School laboratory investigations are defined by the National Research Council (NRC) as an experience in the laboratory, classroom, or the field that provides students with opportunities to interact directly with natural phenomena or with data collected by others using tools, materials, data collection techniques, and models (NRC, 2006, p. 3). Laboratory investigations in the middle school classroom should help all students develop a growing understanding of the complexity and ambiguity of empirical work, as well as the skills to calibrate and troubleshoot equipment used to make observations. Learners should understand measurement error and have the skills to aggregate, interpret, and present the resulting data (NRC 2006, p. 77; NSTA, 2007).

**Special Notes:**

**Instructional Practices**
Teaching from a range of complex text is optimized when teachers in all subject areas implement the following strategies on a routine basis:

1. Ensuring wide reading from complex text that varies in length.
2. Making close reading and rereading of texts central to lessons.
3. Emphasizing text-specific complex questions, and cognitively complex tasks, reinforce focus on the text and cultivate independence.
4. Emphasizing students supporting answers based upon evidence from the text.
5. Providing extensive research and writing opportunities (claims and evidence).

**Science and Engineering Practices** (NRC Framework for K-12 Science Education, 2010)
- Asking questions (for science) and defining problems (for engineering).
- Developing and using models.
- Planning and carrying out investigations.
- Analyzing and interpreting data.
- Using mathematics, information and computer technology, and computational thinking.
- Constructing explanations (for science) and designing solutions (for engineering).
- Engaging in argument from evidence.
- Obtaining, evaluating, and communicating information.

**Literacy Standards in Science**
Secondary science courses include reading standards for literacy in science and technical subjects 6-12 and writing standards for literacy in history/social studies, science, and technical subjects 6-12. The courses also include speaking and listening standards. For a complete list of standards required for this course click on the blue tile labeled course standards. You may also download the complete course including all required standards and notes sections using the export function located at the top of this page.

**English Language Development ELD Standards Special Notes Section:**
Teachers are required to provide listening, speaking, reading and writing instruction that allows English language learners (ELL) to communicate information, ideas and concepts for academic success in the content area of Science. For the given level of English language proficiency and with visual, graphic, or interactive support, students will interact with grade level words, expressions, sentences and discourse to process or produce language necessary for academic success. The ELD standard should specify a relevant content area concept or topic of study chosen by curriculum developers and teachers which maximizes an ELL's need for communication and social skills. To access an ELL supporting document which delineates performance definitions and descriptors, please click on the following link:
https://cpalmsmediaprod.blob.core.windows.net/uploads/docs/standards/eld/sc.pdf

**Additional Instructional Resources:**

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**GENERAL INFORMATION**

**Course Number:** 2002040

**Course Path:** Section: Grades PreK to 12 Education
Courses > Grade Group: Grades 6 to 8 Education
Courses > Subject: Science > SubSubject: General Sciences

**Abbreviated Title:** M/J COMP SCI 1

**Course Length:** Year (Y)

**Course Attributes:**
- Class Size Core Required

**Course Level:** 2
## Educator Certifications

<table>
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**Course Status:** Course Approved

**Grade Level(s):** 6, 7, 8
### Course Standards

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<td>SC.6.E.6.1</td>
<td>Describe and give examples of ways in which Earth's surface is built up and torn down by physical and chemical weathering, erosion, and deposition.</td>
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<td>SC.6.E.6.2</td>
<td>Recognize that there are a variety of different landforms on Earth's surface such as coastlines, dunes, rivers, mountains, glaciers, deltas, and lakes and relate these landforms as they apply to Florida.</td>
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<td>SC.6.E.7.1</td>
<td>Differentiate among radiation, conduction, and convection, the three mechanisms by which heat is transferred through Earth's system.</td>
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<td>Investigate and apply how the cycling of water between the atmosphere and hydrosphere has an effect on weather patterns and climate.</td>
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<td>SC.6.E.7.3</td>
<td>Describe how global patterns such as the jet stream and ocean currents influence local weather in measurable terms such as temperature, air pressure, wind direction and speed, and humidity and precipitation.</td>
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<td>SC.6.E.7.4</td>
<td>Differentiate and show interactions among the geosphere, hydrosphere, cryosphere, atmosphere, and biosphere.</td>
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<td>Explain how energy provided by the sun influences global patterns of atmospheric movement and the temperature differences between land, water, and ice.</td>
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<td>Differentiate between weather and climate.</td>
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<td>Investigate how natural disasters have affected human life in Florida.</td>
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<td>Describe ways human beings protect themselves from hazardous weather and sun exposure.</td>
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<td>SC.6.E.7.9</td>
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<td>Recognize and explain that a scientific law is a description of a specific relationship under given conditions in the natural world. Thus, scientific laws are different from societal laws.</td>
</tr>
<tr>
<td>SC.6.N.3.3</td>
<td>Give several examples of scientific laws.</td>
</tr>
<tr>
<td>SC.6.N.3.4</td>
<td>Identify the role of models in the context of the sixth grade science benchmarks.</td>
</tr>
<tr>
<td>SC.6.P.11.1</td>
<td>Explore the Law of Conservation of Energy by differentiating between potential and kinetic energy. Identify situations where kinetic energy is transformed into potential energy and vice versa.</td>
</tr>
<tr>
<td>SC.6.P.12.1</td>
<td>Measure and graph distance versus time for an object moving at a constant speed. Interpret this relationship.</td>
</tr>
<tr>
<td>SC.6.P.13.1</td>
<td>Investigate and describe types of forces including contact forces and forces acting at a distance, such as electrical, magnetic, and gravitational.</td>
</tr>
<tr>
<td>SC.6.P.13.2</td>
<td>Explore the Law of Gravity by recognizing that every object exerts gravitational force on every other object and that the force depends on how much mass the objects have and how far apart they are.</td>
</tr>
<tr>
<td>SC.6.P.13.3</td>
<td>Investigate and describe that an unbalanced force acting on an object changes its speed, or direction of motion, or both.</td>
</tr>
</tbody>
</table>

Mathematicians who participate in effortful learning both individually and with others:
- Analyze the problem in a way that makes sense given the task.
- Ask questions that will help with solving the task.
- Build perseverance by modifying methods as needed while solving a challenging task.
- Stay engaged and maintain a positive mindset when working to solve tasks.
- Help and support each other when attempting a new method or approach.

Teachers who encourage students to participate actively in effortful learning both individually and with others:
- Cultivate a community of growth mindset learners.
- Foster perseverance in students by choosing tasks that are challenging.
- Develop students' ability to analyze and problem solve.
- Recognize students' effort when solving challenging problems.

Demonstrate understanding by representing problems in multiple ways.

Mathematicians who demonstrate understanding by representing problems in multiple ways:

- Build understanding through modeling and using manipulatives.
- Represent solutions to problems in multiple ways using objects, drawings, tables, graphs and equations.
- Progress from modeling problems with objects and drawings to using algorithms and equations.
- Express connections between concepts and representations.
- Choose a representation based on the given context or purpose.

**Clarifications:**
Teachers who encourage students to demonstrate understanding by representing problems in multiple ways:

- Help students make connections between concepts and representations.
- Provide opportunities for students to use manipulatives when investigating concepts.
- Guide students from concrete to pictorial to abstract representations as understanding progresses.
- Show students that various representations can have different purposes and can be useful in different situations.

Complete tasks with mathematical fluency.

Mathematicians who complete tasks with mathematical fluency:

- Select efficient and appropriate methods for solving problems within the given context.
- Maintain flexibility and accuracy while performing procedures and mental calculations.
- Complete tasks accurately and with confidence.
- Adapt procedures to apply them to a new context.
- Use feedback to improve efficiency when performing calculations.

**Clarifications:**
Teachers who encourage students to complete tasks with mathematical fluency:

- Provide students with the flexibility to solve problems by selecting a procedure that allows them to solve efficiently and accurately.
- Offer multiple opportunities for students to practice efficient and generalizable methods.
- Provide opportunities for students to reflect on the method they used and determine if a more efficient method could have been used.

Engage in discussions that reflect on the mathematical thinking of self and others.

Mathematicians who engage in discussions that reflect on the mathematical thinking of self and others:

- Communicate mathematical ideas, vocabulary and methods effectively.
- Analyze the mathematical thinking of others.
- Compare the efficiency of a method to those expressed by others.
- Recognize errors and suggest how to correctly solve the task.
- Justify results by explaining methods and processes.
- Construct possible arguments based on evidence.

**Clarifications:**
Teachers who encourage students to engage in discussions that reflect on the mathematical thinking of self and others:

- Establish a culture in which students ask questions of the teacher and their peers, and error is an opportunity for learning.
- Create opportunities for students to discuss their thinking with peers.
- Select, sequence and present student work to advance and deepen understanding of correct and increasingly efficient methods.
- Develop students' ability to justify methods and compare their responses to the responses of their peers.

Use patterns and structure to help understand and connect mathematical concepts.

Mathematicians who use patterns and structure to help understand and connect mathematical concepts:

- Focus on relevant details within a problem.
- Create plans and procedures to logically order events, steps or ideas to solve problems.
- Decompose a complex problem into manageable parts.
- Relate previously learned concepts to new concepts.
- Look for similarities among problems.
- Connect solutions of problems to more complicated large-scale situations.

**Clarifications:**
Teachers who encourage students to use patterns and structure to help understand and connect mathematical concepts:

- Help students recognize the patterns in the world around them and connect these patterns to mathematical concepts.
- Support students to develop generalizations based on the similarities found among problems.
- Provide opportunities for students to create plans and procedures to solve problems.
- Develop students' ability to construct relationships between their current understanding and more sophisticated ways of thinking.

Assess the reasonableness of solutions.

Mathematicians who assess the reasonableness of solutions:

- Estimate to discover possible solutions.
- Use benchmark quantities to determine if a solution makes sense.
- Check calculations when solving problems.
- Verify possible solutions by explaining the methods used.
- Evaluate results based on the given context.

**Clarifications:**
Teachers who encourage students to assess the reasonableness of solutions:

- Have students estimate or predict solutions prior to solving.
Apply mathematics to real-world contexts.
Mathematicians who apply mathematics to real-world contexts:
- Connect mathematical concepts to everyday experiences.
- Use models and methods to understand, represent and solve problems.
- Perform investigations to gather data or determine if a method is appropriate.
- Redesign models and methods to improve accuracy or efficiency.

Clarifications:
Teachers who encourage students to apply mathematics to real-world contexts:
- Provide opportunities for students to create models, both concrete and abstract, and perform investigations.
- Challenge students to question the accuracy of their models and methods.
- Support students as they validate conclusions by comparing them to the given situation.
- Indicate how various concepts can be applied to other disciplines.

Cite evidence to explain and justify reasoning.

Clarifications:
K-1 Students include textual evidence in their oral communication with guidance and support from adults. The evidence can consist of details from the text without naming the text. During 1st grade, students learn how to incorporate the evidence in their writing.
2-3 Students include relevant textual evidence in their written and oral communication. Students should name the text when they refer to it. In 3rd grade, students should use a combination of direct and indirect citations.
4-5 Students continue with previous skills and reference comments made by speakers and peers. Students cite texts that they've directly quoted, paraphrased, or used for information. When writing, students will use the form of citation dictated by the instructor or the style guide referenced by the instructor.
6-8 Students continue with previous skills and use a style guide to create a proper citation.
9-12 Students continue with previous skills and should be aware of existing style guides and the ways in which they differ.

Read and comprehend grade-level complex texts proficiently.

Clarifications:
See Text Complexity for grade-level complexity bands and a text complexity rubric.

Make inferences to support comprehension.

Clarifications:
Students will make inferences before the words infer or inference are introduced. Kindergarten students will answer questions like "Why is the girl smiling?" or make predictions about what will happen based on the title page. Students will use the terms and apply them in 2nd grade and beyond.

Use appropriate collaborative techniques and active listening skills when engaging in discussions in a variety of situations.

Clarifications:
In kindergarten, students learn to listen to one another respectfully.
In grades 1-2, students build upon these skills by justifying what they are thinking. For example: "I think ______ because ______." The collaborative conversations are becoming academic conversations.
In grades 3-12, students engage in academic conversations discussing claims and justifying their reasoning, refining and applying skills. Students build on ideas, propel the conversation, and support claims and counterclaims with evidence.

Use the accepted rules governing a specific format to create quality work.

Clarifications:
Students will incorporate skills learned into work products to produce quality work. For students to incorporate these skills appropriately, they must receive instruction. A 3rd grade student creating a poster board display must have instruction in how to effectively present information to do quality work.

Use appropriate voice and tone when speaking or writing.

Clarifications:
In kindergarten and 1st grade, students learn the difference between formal and informal language. For example, the way we talk to our friends differs from the way we speak to adults. In 2nd grade and beyond, students practice appropriate social and academic language to discuss texts.

General Course Information and Notes
**Educator Certifications**

<table>
<thead>
<tr>
<th>Subject</th>
<th>Grade Levels</th>
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<tbody>
<tr>
<td>Science (Elementary Grades 1-6)</td>
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<tr>
<td>Science (Secondary Grades 7-12)</td>
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<tr>
<td>Physics (Grades 6-12)</td>
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<tr>
<td>Earth/Space Science (Grades 6-12)</td>
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<tr>
<td>Middle Grades General Science (Middle Grades 5-9)</td>
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<tr>
<td>Middle Grades Integrated Curriculum (Middle Grades 5-9)</td>
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</tbody>
</table>
Course Standards

<table>
<thead>
<tr>
<th>Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>SC.6.E.6.1:</td>
<td>Describe and give examples of ways in which Earth's surface is built up and torn down by physical and chemical weathering, erosion, and deposition.</td>
</tr>
<tr>
<td>SC.6.E.6.2:</td>
<td>Recognize that there are a variety of different landforms on Earth's surface such as coastlines, dunes, rivers, mountains, glaciers, deltas, and lakes and relate these landforms as they apply to Florida.</td>
</tr>
<tr>
<td>SC.6.E.7.1:</td>
<td>Differentiate among radiation, conduction, and convection, the three mechanisms by which heat is transferred through Earth's system.</td>
</tr>
<tr>
<td>SC.6.E.7.2:</td>
<td>Investigate and apply how the cycling of water between the atmosphere and hydrosphere has an effect on weather patterns and climate.</td>
</tr>
<tr>
<td>SC.6.E.7.3:</td>
<td>Describe how global patterns such as the jet stream and ocean currents influence local weather in measurable terms such as temperature, air pressure, wind direction and speed, and humidity and precipitation.</td>
</tr>
<tr>
<td>SC.6.E.7.4:</td>
<td>Differentiate and show interactions among the geosphere, hydrosphere, cryosphere, atmosphere, and biosphere.</td>
</tr>
<tr>
<td>SC.6.E.7.5:</td>
<td>Explain how energy provided by the sun influences global patterns of atmospheric movement and the temperature differences between air, water, and land.</td>
</tr>
<tr>
<td>SC.6.E.7.6:</td>
<td>Differentiate between weather and climate.</td>
</tr>
<tr>
<td>SC.6.E.7.7:</td>
<td>Investigate how natural disasters have affected human life in Florida.</td>
</tr>
<tr>
<td>SC.6.E.7.8:</td>
<td>Describe ways human beings protect themselves from hazardous weather and sun exposure.</td>
</tr>
<tr>
<td>SC.6.E.7.9:</td>
<td>Describe how the composition and structure of the atmosphere protects life and insulates the planet.</td>
</tr>
<tr>
<td>SC.6.L.14.1:</td>
<td>Describe and identify patterns in the hierarchical organization of organisms from atoms to molecules and cells to tissues to organs to organ systems to organisms.</td>
</tr>
<tr>
<td>SC.6.L.14.2:</td>
<td>Investigate and explain the components of the scientific theory of cells (cell theory): all organisms are composed of cells (single-celled or multi-cellular), all cells come from pre-existing cells, and cells are the basic unit of life.</td>
</tr>
<tr>
<td>SC.6.L.14.3:</td>
<td>Recognize and explore how cells of all organisms undergo similar processes to maintain homeostasis, including extracting energy from food, getting rid of waste, and reproducing.</td>
</tr>
<tr>
<td>SC.6.L.14.4:</td>
<td>Compare and contrast the structure and function of major organelles of plant and animal cells, including cell wall, cell membrane, nucleus, cytoplasm, chloroplasts, mitochondria, and vacuoles.</td>
</tr>
<tr>
<td>SC.6.L.14.5:</td>
<td>Identify and investigate the general functions of the major systems of the human body (digestive, respiratory, circulatory, reproductive, excretory, immune, nervous, and musculoskeletal) and describe ways these systems interact with each other to maintain homeostasis.</td>
</tr>
<tr>
<td>SC.6.L.14.6:</td>
<td>Compare and contrast types of infectious agents that may infect the human body, including viruses, bacteria, fungi, and parasites.</td>
</tr>
<tr>
<td>SC.6.L.15.1:</td>
<td>Analyze and describe how and why organisms are classified according to shared characteristics with emphasis on the Linnaean system combined with the concept of Domains.</td>
</tr>
<tr>
<td>SC.6.N.1.1:</td>
<td>Define a problem from the sixth grade curriculum, use appropriate reference materials to support scientific understanding, plan and carry out scientific investigation of various types, such as systematic observations or experiments, identify variables, collect and organize data, interpret data in charts, tables, and graphics, analyze information, make predictions, and defend conclusions.</td>
</tr>
<tr>
<td>SC.6.N.1.2:</td>
<td>Explain why scientific investigations should be replicable.</td>
</tr>
<tr>
<td>SC.6.N.1.3:</td>
<td>Explain the difference between an experiment and other types of scientific investigation, and explain the relative benefits and limitations of each.</td>
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<tr>
<td>SC.6.N.1.4:</td>
<td>Discuss, compare, and negotiate methods used, results obtained, and explanations among groups of students conducting the same investigation.</td>
</tr>
<tr>
<td>SC.6.N.1.5:</td>
<td>Recognize that science involves creativity, not just in designing experiments, but also in creating explanations that fit evidence.</td>
</tr>
<tr>
<td>SC.6.N.2.1:</td>
<td>Distinguish science from other activities involving thought.</td>
</tr>
<tr>
<td>SC.6.N.2.2:</td>
<td>Explain that scientific knowledge is durable because it is open to change as new evidence or interpretations are encountered.</td>
</tr>
<tr>
<td>SC.6.N.2.3:</td>
<td>Recognize that scientists who make contributions to scientific knowledge come from all kinds of backgrounds and possess varied talents, interests, and goals.</td>
</tr>
<tr>
<td>SC.6.N.3.1:</td>
<td>Recognize and explain that a scientific theory is a well-supported and widely accepted explanation of nature and is not simply a claim posed by an individual. Thus, the use of the term theory in science is very different than how it is used in everyday life.</td>
</tr>
<tr>
<td>SC.6.N.3.2:</td>
<td>Recognize and explain that a scientific law is a description of a specific relationship under given conditions in the natural world. Thus, scientific laws are different from societal laws.</td>
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<td>SC.6.P.13.3:</td>
<td>Investigate and describe that an unbalanced force acting on an object changes its speed, or direction of motion, or both.</td>
</tr>
<tr>
<td>SC.912.E.7.3:</td>
<td>Differentiate and describe the various interactions among Earth systems, including: atmosphere, hydrosphere, cryosphere, geosphere, and biosphere.</td>
</tr>
<tr>
<td>SC.912.E.7.5:</td>
<td>Predict future weather conditions based on present observations and conceptual models and recognize limitations and uncertainties of such predictions.</td>
</tr>
<tr>
<td>SC.912.E.7.6:</td>
<td>Relate the formation of severe weather to the various physical factors.</td>
</tr>
<tr>
<td>SC.912.L.14.2:</td>
<td>Relate structure to function for the components of plant and animal cells. Explain the role of cell membranes as a highly selective barrier (passive and active transport).</td>
</tr>
</tbody>
</table>
Compare and contrast the general structures of plant and animal cells. Compare and contrast the general structures of prokaryotic and eukaryotic cells.

Describe the cell cycle, including the process of mitosis. Explain the role of mitosis in the formation of new cells and its importance in maintaining chromosome number during asexual reproduction.

Describe heat as the energy transferred by convection, conduction, and radiation, and explain the connection of heat to change in temperature or states of matter.

Engage effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grade 6 topics, texts, and issues, building on others’ ideas and expressing their own clearly.

a. Come to discussions prepared, having read or studied required material; explicitly draw on that preparation by referring to evidence on the topic, text, or issue to probe and reflect on ideas under discussion.

b. Follow rules for collegial discussions, set specific goals and deadlines, and define individual roles as needed.

c. Pose and respond to specific questions with elaboration and detail by making comments that contribute to the topic, text, or issue under discussion.

d. Review the key ideas expressed and demonstrate understanding of multiple perspectives through reflection and paraphrasing.

Compare and contrast the general structures of prokaryotic and eukaryotic cells.
**MAFS.6.SP.2.5:**

- a. Reporting the number of observations.
- b. Describing the nature of the attribute under investigation, including how it was measured and its units of measurement.
- c. Giving quantitative measures of center (median and/or mean) and variability (interquartile range and/or mean absolute deviation), as well as describing any overall pattern and any striking deviations from the overall pattern with reference to the context in which the data were gathered.
- d. Relating the choice of measures of center and variability to the shape of the data distribution and the context in which the data were gathered.

**MAFS.7.SP.2.4:**

Use measures of center and measures of variability for numerical data from random samples to draw informal comparative inferences about two populations. For example, decide whether the words in a chapter of a seventh-grade science book are generally longer than the words in a chapter of a fourth-grade science book.

**MAFS.7.SP.3.5:**

Understand that the probability of a chance event is a number between 0 and 1 that expresses the likelihood of the event occurring. Larger numbers indicate greater likelihood. A probability near 0 indicates an unlikely event, a probability around 1/2 indicates an event that is neither unlikely nor likely, and a probability near 1 indicates a likely event.

**Make sense of problems and persevere in solving them.**

Mathematically proficient students start by explaining to themselves the meaning of a problem and looking for entry points to its solution. They analyze givens, constraints, relationships, and goals. They make conjectures about the form and meaning of the solution and plan a solution pathway rather than simply jumping into a solution attempt. They consider analogous problems, and try special cases and simpler forms of the original problem in order to gain insight into its solution. They monitor and evaluate their progress and change course if necessary. Older students might, depending on the context of the problem, transform algebraic expressions or change the viewing window on their graphing calculator to get the information they need. Mathematically proficient students can explain correspondences between equations, verbal descriptions, tables, and graphs or draw diagrams of important features and relationships, graph data, and search for regularity or trends. Younger students might rely on using concrete objects or pictures to help conceptualize and solve a problem. Mathematically proficient students check their answers to problems using a different method, and they continually ask themselves, “Does this make sense?” They can understand the approaches of others to solving complex problems and identify correspondences between different approaches.

**Standard Relation to Course: Supporting**

**Reason abstractly and quantitatively.**

Mathematically proficient students make sense of quantities and their relationships in problem situations. They bring two complementary abilities to bear on problems involving quantitative relationships: the ability to decontextualize—to abstract a given situation and represent it symbolically and manipulate the representing symbols as if they have a life of their own, without necessarily attending to their referents—and the ability to contextualize, to pause as needed during the manipulation process in order to probe into the referents for the symbols involved. Quantitative reasoning entails habits of creating a coherent representation of the problem at hand; considering the units involved; attending to the meaning of quantities, not just how to compute them; and knowing and flexibly using different properties of operations and objects.

**Standard Relation to Course: Supporting**

**Construct viable arguments and critique the reasoning of others.**

Mathematically proficient students understand and use stated assumptions, definitions, and previously established results in constructing arguments. They make conjectures and build a logical progression of statements to explore the truth of their conjectures. They are able to analyze situations by breaking them into cases, and can recognize and use counterexamples. They justify their conclusions, communicate them to others, and respond to the arguments of others. They reason inductively about data, making plausible arguments that take into account the context from which the data arose. Mathematically proficient students are also able to compare the effectiveness of two plausible arguments, distinguish correct logic or reasoning from that which is flawed, and—if there is a flaw in an argument—explain what it is. Elementary students can construct arguments using concrete objects or pictures to help conceptualize and solve a problem. As they develop more formal reasoning, they recognize the importance of stating clearly what assumptions they make. They develop an argument according to mathematical principles rather than by extending a line of reasoning that is not sound. Mathematically proficient students are also able to compare the effectiveness of two plausible arguments, distinguish correct logic or reasoning from that which is flawed, and—if there is a flaw in an argument—explain what it is. Elementary students can construct arguments using concrete objects or pictures to help conceptualize and solve a problem. As they develop more formal reasoning, they recognize the importance of stating clearly what assumptions they make. They develop an argument according to mathematical principles rather than by extending a line of reasoning that is not sound. Older students learn to determine domains to which an argument applies. Students at all grade levels can listen or read the arguments of others, decide whether they make sense, and ask useful questions to clarify or improve the arguments.

**Standard Relation to Course: Supporting**

**Model with mathematics.**

Mathematically proficient students can apply the mathematics they know to solve problems arising in everyday life, society, and the workplace. In early grades, this might be as simple as writing an addition equation to describe a situation. In middle grades, a student might apply proportional reasoning to plan a school event or analyze a problem in the community. By high school, a student might use geometry to solve a design problem or use a function to describe how one quantity changes in relation to another. Mathematically proficient students who can apply what they know are comfortable making assumptions and approximations to simplify a complicated situation, realizing that these may need revision later. They are able to identify important quantities in a practical situation and map their relationships using such tools as diagrams, two-way tables, graphs, flowcharts and formulas. They can analyze those relationships mathematically to draw conclusions. They routinely interpret their mathematical results in the context of the situation and reflect on whether the results make sense, possibly improving the model if it has not served its purpose.

**Standard Relation to Course: Supporting**

**Use appropriate tools strategically.**

Mathematically proficient students consider the available tools when solving a mathematical problem. These tools might include pencil and paper, concrete models, a ruler, a protractor, a calculator, a spreadsheet, a computer algebra system, a statistical package, or dynamic geometry software. Proficient students are sufficiently familiar with tools appropriate for their grade or course to make sound decisions about when each of these tools might be helpful, recognizing both the insight to be gained and their limitations. For example, mathematically proficient high school students analyze graphs of functions and solutions generated using a graphing calculator. They detect possible errors by strategically using estimation and other mathematical knowledge. When making mathematical models, they know that technology can enable them to visualize the results of varying assumptions, explore consequences, and compare predictions with data. Mathematically proficient students at various grade levels are able to identify relevant external mathematical resources, such as digital content located on a website, and use them to pose or solve problems. They are able to use technological tools to explore and deepen their understanding of concepts.

**Standard Relation to Course: Supporting**

**Attend to precision.**

Mathematically proficient students try to communicate precisely to others. They try to use clear definitions in discussion with others and in their own reasoning. They state the meaning of the symbols they choose, including using the equal sign consistently and appropriately. They are careful about specifying units of measure, and labeling axes to clarify the correspondence with quantities in a problem. They calculate accurately and efficiently, express numerical answers with a degree of precision appropriate for the problem context. In the elementary grades, students give
English language learners communicate for social and instructional purposes within the school setting. By the time they reach high school they have learned to examine claims (for science) and designing solutions (for engineering).

Look for and make use of structure.

MAFS.K12.MP.7.1: Mathematically proficient students look closely to discern a pattern or structure. Young students, for example, might notice that three and seven more is the same amount as seven and three more, or they may sort a collection of shapes according to how many sides the shapes have. Later, students will see 7 + 8 equals the well remembered 7 × 5 + 7 × 3, in preparation for learning about the distributive property. In the expression x² + 9x + 14, older students can see the 14 as 2 × 7 and the 9 as 2 + 7. They recognize the significance of an existing line in a geometric figure and can use the strategy of drawing an auxiliary line for solving problems. They also can step back for an overview and shift perspective. They can see complicated things, such as some algebraic expressions, as single objects or as being composed of several objects. For example, they can see 5 – (3(x – y)² as 5 minus a positive number times a square and use that to realize that its value cannot be more than 5 for any real numbers x and y.

Look for and express regularity in repeated reasoning.

MAFS.K12.MP.8.1: Mathematically proficient students notice if calculations are repeated, and look both for general methods and for shortcuts. Upper elementary students might notice when dividing 25 by 11 that they are repeating the same calculations over and over again, and conclude they have a repeating decimal. By paying attention to the calculation of slope as they repeatedly check whether points are on the line through (1, 2) with slope 3, middle school students might abstract the equation (y – 2)/(x – 1) = 3. Noticing the regularity in the way terms cancel when expanding (x – 1)(x + 1), (x – 1)(x² + x + 1), and (x – 1)(x³ + x² + x + 1) might lead them to the general formula for the sum of a geometric series. As they work to solve a problem, mathematically proficient students maintain oversight of the process, while attending to the details. They continually evaluate the reasonableness of their intermediate results.

Identify environmental factors that affect personal health.

Clarifications: Air and water quality, availability of sidewalks, contaminated food, and road hazards.

Explain how body systems are impacted by hereditary factors and infectious agents.

Clarifications: Cystic fibrosis affects respiratory and a digestive system, sickle-cell anemia affects the circulatory system, and influenza affects the respiratory system.

General Course Information and Notes

GENERAL NOTES

Laboratory investigations that include the use of scientific inquiry, research, measurement, problem solving, laboratory apparatus and technologies, experimental procedures, and safety procedures are an integral part of this course. The National Science Teachers Association (NSTA) recommends that at the middle school level, all students should have multiple opportunities every week to explore science laboratory investigations (labs). School laboratory investigations are defined by the National Research Council (NRC) as an experience in the laboratory, classroom, or the field that provides students with opportunities to interact directly with natural phenomena or with data collected by others using tools, materials, data collection techniques, and models (NRC, 2006, p. 3). Laboratory investigations in the middle school classroom should help all students develop a growing understanding of the complexity and ambiguity of empirical work, as well as the skills to calibrate and troubleshoot equipment used to make observations. Learners should understand measurement error; and have the skills to aggregate, interpret, and present the resulting data (NRC 2006, p. 77; NSTA, 2007).

Honors and Advanced Level Course Note: Advanced courses require a greater demand on students through increased academic rigor. Academic rigor is obtained through the application, analysis, evaluation, and creation of complex ideas that are often abstract and multi-faceted. Students are challenged to think and collaborate critically on the content they are learning. Honors level rigor will be achieved by increasing text complexity through text selection, focus on high-level qualitative measures, and complexity of task. Instruction will be structured to give students a deeper understanding of conceptual themes and organization within and across disciplines. Academic rigor is more than simply assigning to students a greater quantity of work.

Special Notes:

Instructional Practices
Teaching from a range of complex text is optimized when teachers in all subject areas implement the following strategies on a routine basis:

1. Ensuring wide reading from complex text that varies in length.
2. Making close reading and rereading of texts central to lessons.
3. Emphasizing text-specific complex questions, and cognitively complex tasks, reinforce focus on the text and cultivate independence.
4. Emphasizing students supporting answers based upon evidence from the text.
5. Providing extensive research and writing opportunities (claims and evidence).


- Asking questions (for science) and defining problems (for engineering).
- Developing and using models.
- Planning and carrying out investigations.
- Analyzing and interpreting data.
- Using mathematics, information and computer technology, and computational thinking.
- Constructing explanations (for science) and designing solutions (for engineering).
- Engaging in argument from evidence.
Obtaining, evaluating, and communicating information.

Literacy Standards in Science
Secondary science courses include reading standards for literacy in science and technical subjects 6-12 and writing standards for literacy in history/social studies, science, and technical subjects 6-12. The courses also include speaking and listening standards. For a complete list of standards required for this course click on the blue tile labeled course standards. You may also download the complete course including all required standards and notes sections using the export function located at the top of this page.

English Language Development ELD Standards Special Notes Section:
Teachers are required to provide listening, speaking, reading and writing instruction that allows English language learners (ELL) to communicate information, ideas and concepts for academic success in the content area of Science. For the given level of English language proficiency and with visual, graphic, or interactive support, students will interact with grade level words, expressions, sentences and discourse to process or produce language necessary for academic success. The ELD standard should specify a relevant content area concept or topic of study chosen by curriculum developers and teachers which maximizes an ELL's need for communication and social skills. To access an ELL supporting document which delineates performance definitions and descriptors, please click on the following link:
https://cpalmsmediaprod.blob.core.windows.net/uploads/docs/standards/eld/sc.pdf

GENERAL INFORMATION

Course Number: 2002050
Course Path: Section: Grades PreK to 12 Education
Courses -> Grade Group: Grades 6 to 8 Education
Courses -> Subject: Science -> SubSubject: General Sciences
Abbreviated Title: M/J COMP SCI 1 ADV
Course Length: Year (Y)
Course Attributes:
- Class Size Core Required
Course Level: 3

Course Status: Course Approved
Grade Level(s): 6,7,8

Educator Certifications

| Science (Elementary Grades 1-6) |
| Science (Secondary Grades 7-12) |
| Middle Grades Integrated Curriculum (Middle Grades 5-9) |
| Chemistry (Grades 6-12) |
| Biology (Grades 6-12) |
| Middle Grades General Science (Middle Grades 5-9) |
| Physics (Grades 6-12) |
| Earth/Space Science (Grades 6-12) |
| Elementary Education (Grades K-6) |
| Elementary Education (Elementary Grades 1-6) |
**Course Standards**

<table>
<thead>
<tr>
<th>Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>SC.6.E.6.1:</td>
<td>Describe and give examples of ways in which Earth's surface is built up and torn down by physical and chemical weathering, erosion, and deposition.</td>
</tr>
<tr>
<td>SC.6.E.6.2:</td>
<td>Recognize that there are a variety of different landforms on Earth's surface such as coastlines, dunes, rivers, mountains, glaciers, deltas, and lakes and relate these landforms as they apply to Florida.</td>
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<tr>
<td>SC.6.E.7.1:</td>
<td>Differentiate among radiation, conduction, and convection, the three mechanisms by which heat is transferred through Earth's system.</td>
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<td>SC.6.E.7.2:</td>
<td>Investigate and apply how the cycling of water between the atmosphere and hydrosphere has an effect on weather patterns and climate.</td>
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<td>SC.6.E.7.3:</td>
<td>Describe how global patterns such as the jet stream and ocean currents influence local weather in measurable terms such as temperature, air pressure, wind direction and speed, and humidity and precipitation.</td>
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<td>SC.6.E.7.4:</td>
<td>Differentiate and show interactions among the geosphere, hydrosphere, cryosphere, atmosphere, and biosphere.</td>
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<td>SC.6.E.7.5:</td>
<td>Explain how energy provided by the sun influences global patterns of atmospheric movement and the temperature differences between air, water, and land.</td>
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<td>SC.6.E.7.6:</td>
<td>Differentiate between weather and climate.</td>
</tr>
<tr>
<td>SC.6.E.7.7:</td>
<td>Investigate how natural disasters have affected human life in Florida.</td>
</tr>
<tr>
<td>SC.6.E.7.8:</td>
<td>Describe ways human beings protect themselves from hazardous weather and sun exposure.</td>
</tr>
<tr>
<td>SC.6.E.7.9:</td>
<td>Describe how the composition and structure of the atmosphere protects life and insulates the planet.</td>
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<tr>
<td>SC.6.L.14.1:</td>
<td>Describe and identify patterns in the hierarchical organization of organisms from atoms to molecules and cells to tissues to organs to organ systems to organisms.</td>
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<tr>
<td>SC.6.L.14.2:</td>
<td>Investigate and explain the components of the scientific theory of cells (cell theory): all organisms are composed of cells (single-celled or multi-cellular), all cells come from pre-existing cells, and cells are the basic unit of life.</td>
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<tr>
<td>SC.6.L.14.3:</td>
<td>Recognize and explore how cells of all organisms undergo similar processes to maintain homeostasis, including extracting energy from food, getting rid of waste, and reproducing.</td>
</tr>
<tr>
<td>SC.6.L.14.4:</td>
<td>Compare and contrast the structure and function of major organelles of plant and animal cells, including cell wall, cell membrane, nucleus, cytoplasm, chloroplasts, mitochondria, and vacuoles.</td>
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<tr>
<td>SC.6.L.14.5:</td>
<td>Identify and investigate the general functions of the major systems of the human body (digestive, respiratory, circulatory, reproductive, excretory, immune, nervous, and musculoskeletal) and describe ways these systems interact with each other to maintain homeostasis.</td>
</tr>
<tr>
<td>SC.6.L.14.6:</td>
<td>Compare and contrast types of infectious agents that may infect the human body, including viruses, bacteria, fungi, and parasites.</td>
</tr>
<tr>
<td>SC.6.L.15.1:</td>
<td>Analyze and describe how and why organisms are classified according to shared characteristics with emphasis on the Linnaean system combined with the concept of Domains.</td>
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<td>SC.6.N.1.1:</td>
<td>Define a problem from the sixth grade curriculum, use appropriate reference materials to support scientific understanding, plan and carry out scientific investigation of various types, such as systematic observations or experiments, identify variables, collect and organize data, interpret data in charts, tables, and graphics, analyze information, make predictions, and defend conclusions.</td>
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<tr>
<td>SC.6.N.1.2:</td>
<td>Explain why scientific investigations should be replicable.</td>
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<td>SC.6.N.1.3:</td>
<td>Explain the difference between an experiment and other types of scientific investigation, and explain the relative benefits and limitations of each.</td>
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<td>SC.6.N.1.4:</td>
<td>Discuss, compare, and negotiate methods used, results obtained, and explanations among groups of students conducting the same investigation.</td>
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<td>Recognize that science involves creativity, not just in designing experiments, but also in creating explanations that fit evidence.</td>
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<td>SC.6.N.2.1:</td>
<td>Distinguish science from other activities involving thought.</td>
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<td>SC.6.N.2.2:</td>
<td>Explain that scientific knowledge is durable because it is open to change as new evidence or interpretations are encountered.</td>
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<td>SC.6.N.2.3:</td>
<td>Recognize that scientists who make contributions to scientific knowledge come from all kinds of backgrounds and possess varied talents, interests, and goals.</td>
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<td>SC.6.N.3.1:</td>
<td>Recognize and explain that a scientific theory is a well-supported and widely accepted explanation of nature and is not simply a claim posed by an individual. Thus, the use of the term theory in science is very different than how it is used in everyday life.</td>
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<td>SC.6.N.3.2:</td>
<td>Recognize and explain that a scientific law is a description of a specific relationship under given conditions in the natural world. Thus, scientific laws are different from societal laws.</td>
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<td>SC.6.N.3.3:</td>
<td>Give several examples of scientific laws.</td>
</tr>
<tr>
<td>SC.6.N.3.4:</td>
<td>Identify the role of models in the context of the sixth grade science benchmarks.</td>
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</table>
Compare and contrast the general structures of plant and animal cells. Compare and contrast the general structures of prokaryotic and eukaryotic cells.

Describe the cell cycle, including the process of mitosis. Explain the role of mitosis in the formation of new cells and its importance in maintaining chromosome number during asexual reproduction.

Describe heat as the energy transferred by convection, conduction, and radiation, and explain the connection of heat to change in temperature or states of matter.

Mathematicians who participate in effortful learning both individually and with others:
- Analyze the problem in a way that makes sense given the task.
- Ask questions that will help with solving the task.
- Build perseverance by modifying methods as needed while solving a challenging task.
- Stay engaged and maintain a positive mindset when working to solve tasks.
- Help and support each other when attempting a new method or approach.

Clarifications:
- Teachers who encourage students to participate actively in effortful learning both individually and with others:
  - Cultivate a community of growth mindset learners.
  - Foster perseverance in students by choosing tasks that are challenging.
  - Develop students' ability to analyze and problem solve.
  - Recognize students' effort when solving challenging problems.

Demonstrate understanding by representing problems in multiple ways. Mathematicians who demonstrate understanding by representing problems in multiple ways:
- Build understanding through modeling and using manipulatives.
- Represent solutions to problems in multiple ways using objects, drawings, tables, graphs and equations.
- Progress from modeling problems with objects and drawings to using algorithms and equations.
- Express connections between concepts and representations.
- Choose a representation based on the given context or purpose.

Clarifications:
- Teachers who encourage students to demonstrate understanding by representing problems in multiple ways:
  - Help students make connections between concepts and representations.
  - Provide opportunities for students to use manipulatives when investigating concepts.
  - Guide students from concrete to pictorial to abstract representations as understanding progresses.
  - Show students that various representations can have different purposes and can be useful in different situations.

Complete tasks with mathematical fluency. Mathematicians who complete tasks with mathematical fluency:
- Select efficient and appropriate methods for solving problems within the given context.
- Maintain flexibility and accuracy while performing procedures and mental calculations.
- Complete tasks accurately and with confidence.
- Adapt procedures to apply them to a new context.
- Use feedback to improve efficiency when performing calculations.

Clarifications:
- Teachers who encourage students to complete tasks with mathematical fluency:
  - Provide students with the flexibility to solve problems by selecting a procedure that allows them to solve efficiently and accurately.
  - Offer multiple opportunities for students to practice efficient and generalizable methods.
  - Provide opportunities for students to reflect on the method they used and determine if a more efficient method could have been used.

Engage in discussions that reflect on the mathematical thinking of self and others. Mathematicians who engage in discussions that reflect on the mathematical thinking of self and others:
- Communicate mathematical ideas, vocabulary and methods effectively.
- Analyze the mathematical thinking of others.
- Compare the efficiency of a method to those expressed by others.
- Recognize errors and suggest how to correctly solve the task.
- Justify results by explaining methods and processes.
- Construct possible arguments based on evidence.

Clarifications:
- Teachers who encourage students to engage in discussions that reflect on the mathematical thinking of self and others:
  - Establish a culture in which students ask questions of the teacher and their peers, and error is an opportunity for learning.
  - Create opportunities for students to discuss their thinking with peers.
  - Select, sequence and present student work to advance and deepen understanding of correct and increasingly efficient methods.
  - Develop students' ability to justify methods and compare their responses to the responses of their peers.

Use patterns and structure to help understand and connect mathematical concepts. Mathematicians who use patterns and structure to help understand and connect mathematical concepts:
- Focus on relevant details within a problem.
- Create plans and procedures to logically order events, steps or ideas to solve problems.
- Decompose a complex problem into manageable parts.
- Relate previously learned concepts to new concepts.
- Look for similarities among problems.
- Connect solutions of problems to more complicated large-scale situations.

Clarifications:
Teachers who encourage students to use patterns and structure to help understand and connect mathematical concepts:
- Help students recognize the patterns in the world around them and connect these patterns to mathematical concepts.
- Support students to develop generalizations based on the similarities found among problems.
- Provide opportunities for students to create plans and procedures to solve problems.
- Develop students’ ability to construct relationships between their current understanding and more sophisticated ways of thinking.

Assess the reasonableness of solutions.
Mathematicians who assess the reasonableness of solutions:
- Estimate to discover possible solutions.
- Use benchmark quantities to determine if a solution makes sense.
- Check calculations when solving problems.
- Verify possible solutions by explaining the methods used.
- Evaluate results based on the given context.

Clarifications:
Teachers who encourage students to assess the reasonableness of solutions:
- Have students estimate or predict solutions prior to solving.
- Prompt students to continually ask, “Does this solution make sense? How do you know?”
- Reinforce that students check their work as they progress within and after a task.
- Strengthen students’ ability to verify solutions through justifications.

Apply mathematics to real-world contexts.
Mathematicians who apply mathematics to real-world contexts:
- Connect mathematical concepts to everyday experiences.
- Use models and methods to understand, represent and solve problems.
- Perform investigations to gather data or determine if a method is appropriate. • Redesign models and methods to improve accuracy or efficiency.

Clarifications:
Teachers who encourage students to apply mathematics to real-world contexts:
- Provide opportunities for students to create models, both concrete and abstract, and perform investigations.
- Challenge students to question the accuracy of their models and methods.
- Support students as they validate conclusions by comparing them to the given situation.
- Indicate how various concepts can be applied to other disciplines.

Cite evidence to explain and justify reasoning.

Clarifications:
K-1 Students include textual evidence in their oral communication with guidance and support from adults. The evidence can consist of details from the text without naming the text. During 1st grade, students learn how to incorporate the evidence in their writing. 2-3 Students include relevant textual evidence in their written and oral communication. Students should name the text when they refer to it. In 3rd grade, students should use a combination of direct and indirect citations. 4-5 Students continue with previous skills and reference comments made by speakers and peers. Students cite texts that they’ve directly quoted, paraphrased, or used for information. When writing, students will use the form of citation dictated by the instructor or the style guide referenced by the instructor. 6-8 Students continue with previous skills and use a style guide to create a proper citation. 9-12 Students continue with previous skills and should be aware of existing style guides and the ways in which they differ.

Read and comprehend grade-level complex texts proficiently.

Clarifications:
See Text Complexity for grade-level complexity bands and a text complexity rubric.

Make inferences to support comprehension.

Clarifications:
Students will make inferences before the words infer or inference are introduced. Kindergarten students will answer questions like “Why is the girl smiling?” or make predictions about what will happen based on the title page. Students will use the terms and apply them in 2nd grade and beyond.

Use appropriate collaborative techniques and active listening skills when engaging in discussions in a variety of situations.

Clarifications:
In kindergarten, students learn to listen to one another respectfully. In grades 1-2, students build upon these skills by justifying what they are thinking. For example: “I think ______ because ______.” The collaborative conversations are becoming academic conversations. In grades 3-12, students engage in academic conversations discussing claims and justifying their reasoning, refining and applying skills. Students build on ideas, propel the conversation, and support claims and counterclaims with evidence.

Use the accepted rules governing a specific format to create quality work.

Clarifications:
Students will incorporate skills learned into work products to produce quality work. For students to incorporate these skills appropriately, they must receive instruction. A 3rd grade student creating a poster board display must have instruction in how to effectively present information to do quality work.

Use appropriate voice and tone when speaking or writing.

Clarifications:
In kindergarten and 1st grade, students learn the difference between formal and informal language. For example, the way we talk to our friends...
English language learners communicate information, ideas and concepts necessary for academic success in the content area of Science.

Identify environmental factors that affect personal health.

Clarifications:
Air and water quality, availability of sidewalks, contaminated food, and road hazards.

Explain how body systems are impacted by hereditary factors and infectious agents.

Clarifications:
Cystic fibrosis affects respiratory and a digestive system, sickle-cell anemia affects the circulatory system, and influenza affects the respiratory system.

General Course Information and Notes

GENERAL NOTES

Laboratory investigations that include the use of scientific inquiry, research, measurement, problem solving, laboratory apparatus and technologies, experimental procedures, and safety procedures are an integral part of this course. The National Science Teachers Association (NSTA) recommends that at the middle school level, all students should have multiple opportunities every week to explore science laboratory investigations (labs). School laboratory investigations are defined by the National Research Council (NRC) as an experience in the laboratory, classroom, or the field that provides students with opportunities to interact directly with natural phenomena or with data collected by others using tools, materials, data collection techniques, and models (NRC, 2006, p. 3). Laboratory investigations in the middle school classroom should help all students develop a growing understanding of the complexity and ambiguity of empirical work, as well as the skills to calibrate and troubleshoot equipment used to make observations. Learners should understand measurement error; and have the skills to aggregate, interpret, and present the resulting data (NRC 2006, p. 77; NSTA, 2007).

Honors and Advanced Level Course Note: Advanced courses require a greater demand on students through increased academic rigor. Academic rigor is obtained through the application, analysis, evaluation, and creation of complex ideas that are often abstract and multi-faceted. Students are challenged to think and collaborate critically on the content they are learning. Honors level rigor will be achieved by increasing text complexity through text selection, focus on high-level qualitative measures, and complexity of task. Instruction will be structured to give students a deeper understanding of conceptual themes and organization within and across disciplines. Academic rigor is more than simply assigning to students a greater quantity of work.

Special Notes:

Instructional Practices
Teaching from a range of complex text is optimized when teachers in all subject areas implement the following strategies on a routine basis:

1. Ensuring wide reading from complex text that varies in length.
2. Making close reading and rereading of texts central to lessons.
3. Emphasizing text-specific complex questions, and cognitively complex tasks, reinforce focus on the text and cultivate independence.
4. Emphasizing students supporting answers upon evidence from the text.
5. Providing extensive research and writing opportunities (claims and evidence).


- Asking questions (for science) and defining problems (for engineering).
- Developing and using models.
- Planning and carrying out investigations.
- Analyzing and interpreting data.
- Using mathematics, information and computer technology, and computational thinking.
- Constructing explanations (for science) and designing solutions (for engineering).
- Engaging in argument from evidence.
- Obtaining, evaluating, and communicating information.

Florida’s Benchmarks for Excellent Student Thinking (B.E.S.T.) Standards

This course includes Florida’s B.E.S.T. ELA Expectations (EE) and Mathematical Thinking and Reasoning Standards (MTRs) for students. Florida educators should intentionally embed these standards within the content and their instruction as applicable. For guidance on the implementation of the EE’s and MTRs, please visit https://www.cpalms.org/Standards/BEST_Standards.aspx and select the appropriate B.E.S.T. Standards package.

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Teachers are required to provide listening, speaking, reading and writing instruction that allows English language learners (ELL) to communicate information, ideas and concepts for academic success in the content area of Science. For the given level of English language proficiency and with visual, graphic, or interactive support, students will interact with grade level words, expressions, sentences and discourse to process or produce language necessary for academic success. The ELD standard should specify a relevant content area concept or topic of study chosen by curriculum developers and teachers which maximizes an ELL’s need for communication and social skills. To access an ELL supporting document which delineates performance definitions and descriptors, please click on the following link:

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GENERAL INFORMATION

Course Path: Section: Grades PreK to 12 Education
Courses > Grade Group: Grades 6 to 8 Education
Courses > Subject: Science > SubSubject: General Sciences >

Course Number: 2002050
Educator Certifications

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Recognize that there are a variety of different landforms on Earth's surface such as coastlines, dunes, rivers, mountains, glaciers, deltas, and lakes and relate these landforms as they apply to Florida.

Differentiate among radiation, conduction, and convection, the three mechanisms by which heat is transferred through Earth's system.

Investigate and apply how the cycling of water between the atmosphere and hydrosphere has an effect on weather patterns and climate.

Describe how global patterns such as the jet stream and ocean currents influence local weather in measurable terms such as temperature, air pressure, wind direction and speed, and humidity and precipitation.

Differentiate and show interactions among the geosphere, hydrosphere, cryosphere, atmosphere, and biosphere.

Explain how energy provided by the sun influences global patterns of atmospheric movement and the temperature differences between air, water, and land.

Differentiate between weather and climate.

Investigate how natural disasters have affected human life in Florida.

Describe ways human beings protect themselves from hazardous weather and sun exposure.

Describe how the composition and structure of the atmosphere protects life and insulates the planet.

Describe and identify patterns in the hierarchical organization of organisms from atoms to molecules and cells to tissues to organs to organ systems to organisms.

Investigate and explain the components of the scientific theory of cells (cell theory): all organisms are composed of cells (single-celled or multicellular), all cells come from pre-existing cells, and cells are the basic unit of life.

Recognize and explore how cells of all organisms undergo similar processes to maintain homeostasis, including extracting energy from food, getting rid of waste, and reproducing.

Compare and contrast the structure and function of major organelles of plant and animal cells, including cell wall, cell membrane, nucleus, cytoplasm, chloroplasts, mitochondria, and vacuoles.

Identify and investigate the general functions of the major systems of the human body (digestive, respiratory, circulatory, reproductive, excretory, immune, nervous, and musculoskeletal) and describe ways these systems interact with each other to maintain homeostasis.

Compare and contrast types of infectious agents that may infect the human body, including viruses, bacteria, fungi, and parasites.

Analyze and describe how and why organisms are classified according to shared characteristics with emphasis on the Linnaean system combined with the concept of Domains.

Define a problem from the sixth grade curriculum, use appropriate reference materials to support scientific understanding, plan and carry out scientific investigation of various types, such as systematic observations or experiments, identify variables, collect and organize data, interpret data in charts, tables, and graphics, analyze information, make predictions, and defend conclusions.

Explain why scientific investigations should be replicable.

Explain the difference between an experiment and other types of scientific investigation, and explain the relative benefits and limitations of each.

Discuss, compare, and negotiate methods used, results obtained, and explanations among groups of students conducting the same investigation.

Recognize that science involves creativity, not just in designing experiments, but also in creating explanations that fit evidence.

Distinguish science from other activities involving thought.

Explain that scientific knowledge is durable because it is open to change as new evidence or interpretations are encountered.

Recognize that scientists who make contributions to scientific knowledge come from all kinds of backgrounds and possess varied talents, interests, and goals.

Recognize and explain that a scientific theory is a well-supported and widely accepted explanation of nature and is not simply a claim posed by an individual. Thus, the use of the term theory in science is very different than how it is used in everyday life.

Recognize and explain that a scientific law is a description of a specific relationship under given conditions in the natural world. Thus, scientific laws are different from societal laws.

Give several examples of scientific laws.

Identify the role of models in the context of the sixth grade science benchmarks.

Explore the Law of Conservation of Energy by differentiating between potential and kinetic energy. Identify situations where kinetic energy is transformed into potential energy and vice versa.

Measure and graph distance versus time for an object moving at a constant speed. Interpret this relationship.

Investigate and describe types of forces including contact forces and forces acting at a distance, such as electrical, magnetic, and gravitational.

Explore the Law of Gravity by recognizing that every object exerts gravitational force on every other object and that the force depends on how much mass the objects have and how far apart they are.

Investigate and describe that an unbalanced force acting on an object changes its speed, or direction of motion, or both.

Design and conduct a study using repeated trials and replication.

Use phrases such as ’results support’ or ‘fail to support’ in science, understanding that science does not offer conclusive ‘proof’ of a knowledge claim.

Explain how hypotheses are valuable if they lead to further investigations, even if they turn out not to be supported by the data.

Analyze the methods used to develop a scientific explanation as seen in different fields of science.

Understand that scientific investigations involve the collection of relevant empirical evidence, the use of logical reasoning, and the application of imagination in devising hypotheses, predictions, explanations and models to make sense of the collected evidence.

Explore the scientific theory of atoms (also known as atomic theory) by using models to explain the motion of particles in solids, liquids, and gases.
SC.8.P.8.2: Differentiate between weight and mass recognizing that weight is the amount of gravitational pull on an object and is distinct from, though proportional to, mass.

SC.8.P.8.3: Explore and describe the densities of various materials through measurement of their masses and volumes.

SC.8.P.8.4: Classify and compare substances on the basis of characteristic physical properties that can be demonstrated or measured; for example, density, thermal or electrical conductivity, solubility, magnetic properties, melting and boiling points, and know that these properties are independent of the amount of the sample.

SC.8.P.8.5: Recognize that there are a finite number of elements and that their atoms combine in a multitude of ways to produce compounds that make up all of the living and nonliving things that we encounter.

SC.8.P.8.6: Recognize that elements are grouped in the periodic table according to similarities of their properties.

SC.8.P.8.7: Explore the scientific theory of atoms (also known as atomic theory) by recognizing that atoms are the smallest unit of an element and are composed of sub-atomic particles (electrons surrounding a nucleus containing protons and neutrons).

SC.8.P.8.8: Identify basic examples of and compare and classify the properties of compounds, including acids, bases, and salts.

SC.8.P.8.9: Distinguish among mixtures (including solutions) and pure substances.

SC.912.E.7.4: Explain the physical properties of the Sun and its dynamic nature and connect them to conditions and events on Earth.

SC.912.E.7.5: Predict future weather conditions based on present observations and conceptual models and recognize limitations and uncertainties of such predictions.

SC.912.E.7.6: Relate the formation of severe weather to the various physical factors.

SC.912.E.14.2: Relate structure to function for the components of plant and animal cells. Explain the role of cell membranes as a highly selective barrier (passive and active transport).

SC.912.L.14.3: Compare and contrast the general structures of plant and animal cells. Compare and contrast the general structures of prokaryotic and eukaryotic cells.

SC.912.L.16.14: Describe the cell cycle, including the process of mitosis. Explain the role of mitosis in the formation of new cells and its importance in maintaining chromosome number during asexual reproduction.

LAFS.68.RST.1.1: Cite specific textual evidence to support analysis of science and technical texts.

LAFS.68.RST.1.2: Determine the central ideas or conclusions of a text; provide an accurate summary of the text distinct from prior knowledge or opinions.

LAFS.68.RST.1.3: Follow precisely a multistep procedure when carrying out experiments, taking measurements, or performing technical tasks.

LAFS.68.RST.2.4: Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 6–8 texts and topics.

LAFS.68.RST.2.5: Analyze the structure an author uses to organize a text, including how the major sections contribute to the whole and to an understanding of the topic.

LAFS.68.RST.2.6: Analyze the author’s purpose in providing an explanation, describing a procedure, or discussing an experiment in a text.

LAFS.68.RST.3.7: Integrate quantitative or technical information expressed in words in a text with a version of that information expressed visually (e.g., in a flowchart, diagram, model, graph, or table).

LAFS.68.RST.3.8: Distinguish among facts, reasoned judgment based on research findings, and speculation in a text.

LAFS.68.RST.3.9: Compare and contrast the information gained from experiments, simulations, video, or multimedia sources with that gained from reading a text on the same topic.

LAFS.68.WHST.1.1: Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes.

LAFS.68.WHST.1.2: a. Introduce a topic clearly, previewing what is to follow; organize ideas, concepts, and information into broader categories as appropriate to achieving purpose; include formatting (e.g., headings), graphics (e.g., charts, tables), and multimedia when useful to aiding comprehension.

LAFS.68.WHST.2.4: Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.

LAFS.68.WHST.2.5: With some guidance and support from peers and adults, develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on how well purpose and audience have been addressed.

LAFS.68.WHST.2.6: Use technology, including the Internet, to produce and publish writing and present the relationships between information and ideas clearly and efficiently.

LAFS.68.WHST.3.7: Conduct short research projects to answer a question (including a self-generated question), drawing on several sources and generating additional related, focused questions that allow for multiple avenues of exploration.

LAFS.68.WHST.3.8: Gather relevant information from multiple print and digital sources, using search terms effectively; assess the credibility and accuracy of each source; and quote or paraphrase the data and conclusions of others while avoiding plagiarism and following a standard format for citation.

LAFS.68.WHST.3.9: Draw evidence from informational texts to support analysis reflection, and research.
LAFS.68.WHST.4.10: Write routinely over extended time frames (time for reflection and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences.

LAFS.7.SL.1.1: Engage effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grade 7 topics, texts, and issues, building on others' ideas and expressing their own clearly.
   a. Come to discussions prepared, having read or researched material under study; explicitly draw on that preparation by referring to evidence on the topic, text, or issue to probe and reflect on ideas under discussion.
   b. Follow rules for collegial discussions, track progress toward specific goals and deadlines, and define individual roles as needed.
   c. Pose questions that elicit elaboration and respond to others' questions and comments with relevant observations and ideas that bring the discussion back on topic as needed.
   d. Acknowledge new information expressed by others and, when warranted, modify their own views.

LAFS.7.SL.1.2: Analyze the main ideas and supporting details presented in diverse media and formats (e.g., visually, quantitatively, orally) and explain how the ideas clarify a topic, text, or issue under study.

LAFS.7.SL.1.3: Delineate a speaker's argument and specific claims, evaluating the soundness of the reasoning and the relevance and sufficiency of the evidence.

LAFS.7.SL.2.4: Present claims and findings, emphasizing salient points in a focused, coherent manner with pertinent descriptions, facts, details, and examples; use appropriate eye contact, adequate volume, and clear pronunciation.

LAFS.7.SL.2.5: Include multimedia components and visual displays in presentations to clarify claims and findings and emphasize salient points.

MAFS.6.SP.2.4: Use measures of center and measures of variability for numerical data from random samples to draw informal comparative inferences about two populations. For example, decide whether the words in a chapter of a seventh-grade science book are generally longer than the words in a chapter of a fourth-grade science book.

MAFS.7.SP.3.5: Understand that the probability of a chance event is a number between 0 and 1 that expresses the likelihood of the event occurring. Larger numbers indicate greater likelihood. A probability near 0 indicates an unlikely event, a probability around 1/2 indicates an event that is neither unlikely nor likely, and a probability near 1 indicates a likely event.

MAFS.8.SP.1.4: Understand that patterns of association can also be seen in bivariate categorical data by displaying frequencies and relative frequencies in a two-way table. Construct and interpret a two-way table summarizing data on two categorical variables collected from the same subjects. Use relative frequencies calculated for rows or columns to describe possible association between the two variables. For example, collect data from students in your class on whether or not they have a curfew on school nights and whether or not they have assigned chores at home. Is there evidence that those who have a curfew also tend to have chores?

Make sense of problems and persevere in solving them.

Mathematically proficient students start by explaining to themselves the meaning of a problem and looking for entry points to its solution. They analyze givens, constraints, relationships, and goals. They make conjectures about the form and meaning of the solution and plan a solution pathway rather than simply jumping into a solution attempt. They consider analogous problems, and try special cases and simpler forms of the original problem in order to gain insight into its solution. They monitor and evaluate their progress and change course if necessary. Older students might, depending on the context of the problem, transform algebraic expressions or change the viewing window on their graphing calculator to get the information they need. Mathematically proficient students can explain correspondences between equations, verbal descriptions, tables, and graphs or draw diagrams of important features and relationships, graph data, and search for regularity or trends. Younger students might rely on using concrete objects or pictures to help conceptualize and solve a problem. Mathematically proficient students check their answers to problems using a different method, and they continually ask themselves, "Does this make sense?" They can understand the approaches of others to solving complex problems and identify correspondences between different approaches.

Reason abstractly and quantitatively.

Mathematically proficient students make sense of quantities and their relationships in problem situations. They bring two complementary abilities to bear on problems involving quantitative relationships: the ability to decontextualize—to abstract a given situation and represent it symbolically and manipulate the representing symbols as if they have a life of their own, without necessarily attending to their referents—and the ability to contextualize, to pause as needed during the manipulation process in order to probe into the referents for the symbols involved. Quantitative reasoning entails habits of creating a coherent representation of the problem at hand; considering the units involved; attending to the meaning of quantities, not just how to compute them; and knowing and flexibly using different properties of operations and objects.

Construct viable arguments and critique the reasoning of others.

Mathematically proficient students understand and use stated assumptions, definitions, and previously established results in constructing arguments. They make conjectures and build a logical progression of statements to explore the truth of their conjectures. They are able to analyze situations by breaking them into cases, and can recognize and use counterexamples. They justify their conclusions, communicate them to others, and respond to the arguments of others. They reason inductively about data, making plausible arguments that take into account the context from which the data arose. Mathematically proficient students are also able to compare the effectiveness of two plausible arguments, distinguish correct logic or reasoning from that which is flawed, and—if there is a flaw in an argument—explain what it is. Elementary students can construct arguments using concrete referents such as objects, drawings, diagrams, and actions. Such arguments can make sense and be correct, even though they are not generalized or made formal until later grades. Later, students learn to determine domains to which an argument applies. Students at all grades can listen or read the arguments of others, decide whether they make sense, and ask useful questions to clarify or improve the arguments.

Model with mathematics.

Mathematically proficient students can apply the mathematics they know to solve problems arising in everyday life, society, and the workplace. In early grades, this might be as simple as writing an addition equation to describe a situation. In middle grades, a student might apply proportional reasoning to plan a school event or analyze a problem in the community. By high school, a student might use geometry to solve a design problem or use a function to describe how one quantity of interest depends on another. Mathematically proficient students who can apply what they know are comfortable making assumptions and approximations to simplify a complicated situation, realizing that these may need revision later. They are able to identify important quantities in a practical situation and map their relationships using such tools as diagrams, two-way tables, graphs, flowcharts and formulas. They can analyze those relationships mathematically to draw conclusions. They routinely interpret their mathematical results in the context of the situation and reflect on whether the results make sense, possibly improving the model if it has not served its purpose.

Use appropriate tools strategically.
MAFS.K12.MP.5.1: Mathematically proficient students consider the available tools when solving a mathematical problem. These tools might include pencil and paper, concrete models, a ruler, a protractor, a calculator, a spreadsheet, a computer algebra system, a statistical package, or dynamic geometry software. Proficient students are sufficiently familiar with tools appropriate for their grade or course to make sound decisions about when each of these tools might be helpful, recognizing both the insight to be gained and their limitations. For example, mathematically proficient high school students analyze graphs of functions and solutions generated using a graphing calculator. They detect possible errors by strategically using estimation and other mathematical knowledge. When making mathematical models, they know that technology can enable them to visualize the results of varying assumptions, explore consequences, and compare predictions with data. Mathematically proficient students at various grade levels are able to identify relevant external mathematical resources, such as digital content located on a website, and use them to pose or solve problems. They are able to use technological tools to explore and deepen their understanding of concepts.

Standard Relation to Course: Supporting

MAFS.K12.MP.6.1: Attend to precision.

Mathematically proficient students try to communicate precisely to others. They try to use clear definitions in discussion with others and in their own reasoning. They state the meaning of the symbols they choose, including using the equal sign consistently and appropriately. They are careful about specifying units of measure, and labeling axes to clarify the correspondence with quantities in a problem. They calculate accurately and efficiently, express numerical answers with a degree of precision appropriate for the problem context. In the elementary grades, students give carefully formulated explanations to each other. By the time they reach high school they have learned to examine claims and make explicit use of definitions.

Standard Relation to Course: Supporting

MAFS.K12.MP.7.1: Look for and make use of structure.

Mathematically proficient students look closely to discern a pattern or structure. Young students, for example, might notice that three and seven more is the same amount as seven and three more, or they may sort a collection of shapes according to how many sides the shapes have. Later, students will see 7 × 8 equals the better remembered 7 × 5 + 7 as 5 minus a positive number times a square and use that to realize that its value cannot be more than 5 for any real numbers x and y.

Standard Relation to Course: Supporting

MAFS.K12.MP.8.1: Look for and express regularity in repeated reasoning.

Mathematically proficient students notice if calculations are repeated, and look both for general methods and for shortcuts. Upper elementary students might notice when dividing 25 by 11 that they are repeating the same calculations over and over again, and conclude they have a repeating decimal. By paying attention to the calculation of slope as they repeatedly check whether points are on the line through (1, 2) with slope 3, middle school students might abstract the equation (y – 2)/(x – 1) = 3. Noticing the regularity in the way terms cancel when expanding (x – 1)(x + 1), (x – 1)(x² + x + 1), and (x – 1)(x² + x + 1) + 1 might lead them to the general formula for the sum of a geometric series. As they work to solve a problem, mathematically proficient students maintain oversight of the process, while attending to the details. They continually evaluate the reasonableness of their intermediate results.

Standard Relation to Course: Supporting

ELD.K12.ELL.SC.1: English language learners communicate information, ideas and concepts necessary for academic success in the content area of Science.

ELD.K12.ELL.SI.1: English language learners communicate for social and instructional purposes within the school setting.

HE.7.C.1.3: Clarifications:
Food refrigeration, appropriate home heating and cooling, air/water quality, and garbage/trash collection.

HE.7.C.1.7: Clarifications:
Sickle-cell anemia, diabetes, and acne.

General Course Information and Notes

GENERAL NOTES

Laboratory investigations that include the use of scientific inquiry, research, measurement, problem solving, laboratory apparatus and technologies, experimental procedures, and safety procedures are an integral part of this course. The National Science Teachers Association (NSTA) recommends that at the middle school level, all students should have multiple opportunities every week to explore science laboratory investigations (labs). School laboratory investigations are defined by the National Research Council (NRC) as an experience in the laboratory, classroom, or the field that provides students with opportunities to interact directly with natural phenomena or with data collected by others using tools, materials, data collection techniques, and models (NRC, 2006, p. 3). Laboratory investigations in the middle school classroom should help all students develop a growing understanding of the complexity and ambiguity of empirical work, as well as the skills to calibrate and troubleshoot equipment used to make observations. Learners should understand measurement error; and have the skills to aggregate, interpret, and present the resulting data (NRC, 2006, p. 77; NSTA, 2007).

Honors and Advanced Level Course Note: Advanced courses require a greater demand on students through increased academic rigor. Academic rigor is obtained through the application, analysis, evaluation, and creation of complex ideas that are often abstract and multi-faceted. Students are challenged to think and collaborate critically on the content they are learning. Honors level rigor will be achieved by increasing text complexity through text selection, focus on high-level qualitative measures, and complexity of task. Instruction will be structured to give students a deeper understanding of conceptual themes and organization within and across disciplines. Academic rigor is more than simply assigning to students a greater quantity of work.

Special Notes:

Instructional Practices
Teaching from a range of complex text is optimized when teachers in all subject areas implement the following strategies on a routine basis:
1. Ensuring wide reading from complex text that varies in length.
2. Making close reading and rereading of texts central to lessons.
3. Emphasizing text-specific complex questions, and cognitively complex tasks, reinforce focus on the text and cultivate independence.
4. Emphasizing students supporting answers based upon evidence from the text.
5. Providing extensive research and writing opportunities (claims and evidence).

**Science and Engineering Practices (NRC Framework for K-12 Science Education, 2010)**

- Asking questions (for science) and defining problems (for engineering).
- Developing and using models.
- Planning and carrying out investigations.
- Analyzing and interpreting data.
- Using mathematics, information and computer technology, and computational thinking.
- Constructing explanations (for science) and designing solutions (for engineering).
- Engaging in argument from evidence.
- Obtaining, evaluating, and communicating information.

**Literacy Standards in Science**

Secondary science courses include reading standards for literacy in science and technical subjects 6-12 and writing standards for literacy in history/social studies, science, and technical subjects 6-12. The courses also include speaking and listening standards. For a complete list of standards required for this course click on the blue tile labeled course standards. You may also download the complete course including all required standards and notes sections using the export function located at the top of this page.

**English Language Development ELD Standards Special Notes Section:**

Teachers are required to provide listening, speaking, reading and writing instruction that allows English language learners (ELL) to communicate information, ideas and concepts for academic success in the content area of Science. For the given level of English language proficiency and with visual, graphic, or interactive support, students will interact with grade level words, expressions, sentences and discourse to process or produce language necessary for academic success. The ELD standard should specify a relevant content area concept or topic of study chosen by curriculum developers and teachers which maximizes an ELL’s need for communication and social skills. To access an ELL supporting document which delineates performance definitions and descriptors, please click on the following link:

https://cpalmsmediaprod.blob.core.windows.net/uploads/docs/standards/eld/sc.pdf

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**GENERAL INFORMATION**

**Course Number:** 2002055

**Course Path:** Section: Grades PreK to 12 Education
Courses > **Grade Group:** Grades 6 to 8 Education
Courses > **Subject:** Science > **SubSubject:** General Sciences > **Abbreviated Title:** M/J COMPSCI1 ACC HON

**Course Length:** Year (Y)

**Course Attributes:**
- Class Size Core Required

**Course Level:** 3

**Course Status:** Course Approved

**Grade Level(s):** 6,7,8

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**Educator Certifications**

- Biology (Grades 6-12)
- Earth/Space Science (Grades 6-12)
- Middle Grades General Science (Middle Grades 5-9)
- Chemistry (Grades 6-12)
- Physics (Grades 6-12)
- Science (Secondary Grades 7-12)
### Course Standards

<table>
<thead>
<tr>
<th>Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>SC.6.E.6.1</td>
<td>Describe and give examples of ways in which Earth’s surface is built up and torn down by physical and chemical weathering, erosion, and deposition.</td>
</tr>
<tr>
<td>SC.6.E.6.2</td>
<td>Recognize that there are a variety of different landforms on Earth’s surface such as coastlines, dunes, rivers, mountains, glaciers, deltas, and lakes and relate these landforms as they apply to Florida.</td>
</tr>
<tr>
<td>SC.6.E.7.1</td>
<td>Differentiate among radiation, conduction, and convection, the three mechanisms by which heat is transferred through Earth’s system.</td>
</tr>
<tr>
<td>SC.6.E.7.2</td>
<td>Investigate and apply how the cycling of water between the atmosphere and hydrosphere has an effect on weather patterns and climate.</td>
</tr>
<tr>
<td>SC.6.E.7.3</td>
<td>Describe how global patterns such as the jet stream and ocean currents influence local weather in measurable terms such as temperature, air pressure, wind direction and speed, and humidity and precipitation.</td>
</tr>
<tr>
<td>SC.6.E.7.4</td>
<td>Differentiate and show interactions among the geosphere, hydrosphere, cryosphere, atmosphere, and biosphere.</td>
</tr>
<tr>
<td>SC.6.E.7.5</td>
<td>Explain how energy provided by the sun influences global patterns of atmospheric movement and the temperature differences between air, water, and land.</td>
</tr>
<tr>
<td>SC.6.E.7.6</td>
<td>Differentiate between weather and climate.</td>
</tr>
<tr>
<td>SC.6.E.7.7</td>
<td>Investigate how natural disasters have affected human life in Florida.</td>
</tr>
<tr>
<td>SC.6.E.7.8</td>
<td>Describe ways human beings protect themselves from hazardous weather and sun exposure.</td>
</tr>
<tr>
<td>SC.6.E.7.9</td>
<td>Describe how the composition and structure of the atmosphere protects life and insulates the planet.</td>
</tr>
<tr>
<td>SC.6.L.14.1</td>
<td>Describe and identify patterns in the hierarchical organization of organisms from atoms to molecules and cells to tissues to organs to organ systems to organisms.</td>
</tr>
<tr>
<td>SC.6.L.14.2</td>
<td>Investigate and explain the components of the scientific theory of cells (cell theory): all organisms are composed of cells (single-celled or multi-cellular), all cells come from pre-existing cells, and cells are the basic unit of life.</td>
</tr>
<tr>
<td>SC.6.L.14.3</td>
<td>Recognize and explore how cells of all organisms undergo similar processes to maintain homeostasis, including extracting energy from food, getting rid of waste, and reproducing.</td>
</tr>
<tr>
<td>SC.6.L.14.4</td>
<td>Compare and contrast the structure and function of major organelles of plant and animal cells, including cell wall, cell membrane, nucleus, cytoplasm, chloroplasts, mitochondria, and vacuoles.</td>
</tr>
<tr>
<td>SC.6.L.14.5</td>
<td>Identify and investigate the general functions of the major systems of the human body (digestive, respiratory, circulatory, reproductive, excretory, immune, nervous, and musculoskeletal) and describe ways these systems interact with each other to maintain homeostasis.</td>
</tr>
<tr>
<td>SC.6.L.14.6</td>
<td>Compare and contrast types of infectious agents that may infect the human body, including viruses, bacteria, fungi, and parasites.</td>
</tr>
<tr>
<td>SC.6.L.15.1</td>
<td>Analyze and describe how and why organisms are classified according to shared characteristics with emphasis on the Linnaean system combined with the concept of Domains.</td>
</tr>
<tr>
<td>SC.6.N.1.1</td>
<td>Define a problem from the sixth grade curriculum, use appropriate reference materials to support scientific understanding, plan and carry out scientific investigation of various types, such as systematic observations or experiments, identify variables, collect and organize data, interpret data in charts, tables, and graphics, analyze information, make predictions, and defend conclusions.</td>
</tr>
<tr>
<td>SC.6.N.1.2</td>
<td>Explain why scientific investigations should be replicable.</td>
</tr>
<tr>
<td>SC.6.N.1.3</td>
<td>Explain the difference between an experiment and other types of scientific investigation, and explain the relative benefits and limitations of each.</td>
</tr>
<tr>
<td>SC.6.N.1.4</td>
<td>Discuss, compare, and negotiate methods used, results obtained, and explanations among groups of students conducting the same investigation.</td>
</tr>
<tr>
<td>SC.6.N.1.5</td>
<td>Recognize that science involves creativity, not just in designing experiments, but also in creating explanations that fit evidence.</td>
</tr>
<tr>
<td>SC.6.N.2.1</td>
<td>Distinguish science from other activities involving thought.</td>
</tr>
<tr>
<td>SC.6.N.2.2</td>
<td>Explain that scientific knowledge is durable because it is open to change as new evidence or interpretations are encountered.</td>
</tr>
<tr>
<td>SC.6.N.2.3</td>
<td>Recognize that scientists who make contributions to scientific knowledge come from all kinds of backgrounds and possess varied talents, interests, and goals.</td>
</tr>
<tr>
<td>SC.6.N.3.1</td>
<td>Recognize and explain that a scientific theory is a well-supported and widely accepted explanation of nature and is not simply a claim posed by an individual. Thus, the use of the term theory in science is very different than how it is used in everyday life.</td>
</tr>
<tr>
<td>SC.6.N.3.2</td>
<td>Recognize and explain that a scientific law is a description of a specific relationship under given conditions in the natural world. Thus, scientific laws are different from factual laws.</td>
</tr>
<tr>
<td>SC.6.N.3.3</td>
<td>Give several examples of scientific laws.</td>
</tr>
<tr>
<td>SC.6.N.3.4</td>
<td>Identify the role of models in the context of the sixth grade science benchmarks.</td>
</tr>
<tr>
<td>SC.6.P.11.1</td>
<td>Explore the Law of Conservation of Energy by differentiating between potential and kinetic energy. Identify situations where kinetic energy is transformed into potential energy and vice versa.</td>
</tr>
<tr>
<td>SC.6.P.12.1</td>
<td>Measure and graph distance versus time for an object moving at a constant speed. Interpret this relationship.</td>
</tr>
<tr>
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<td>Investigate and describe types of forces including contact forces and forces acting at a distance, such as electrical, magnetic, and gravitational.</td>
</tr>
<tr>
<td>SC.6.P.13.2</td>
<td>Explore the Law of Gravity by recognizing that every object exerts gravitational force on every other object and that the force depends on how much mass the objects have and how far apart they are.</td>
</tr>
<tr>
<td>SC.6.P.13.3</td>
<td>Investigate and describe that an unbalanced force acting on an object changes its speed, or direction of motion, or both.</td>
</tr>
<tr>
<td>SC.8.B.1.2</td>
<td>Design and conduct a study using repeated trials and replication.</td>
</tr>
<tr>
<td>SC.8.B.1.3</td>
<td>Use phrases such as &quot;results support&quot; or &quot;fail to support&quot; in science, understanding that science does not offer conclusive ‘proof’ of a knowledge claim.</td>
</tr>
<tr>
<td>SC.8.B.1.4</td>
<td>Explain how hypotheses are valuable if they lead to further investigations, even if they turn out not to be supported by the data.</td>
</tr>
<tr>
<td>SC.8.B.1.5</td>
<td>Analyze the methods used to develop a scientific explanation as seen in different fields of science.</td>
</tr>
<tr>
<td>SC.8.B.1.6</td>
<td>Understand that scientific investigations involve the collection of relevant empirical evidence, the use of logical reasoning, and the application of imagination in devising hypotheses, predictions, explanations and models to make sense of the collected evidence.</td>
</tr>
<tr>
<td>SC.8.B.1.7</td>
<td>Explore the scientific theory of atoms (also known as atomic theory) by using models to explain the motion of particles in solids, liquids, and gases.</td>
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</tbody>
</table>
Differentiate between weight and mass recognizing that weight is the amount of gravitational pull on an object and is distinct from, though proportional to, mass.

Distinguish among mixtures (including solutions) and pure substances.

Explain the physical properties of the Sun and its dynamic nature and connect them to conditions and events on Earth.

Identify basic examples of and compare and classify the properties of compounds, including acids, bases, and salts.

Differentiate between physical and chemical properties and physical and chemical changes of matter.

Describe heat as the energy transferred by convection, conduction, and radiation, and explain the connection of heat to change in temperature or states of matter.

Compare and contrast the general structures of plant and animal cells.

Compare and contrast the general structures of prokaryotic and eukaryotic cells.

Describe the cell cycle, including the process of mitosis. Explain the role of mitosis in the formation of new cells and its importance in maintaining chromosome number during asexual reproduction.

Differentiate among the four states of matter.

Differentiate between physical and chemical properties and physical and chemical changes of matter.

Interpret formula representations of molecules and compounds in terms of composition and structure.

Describe heat as the energy transferred by convection, conduction, and radiation, and explain the connection of heat to change in temperature or states of matter.

Explore the scientific theory of atoms (also known as atomic theory) by investigating the role of subatomic particles (electrons surrounding a nucleus containing protons and neutrons).

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Identify basic examples of and compare and classify the properties of compounds, including acids, bases, and salts.

Differentiate between physical and chemical properties and physical and chemical changes of matter.

Describe heat as the energy transferred by convection, conduction, and radiation, and explain the connection of heat to change in temperature or states of matter.

Explore the scientific theory of atoms (also known as atomic theory) by investigating the role of subatomic particles (electrons surrounding a nucleus containing protons and neutrons).

Differentiate between weight and mass recognizing that weight is the amount of gravitational pull on an object and is distinct from, though proportional to, mass.

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Differentiate between physical and chemical properties and physical and chemical changes of matter.

Describe heat as the energy transferred by convection, conduction, and radiation, and explain the connection of heat to change in temperature or states of matter.

Explore the scientific theory of atoms (also known as atomic theory) by investigating the role of subatomic particles (electrons surrounding a nucleus containing protons and neutrons).
Mathematicians who engage in discussions that reflect on the mathematical thinking of self and others:
- Communicate mathematical ideas, vocabulary and methods effectively.
- Analyze the mathematical thinking of others.
- Compare the efficiency of a method to those expressed by others.
- Recognize errors and suggest how to correctly solve the task.
- Justify results by explaining methods and processes.
- Construct possible arguments based on evidence.

Clarifications:
Teachers who encourage students to engage in discussions that reflect on the mathematical thinking of self and others:
- Establish a culture in which students ask questions of the teacher and their peers, and error is an opportunity for learning.
- Create opportunities for students to discuss their thinking with peers.
- Select, sequence and present student work to advance and deepen understanding of correct and increasingly efficient methods.
- Develop students' ability to justify methods and compare their responses to the responses of their peers.

Use patterns and structure to help understand and connect mathematical concepts.
Mathematicians who use patterns and structure to help understand and connect mathematical concepts:
- Focus on relevant details within a problem.
- Create plans and procedures to logically order events, steps or ideas to solve problems.
- Decompose a complex problem into manageable parts.
- Relate previously learned concepts to new concepts.
- Look for similarities among problems.
- Connect solutions of problems to more complicated large-scale situations.

Clarifications:
Teachers who encourage students to use patterns and structure to help understand and connect mathematical concepts:
- Help students recognize the patterns in the world around them and connect these patterns to mathematical concepts.
- Support students to develop generalizations based on the similarities found among problems.
- Provide opportunities for students to create plans and procedures to solve problems.
- Develop students' ability to construct relationships between their current understanding and more sophisticated ways of thinking.

Assess the reasonableness of solutions.
Mathematicians who assess the reasonableness of solutions:
- Estimate to discover possible solutions.
- Use benchmark quantities to determine if a solution makes sense.
- Check calculations when solving problems.
- Verify possible solutions by explaining the methods used.
- Evaluate results based on the given context.

Clarifications:
Teachers who encourage students to assess the reasonableness of solutions:
- Have students estimate or predict solutions prior to solving.
- Prompt students to continually ask, "Does this solution make sense? How do you know?"
- Reinforce that students check their work as they progress within and after a task.
- Strengthen students' ability to verify solutions through justifications.

Apply mathematics to real-world contexts.
Mathematicians who apply mathematics to real-world contexts:
- Connect mathematical concepts to everyday experiences.
- Use models and methods to understand, represent and solve problems.
- Perform investigations to gather data or determine if a method is appropriate.
- Redesign models and methods to improve accuracy or efficiency.

Clarifications:
Teachers who encourage students to apply mathematics to real-world contexts:
- Provide opportunities for students to create models, both concrete and abstract, and perform investigations.
- Challenge students to question the accuracy of their models and methods.
- Support students as they validate conclusions by comparing them to the given situation.
- Indicate how various concepts can be applied to other disciplines.

Cite evidence to explain and justify reasoning.

Clarifications:
K-1 Students include textual evidence in their oral communication with guidance and support from adults. The evidence can consist of details from the text without naming the text. During 1st grade, students learn how to incorporate the evidence in their writing.
2-3 Students include relevant textual evidence in their written and oral communication. Students should name the text when they refer to it. In 3rd grade, students should use a combination of direct and indirect citations.
4-5 Students continue with previous skills and reference comments made by speakers and peers. Students cite texts that they've directly quoted, paraphrased, or used for information. When writing, students will use the form of citation dictated by the instructor or the style guide referenced by the instructor.
6-8 Students continue with previous skills and use a style guide to create a proper citation.
9-12 Students continue with previous skills and should be aware of existing style guides and the ways in which they differ.

Read and comprehend grade-level complex texts proficiently.
### Clarifications

#### ELA.K12.EE.2.1
- **Clarifications:**
  - Make inferences to support comprehension.

#### ELA.K12.EE.3.1
- **Clarifications:**
  - Students will make inferences before the words infer or inference are introduced. Kindergarten students will answer questions like “Why is the girl smiling?” or make predictions about what will happen based on the title page. Students will use the terms and apply them in 2nd grade and beyond.

#### ELA.K12.EE.4.1
- **Clarifications:**
  - Use appropriate collaborative techniques and active listening skills when engaging in discussions in a variety of situations.

#### ELA.K12.EE.5.1
- **Clarifications:**
  - Use the accepted rules governing a specific format to create quality work.

#### ELA.K12.EE.6.1
- **Clarifications:**
  - Use appropriate voice and tone when speaking or writing.

#### ELD.K12.ELL.SI.1
- **Clarifications:**
  - English language learners communicate information, ideas and concepts necessary for academic success in the content area of Science.

#### ELD.K12.ELL.SC.1
- **Clarifications:**
  - English language learners communicate for social and instructional purposes within the school setting.

#### HE.7.C.1.3
- **Clarifications:**
  - Analyses: Students build on ideas, propel the conversation, and support claims and counterclaims with evidence.

#### HE.7.C.1.7
- **Clarifications:**
  - Compare: Students build on ideas, propel the conversation, and support claims and counterclaims with evidence.

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### General Course Information and Notes

**GENERAL NOTES**

Laboratory investigations that include the use of scientific inquiry, research, measurement, problem solving, laboratory apparatus and technologies, experimental procedures, and safety procedures are an integral part of this course. The National Science Teachers Association (NSTA) recommends that at the middle school level, all students should have multiple opportunities every week to explore science laboratory investigations (labs). School laboratory investigations are defined by the National Research Council (NRC) as an experience in the laboratory, classroom, or the field that provides students with opportunities to interact directly with natural phenomena or with data collected by others using tools, materials, data collection techniques, and models (NRC, 2006, p. 3). Laboratory investigations in the middle school classroom should help all students develop a growing understanding of the complexity and ambiguity of empirical work, as well as the skills to calibrate and troubleshoot equipment used to make observations. Learners should understand measurement error; and have the skills to aggregate, interpret, and present the resulting data (NRC 2006, p. 77; NSTA, 2007).

**Honors and Advanced Level Course Note:** Advanced courses require a greater demand on students through increased academic rigor. Academic rigor is obtained through the application, analysis, evaluation, and creation of complex ideas that are often abstract and multi-faceted. Students are challenged to think and collaborate critically on the content they are learning. Honors level rigor will be achieved by increasing text complexity through text selection, focus on high-level qualitative measures, and complexity of task. Instruction will be structured to give students a deeper understanding of conceptual themes and organization within and across disciplines. Academic rigor is more than simply assigning to students a greater quantity of work.

**Special Notes:**

**Instructional Practices**

Teaching from a range of complex text is optimized when teachers in all subject areas implement the following strategies on a routine basis:

1. Ensuring wide reading from complex text that varies in length.
2. Making close reading and rereading of texts central to lessons.
3. Emphasizing text-specific complex questions, and cognitively complex tasks, reinforce focus on the text and cultivate independence.
4. Emphasizing students supporting answers based upon evidence from the text.
5. Providing extensive research and writing opportunities (claims and evidence).

**Science and Engineering Practices (NRC Framework for K-12 Science Education, 2010)**

- Asking questions (for science) and defining problems (for engineering).
- Developing and using models.
- Planning and carrying out investigations.
- Analyzing and interpreting data.
- Using mathematics, information and computer technology, and computational thinking.
- Constructing explanations (for science) and designing solutions (for engineering).
- Engaging in argument from evidence.
- Obtaining, evaluating, and communicating information.

**Florida's Benchmarks for Excellent Student Thinking (B.E.S.T.) Standards**

This course includes Florida's B.E.S.T. ELA Expectations (EE) and Mathematical Thinking and Reasoning Standards (MTRs) for students. Florida educators should intentionally embed these standards within the content and their instruction as applicable. For guidance on the implementation of the EE and MTRs, please visit https://www.cpalms.org/Standards/BEST_Standards.aspx and select the appropriate B.E.S.T. Standards package.

**English Language Development ELD Standards Special Notes Section:**

Teachers are required to provide listening, speaking, reading and writing instruction that allows English language learners (ELL) to communicate information, ideas and concepts for academic success in the content area of Science. For the given level of English language proficiency and with visual, graphic, or interactive support, students will interact with grade level words, expressions, sentences and discourse to process or produce language necessary for academic success. The ELD standard should specify a relevant content area concept or topic of study chosen by curriculum developers and teachers which maximizes an ELL's need for communication and social skills. To access an ELL supporting document which delineates performance definitions and descriptors, please click on the following link:
https://cpalmsmediaprod.blob.core.windows.net/uploads/docs/standards/eld/sc.pdf

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**GENERAL INFORMATION**

<table>
<thead>
<tr>
<th>Course Number: 2002055</th>
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<tbody>
<tr>
<td>Course Path: Section: Grades PreK to 12 Education Courses &gt; Grade Group: Grades 6 to 8 Education Courses &gt; Subject: Science &gt; SubSubject: General Sciences</td>
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<td>Course Length: Year (Y)</td>
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<td>Class Size Core Required</td>
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**Course Status:** State Board Approved

**Grade Level(s):** 6,7,8

**Educator Certifications**

- Biology (Grades 6-12)
- Earth/Space Science (Grades 6-12)
- Middle Grades General Science (Middle Grades 5-9)
- Chemistry (Grades 6-12)
- Physics (Grades 6-12)
- Science (Secondary Grades 7-12)

General Course Information and Notes

GENERAL NOTES


GENERAL INFORMATION

Course Number: 2002056
Course Type: Core Academic Course
Course Status: Course Approved
Grade Level(s): 6,7,8

Course Path: Grades PreK to 12 Education
Courses > Grade Group: Grades 6 to 8 Education
Courses > Subject: Science > SubSubject: General Sciences
Abbreviated Title: M/J SCI 1 CLS
Course Length: Year (Y)
Course Attributes:
  * Advanced International Certificate of Education (AICE)
Course Level: 3

Educator Certifications

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General Course Information and Notes

GENERAL NOTES


GENERAL INFORMATION

Course Number: 2002056
Course Path: Section: Grades PreK to 12 Education Courses > Grade Group: Grades 6 to 8 Education Courses > Subject: Science > SubSubject: General Sciences > Abbreviated Title: M/J SCI 1 CLS
Course Length: Year (Y)
Course Attributes:
- Advanced International Certificate of Education (AICE)
Course Level: 3

Grade Level(s): 6,7,8

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<td>Science (Secondary Grades 7-12)</td>
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General Course Information and Notes

GENERAL NOTES

The curriculum description for this IB course is provided at:
http://www.ibo.org/en/programmes/

GENERAL INFORMATION

Course Number: 2002060
Course Type: Core Academic Course
Course Status: Course Approved
Grade Level(s): 6,7,8

Course Path: Section: Grades PreK to 12 Education
Courses > Grade Group: Grades 6 to 8 Education
Courses > Subject: Science > SubSubject: General Sciences >
Abbreviated Title: M/J IB MYP COMP SCI1
Course Length: Year (Y)
Course Attributes:
• International Baccalaureate (IB)
Course Level: 3

Educator Certifications

Science (Elementary Grades 1-6)
Science (Secondary Grades 7-12)
Middle Grades Integrated Curriculum (Middle Grades 5-9)
Chemistry (Grades 6-12)
Middle Grades General Science (Middle Grades 5-9)
Physics (Grades 6-12)
Earth/Space Science (Grades 6-12)
Biology (Grades 6-12)
Elementary Education (Grades K-6)
Elementary Education (Elementary Grades 1-6)
Describe and investigate various limiting factors in the local ecosystem and their impact on native populations, including food, shelter, water, space, disease, parasitism, predation, and nesting sites.

Define a problem from the seventh grade curriculum, use appropriate reference materials to support scientific understanding, plan and carry out scientific investigation of various types, such as systematic observations or experiments, identify variables, collect and organize data, interpret data in charts, tables, and graphics, analyze information, make predictions, and defend conclusions.

Distinguish between an experiment (which must involve the manipulation of the independent variable) and an observation or survey. Also distinguish between an experiment (which must involve the manipulation of the independent variable) and a natural event, and explain that not all scientific knowledge is derived from experimentation.

Identify test variables (independent variables) and outcome variables (dependent variables) in an experiment.

Recognize the trend in evidence that supports the scientific theory of evolution by natural selection and diversity of organisms. Explain how variation within populations and the process of natural selection lead to the evolution of species. Explain and illustrate the roles of and relationships among producers, consumers, and decomposers in the process of energy transfer in a food web.

Explain and illustrate the roles of and relationships among organisms such as mutualism, predation, parasitism, competition, and commensalism.

Define a problem from the seventh grade curriculum, use appropriate reference materials to support scientific understanding, plan and carry out scientific investigation of various types, such as systematic observations or experiments, identify variables, collect and organize data, interpret data in charts, tables, and graphics, analyze information, make predictions, and defend conclusions.

Understand and explain that every organism requires a set of instructions to direct its growth, development, and functioning. Include that heredity is the passage of these instructions from one generation to another.

Describe the layers of the solid Earth, including the lithosphere, the hot convectional mantle, and the dense metallic liquid and solid cores.

Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 6-8 texts and topics.

Recognize the trend in evidence that supports the scientific theory of evolution by natural selection and diversity of organisms. Explain how variation within populations and the process of natural selection lead to the evolution of species. Explain and illustrate the roles of and relationships among organisms such as mutualism, predation, parasitism, competition, and commensalism.

Identify the patterns within the rock cycle and relate them to surface events (weathering and erosion) and sub-surface events (plate tectonics and mountain building).

Identify current methods for measuring the age of Earth and its parts, including the law of superposition and radioactive dating.

Identify the impact that humans have had on Earth, such as deforestation, urbanization, desertification, erosion, air and water quality, changing the flow of water.

Identify the role of energy in the rock cycle, including the major sections contribute to the whole and to an understanding of the major processes.

Recognize that not all scientific knowledge is derived from experimentation.

Recognize and explain that not all scientific knowledge is derived from experimentation.

Identify the benefits and limitations of the use of scientific models.

Recognize the trend in evidence that supports the scientific theory of evolution by natural selection and diversity of organisms. Explain how variation within populations and the process of natural selection lead to the evolution of species. Explain and illustrate the roles of and relationships among organisms such as mutualism, predation, parasitism, competition, and commensalism.

Review evidence from experimentation.

Compare and contrast the relationships among organisms such as mutualism, predation, parasitism, competition, and commensalism.

Describe the methods used in the pursuit of a scientific explanation as seen in different fields of science such as biology, geology, and physics.

Define and use the terms used in scientific writing, including the terms cause, effect, variable, control variable, hypothesis, experiment, conclusion, and inference.

Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 6-8 texts and topics.

Recognize and explain the difference between theories and laws and give several examples of scientific theories and the evidence that supports them.

Recognize and explain the difference between theories and laws and give several examples of scientific theories and the evidence that supports them.

Provide an accurate summary of the text distinct from prior knowledge or opinions.

Analyze the author's purpose in providing an explanation, describing a procedure, or discussing an experiment in a text.

Identify the patterns within the rock cycle and relate them to surface events (weathering and erosion) and sub-surface events (plate tectonics and mountain building).

Define and use the terms used in scientific writing, including the terms cause, effect, variable, control variable, hypothesis, experiment, conclusion, and inference.

Understand that not all scientific knowledge is derived from experimentation.

Describe the layers of the solid Earth, including the lithosphere, the hot convectional mantle, and the dense metallic liquid and solid cores.
Write arguments focused on discipline-specific content.
   a. Introduce claim(s) about a topic or issue, acknowledge and distinguish the claim(s) from alternate or opposing claims, and organize the reasons and evidence logically.
   b. Support claim(s) with logical reasoning and relevant, accurate data and evidence that demonstrate an understanding of the topic or text, using credible sources.
   c. Use words, phrases, and clauses to create cohesion and clarify the relationships among claim(s), counterclaims, reasons, and evidence.
   d. Establish and maintain a formal style.
   e. Provide a concluding statement or section that follows from and supports the argument presented.

Use technology, including the Internet, to produce and publish writing efficiently.

Introduce claim(s) about a topic or issue, acknowledge and distinguish the claim(s) from alternate or opposing claims, and organize the reasons and evidence logically. Support claim(s) with logical reasoning and relevant, accurate data and evidence that demonstrate an understanding of the topic or text, using credible sources. Use words, phrases, and clauses to create cohesion and clarify the relationships among claim(s), counterclaims, reasons, and evidence. Establish and maintain a formal style. Provide a concluding statement or section that follows from and supports the argument presented.

LAFS.68.WHST.1.2:
Write informative/explanatory texts, including the narration of historical events, scientific procedures/experiments, or technical processes.
   a. Introduce a topic clearly, previewing what is to follow; organize ideas, concepts, and information into broader categories as appropriate to achieving purpose; include formatting (e.g., headings), graphics (e.g., charts, tables), and multimedia when useful to aiding comprehension.
   b. Develop the topic with relevant, well-chosen facts, definitions, concrete details, quotations, or other information and examples.
   c. Use appropriate and varied transitions to create cohesion and clarify the relationships among ideas and concepts.
   d. Use precise language and domain-specific vocabulary to inform about or explain the topic.
   e. Establish and maintain a formal style and objective tone.
   f. Provide a concluding statement or section that follows from and supports the information or explanation presented.

LAFS.68.WHST.2.4:
Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.

LAFS.68.WHST.2.5:
With some guidance and support from peers and adults, develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on how well purpose and audience have been addressed.

LAFS.68.WHST.2.6:
Use technology, including the Internet, to produce and publish writing and present the relationships between information and ideas clearly and efficiently.

LAFS.68.WHST.3.7:
Conduct short research projects to answer a question (including a self-generated question), drawing on several sources and generating additional related, focused questions that allow for multiple avenues of exploration.

LAFS.68.WHST.3.8:
Gather relevant information from multiple print and digital sources, using search terms effectively, assess the credibility and accuracy of each source; and quote or paraphrase the data and conclusions of others while avoiding plagiarism and following a standard format for citation.

LAFS.68.WHST.3.9:
Draw evidence from informational texts to support analysis reflection, and research.

LAFS.68.WHST.4.10:
Write routinely over extended time frames (time for reflection and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences.

LAFS.7.SL.1.1:
Engage effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grade 7 topics, texts, and issues, building on others' ideas and expressing their own clearly.
   a. Come to discussions prepared, having read or researched material under study; explicitly draw on that preparation by referring to evidence on the topic, text, or issue to probe and reflect on ideas under discussion.
   b. Follow rules for collegial discussions, track progress toward specific goals and deadlines, and define individual roles as needed.
   c. Pose questions that elicit elaboration and respond to others' questions and comments with relevant observations and ideas that bring the discussion back on topic as needed.
   d. Acknowledge new information expressed by others and, when warranted, modify their own views.

LAFS.7.SL.1.2:
Analyze the main ideas and supporting details presented in diverse media and formats (e.g., visually, quantitatively, orally) and explain how the ideas clarify a topic, text, or issue under study.

LAFS.7.SL.1.3:
Delineate a speaker's argument and specific claims, evaluating the soundness of the reasoning and the relevance and sufficiency of the evidence.

LAFS.7.SL.2.4:
Present claims and findings, emphasizing salient points in a focused, coherent manner with pertinent descriptions, facts, details, and examples; use appropriate eye contact, adequate volume, and clear pronunciation.

LAFS.7.SL.2.5:
Include multimedia components and visual displays in presentations to clarify claims and findings and emphasize salient points.

MAFS.7.SP.2.4:
Use measures of center and measures of variability for numerical data from random samples to draw informal comparative inferences about two populations. For example, decide whether the words in a chapter of a seventh-grade science book are generally longer than the words in a chapter of a fourth-grade science book.

MAFS.7.SP.3.5:
Understand that the probability of a chance event is a number between 0 and 1 that expresses the likelihood of the event occurring. Larger numbers indicate greater likelihood. A probability near 0 indicates an unlikely event, a probability around 1/2 indicates an event that is neither unlikely nor likely, and a probability near 1 indicates a likely event.

Make sense of problems and persevere in solving them.

Mathematically proficient students start by explaining to themselves the meaning of a problem and looking for entry points to its solution. They analyze givers, constraints, relationships, and goals. They make conjectures about the form and meaning of the solution and plan a solution pathway rather than simply jumping into a solution attempt. They consider analogous problems, and try special cases and simpler forms of the original problem in order to gain insight into its solution. They monitor and evaluate their progress and change course if necessary. Older students might, depending on the context of the problem, transform algebraic expressions or change the viewing window on their graphing calculator to get the information they need. Mathematically proficient students can explain correspondences between equations, verbal descriptions, tables, and graphs or draw diagrams of important features and relationships, graph data, and search for regularity or trends. Younger students might rely on using concrete objects or pictures to help conceptualize and solve a problem. Mathematically proficient students check their answers to problems using a different method, and they continually ask themselves, “Does this make sense?” They can understand the approaches of others to solving complex problems and identify correspondences between different approaches.

Standard Relation to Course: Supporting

Reason abstractly and quantitatively.

Mathematically proficient students make sense of quantities and their relationships in problem situations. They bring two complementary abilities to bear on problems involving quantitative relationships: the ability to decontextualize—to isolate a given situation and represent it symbolically and manipulate the representing symbols as if they have a life of their own, without necessarily attending to their referents—and the ability to contextualize, to pause as needed during the manipulation process in order to probe into the referents for the symbols involved. Quantitative reasoning entails habits of creating a coherent representation of the problem at hand; considering the units involved; attending to the meaning of quantities, not just how to compute them; and knowing and flexibly using different properties of operations and objects.

Standard Relation to Course: Supporting

Construct viable arguments and critique the reasoning of others.
Mathematically proficient students understand and use stated assumptions, definitions, and previously established results in constructing arguments. They make conjectures and build a logical progression of statements to explore the truth of their conjectures. They are able to analyze situations by breaking them into cases, and can recognize and use counterexamples. They justify their conclusions, communicate them to others, and respond to the arguments of others. They reason inductively about data, making plausible arguments that take into account the context from which the data arose. Mathematically proficient students are also able to compare the effectiveness of two plausible arguments, distinguish correct logic or reasoning from that which is flawed, and—if there is a flaw in an argument—explain what it is. Elementary students can construct arguments using concrete referents such as objects, drawings, diagrams, and actions. Such arguments can make sense and be correct, even though they are not generalized or made formal until later grades. Later, students learn to determine domains to which an argument applies. Students at all grades can listen or read the arguments of others, decide whether they make sense, and ask useful questions to clarify or improve the arguments.

Standard Relation to Course: Supporting

Model with mathematics.

Mathematically proficient students can apply the mathematics they know to solve problems arising in everyday life, society, and the workplace. In early grades, this might be as simple as writing an addition equation to describe a situation. In middle grades, a student might apply proportional reasoning to plan a school event or analyze a problem in the community. By high school, a student might use geometry models to solve a design problem, use algebraic models to represent and explain quantitative relationships, or use probability to make sense of data.

Standard Relation to Course: Supporting

Use appropriate tools strategically.

Mathematically proficient students consider the available tools when solving a mathematical problem. These tools might include pencil and paper, concrete models, a ruler, a protractor, a calculator, a spreadsheet, a computer algebra system, a statistical package, or dynamic geometry software. Proficient students are sufficiently familiar with tools appropriate for their grade or course to make sound decisions about when each of these tools might be helpful. Recognizing both the insight to be gained and their limitations. For example, mathematically proficient high school students analyze graphs of functions and solutions generated using a graphing calculator. They detect possible errors by strategically using estimation and other mathematical knowledge. When making mathematical models, they know that technology can enable them to visualize the results of varying assumptions, explore consequences, and compare predictions with data. Mathematically proficient students at various grade levels are able to identify relevant external mathematical resources, such as digital content located on a website, and use them to pose or solve problems. They are able to use technological tools to explore and deepen their understanding of concepts.

Standard Relation to Course: Supporting

Attend to precision.

Mathematically proficient students try to communicate precisely to others. They try to use clear definitions in discussion with others and in their own reasoning. They state the meaning of the symbols they choose, including using the equal sign consistently and appropriately. They are careful about specifying units of measure, and labeling axes to clarify the correspondence with quantities in a problem. They calculate accurately and efficiently, and express numerical answers with a degree of precision appropriate for the problem context. In the elementary grades, students give carefully formulated explanations to each other. By the time they reach high school they have learned to examine claims and make explicit use of definitions.

Standard Relation to Course: Supporting

Look for and make use of structure.

Mathematically proficient students look closely to discern a pattern or structure. Young students, for example, might notice that three and seven more is the same amount as seven and three more, or they may sort a collection of shapes according to how many sides the shapes have. Later, students will see 7 + 8 equals the well remembered 7 + 5 = 12, in preparation for learning about the distributive property. In the expression x² + 9x + 14, older students can see the 14 as 2 · 7 and the 9 as 2 + 7. They recognize the significance of an existing line in a geometric figure and can use the strategy of drawing an auxiliary line for solving problems. They also can step back for an overview and shift perspective. They can see complicated things, such as some algebraic expressions, as single objects or as being composed of several objects. For example, they can see 5 - 3(x - y)² as 5 minus a positive number times a square and use that to recognize that its value cannot be more than 5 for any real numbers x and y.

Standard Relation to Course: Supporting

Look for and express regularity in repeated reasoning.

Mathematically proficient students notice if calculations are repeated, and look both for general methods and for shortcuts. Upper elementary students might notice when dividing 25 by 11 that they are repeating the same calculations over and over again, and conclude they have a repeating decimal. By paying attention to the calculation of slope as they repeatedly check whether points are on the line through (1, 2) with slope 3, middle school students might abstract the equation (y - 2)/(x - 1) = 3. Noticing the regularity in the way terms cancel when expanding (x - 1)(x + 1), (x - 1)² + x + 1, and (x - 1)² + x + 1 might lead them to the general formula for the sum of a geometric series. As they work to solve a problem, mathematically proficient students maintain oversight of the process, while attending to the details. They continually evaluate the reasonableness of their intermediate results.

Standard Relation to Course: Supporting

English language learners communicate information, ideas and concepts necessary for academic success in the content area of Science.

English language learners communicate for social and instructional purposes within the school setting.

Analyze how environmental factors affect personal health.

Food refrigeration, appropriate home heating and cooling, air/water quality, and garbage/trash collection.

Explain the likelihood of injury or illness if engaging in unhealthy/risky behaviors.

Abuse of over-the-counter medications, sexually transmitted diseases and sexually transmitted infections from sexual relationships, injury, or death from unsupervised handling of firearms, and physical/emotional injury, or impact from abusive dating partner.
General Course Information and Notes

General Notes

Laboratory investigations that include the use of scientific inquiry, research, measurement, problem solving, laboratory apparatus and technologies, experimental procedures, and safety procedures are an integral part of this course. The National Science Teachers Association (NSTA) recommends that at the middle school level, all students should have multiple opportunities every week to explore science laboratory investigations (labs). School laboratory investigations are defined by the National Research Council (NRC) as an experience in the laboratory, classroom, or the field that provides students with opportunities to interact directly with natural phenomena or with data collected by others using tools, materials, data collection techniques, and models (NRC, 2006, p. 3). Laboratory investigations in the middle school classroom should help all students develop a growing understanding of the complexity and ambiguity of empirical work, as well as the skills to calibrate and troubleshoot equipment used to make observations. Learners should understand measurement error and have the skills to aggregate, interpret, and present the resulting data (NRC 2006, p. 77; NSTA, 2007).

Special Notes:

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4. Emphasizing students supporting answers based upon evidence from the text.
5. Providing extensive research and writing opportunities (claims and evidence).


- Asking questions (for science) and defining problems (for engineering).
- Developing and using models.
- Planning and carrying out investigations.
- Analyzing and interpreting data.
- Using mathematics, information and computer technology, and computational thinking.
- Constructing explanations (for science) and designing solutions (for engineering).
- Engaging in argument from evidence.
- Obtaining, evaluating, and communicating information.

Literacy Standards in Science

Secondary science courses include reading standards for literacy in science and technical subjects 6-12 and writing standards for literacy in history/social studies, science, and technical subjects 6-12. The courses also include speaking and listening standards. For a complete list of standards required for this course click on the blue tile labeled course standards. You may also download the complete course including all required standards and notes sections using the export function located at the top of this page.

English Language Development ELD Standards Special Notes Section:

Teachers are required to provide listening, speaking, reading and writing instruction that allows English language learners (ELL) to communicate information, ideas and concepts for academic success in the content area of Science. For the given level of English language proficiency and with visual, graphic, or interactive support, students will interact with grade level words, expressions, sentences and discourse to process or produce language necessary for academic success. The ELD standard should specify a relevant content area concept or topic of study chosen by curriculum developers and teachers which maximizes an ELL's need for communication and social skills.

To access an ELL supporting document which delineates performance definitions and descriptors, please click on the following link: https://cpalmsmediaprod.blob.core.windows.net/uploads/docs/standards/eld/sc.pdf

Additional Instructional Resources:


General Information

Course Number: 2002070

Course Path: Section: Grades PreK to 12 Education Courses > Grade Group: Grades 6 to 8 Education Courses > Subject: Science > SubSubject: General Sciences >

Abbreviated Title: M/J COMPRE SCI 2

Course Length: Year (Y)

Course Attributes:
- Class Size Core Required

Course Level: 2

Grade Level(s): 6,7,8

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<td>Recognize and explain the difference between theories and laws and give several examples of scientific theories and the evidence that supports them.</td>
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<td>Identify the benefits and limitations of the use of scientific models. Friction is a force that resists the relative motion of objects that are in contact.</td>
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<td>Illustrate that the sun's energy arrives as radiation with a wide range of wavelengths, including infrared, visible, and ultraviolet, and that white light is made up of a spectrum of many different colors.</td>
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<td>Observe and explain that light can be reflected, refracted, and/or absorbed. Use a colorimeter to measure the color of light.</td>
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<td>Recognize that light waves, sound waves, and other waves move at different speeds in different materials.</td>
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<td>Recognize that adding heat to or removing heat from a system may result in a temperature change and possibly a change of state.</td>
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<td>Investigate and describe the transformation of energy from one form to another.</td>
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<td>Cite evidence to explain that energy cannot be created nor destroyed, only changed from one form to another.</td>
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<td>Observe and describe that heat flows in predictable ways, moving from warmer objects to cooler ones until they reach the same temperature.</td>
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**Mathematicians who participate in effortful learning both individually and with others:**
- Analyze the problem in a way that makes sense given the task.
- Ask questions that will help with solving the task.
- Build perseverance by modifying methods as needed while solving a challenging task.
- Stay engaged and maintain a positive mindset when working to solve tasks.
- Help and support each other when attempting a new method or approach.

**Clarifications:**
Teachers who encourage students to participate actively in effortful learning both individually and with others:
- Cultivate a community of growth mindset learners.
- Foster perseverance in students by choosing tasks that are challenging.
- Develop students' ability to analyze and problem solve.
- Recognize students' effort when solving challenging problems.

**MA.K12.MTR.1.1:**
Demonstrate understanding by representing problems in multiple ways.
Mathematicians who demonstrate understanding by representing problems in multiple ways:
- Build understanding through modeling and using manipulatives.
- Represent solutions to problems in multiple ways using objects, drawings, tables, graphs and equations.
- Progress from modeling problems with objects and drawings to using algorithms and equations.
- Express connections between concepts and representations.
- Choose a representation based on the given context or purpose.

**Clarifications:**
Teachers who encourage students to demonstrate understanding by representing problems in multiple ways:
- Help students make connections between concepts and representations.
- Provide opportunities for students to use manipulatives when investigating concepts.
- Guide students from concrete to pictorial to abstract representations as understanding progresses.
- Show students that various representations can have different purposes and can be useful in different situations.

Complete tasks with mathematical fluency.
Mathematicians who complete tasks with mathematical fluency:
- Select efficient and appropriate methods for solving problems within the given context.
- Maintain flexibility and accuracy while performing procedures and mental calculations.
- Complete tasks accurately and with confidence.
- Adapt procedures to apply them to a new context.
- Use feedback to improve efficiency when performing calculations.

**Clarifications:**
Teachers who encourage students to complete tasks with mathematical fluency:
- Provide students with the flexibility to solve problems by selecting a procedure that allows them to solve efficiently and accurately.
- Offer multiple opportunities for students to practice efficient and generalizable methods.
- Provide opportunities for students to reflect on the method they used and determine if a more efficient method could have been used.

Engage in discussions that reflect on the mathematical thinking of self and others.
Mathematicians who engage in discussions that reflect on the mathematical thinking of self and others:
- Communicate mathematical ideas, vocabulary and methods effectively.
- Analyze the mathematical thinking of others.
- Compare the efficiency of a method to those expressed by others.
- Recognize errors and suggest how to correctly solve the task.
- Justify results by explaining methods and processes.
- Construct possible arguments based on evidence.

**Clarifications:**
Teachers who encourage students to engage in discussions that reflect on the mathematical thinking of self and others:
- Establish a culture in which students ask questions of the teacher and their peers, and error is an opportunity for learning.
- Create opportunities for students to discuss their thinking with peers.
- Select, sequence and present student work to advance and deepen understanding of correct and increasingly efficient methods.
- Develop students' ability to justify methods and compare their responses to the responses of their peers.

Use patterns and structure to help understand and connect mathematical concepts.
Mathematicians who use patterns and structure to help understand and connect mathematical concepts:
- Focus on relevant details within a problem.
- Create plans and procedures to logically order events, steps or ideas to solve problems.
- Decompose a complex problem into manageable parts.
- Relate previously learned concepts to new concepts.
- Look for similarities among problems.
- Connect solutions of problems to more complicated large-scale situations.

**Clarifications:**
Teachers who encourage students to use patterns and structure to help understand and connect mathematical concepts:
- Help students recognize the patterns in the world around them and connect these patterns to mathematical concepts.
- Support students to develop generalizations based on the similarities found among problems.
- Provide opportunities for students to create plans and procedures to solve problems.
- Develop students' ability to construct relationships between their current understanding and more sophisticated ways of thinking.

Assess the reasonableness of solutions.
Mathematicians who assess the reasonableness of solutions:
- Estimate to discover possible solutions.
- Use benchmark quantities to determine if a solution makes sense.
- Check calculations when solving problems.
- Verify possible solutions by explaining the methods used.
- Evaluate results based on the given context.

**Clarifications:**
Teachers who encourage students to assess the reasonableness of solutions:
- Have students estimate or predict solutions prior to solving.
- Prompt students to continually ask, "Does this solution make sense? How do you know?"
- Reinforce that students check their work as they progress within and after a task.
- Strengthen students' ability to verify solutions through justifications.
Apply mathematics to real-world contexts.
Mathematicians who apply mathematics to real-world contexts:

- Connect mathematical concepts to everyday experiences.
- Use models and methods to understand, represent and solve problems.
- Perform investigations to gather data or determine if a method is appropriate. • Redesign models and methods to improve accuracy or efficiency.

**MA.K12.MTR.7.1:**

**Clariﬁcations:**

Teachers who encourage students to apply mathematics to real-world contexts:

- Provide opportunities for students to create models, both concrete and abstract, and perform investigations.
- Challenge students to question the accuracy of their models and methods.
- Support students as they validate conclusions by comparing them to the given situation.
- Indicate how various concepts can be applied to other disciplines.

Cite evidence to explain and justify reasoning.

**Clarifications:**

K-1 Students include textual evidence in their oral communication with guidance and support from adults. The evidence can consist of details from the text without naming the text. During 1st grade, students learn how to incorporate the evidence in their writing.

2-3 Students include relevant textual evidence in their written and oral communication. Students should name the text when they refer to it. In 3rd grade, students should use a combination of direct and indirect citations.

4-5 Students continue with previous skills and reference comments made by speakers and peers. Students cite texts that they’ve directly quoted, paraphrased, or used for information. When writing, students will use the form of citation dictated by the instructor or the style guide referenced by the instructor.

6-8 Students continue with previous skills and use a style guide to create a proper citation.

9-12 Students continue with previous skills and should be aware of existing style guides and the ways in which they differ.

Read and comprehend grade-level complex texts proficiently.

**Clarifications:**

See Text Complexity for grade-level complexity bands and a text complexity rubric.

**ELA.K12.EE.2.1:**

Make inferences to support comprehension.

**Clarifications:**

Students will make inferences before the words infer or inference are introduced. Kindergarten students will answer questions like “Why is the girl smiling?” or make predictions about what will happen based on the title page. Students will use the terms and apply them in 2nd grade and beyond.

**ELA.K12.EE.3.1:**

Use appropriate collaborative techniques and active listening skills when engaging in discussions in a variety of situations.

**Clarifications:**

In kindergarten, students learn to listen to one another respectfully. In grades 1-2, students build upon these skills by justifying what they are thinking. For example: “I think ______ because ______.” The collaborative conversations are becoming academic conversations.

In grades 3-12, students engage in academic conversations discussing claims and justifying their reasoning, refining and applying skills. Students build on ideas, propel the conversation, and support claims and counterclaims with evidence.

Use the accepted rules governing a specific format to create quality work.

**Clarifications:**

Students will incorporate skills learned into work products to produce quality work. For students to incorporate these skills appropriately, they must receive instruction. A 3rd grade student creating a poster board display must have instruction in how to effectively present information to do quality work.

Use appropriate voice and tone when speaking or writing.

**Clarifications:**

In kindergarten and 1st grade, students learn the difference between formal and informal language. For example, the way we talk to our friends differs from the way we speak to adults. In 2nd grade and beyond, students practice appropriate social and academic language to discuss texts.

English language learners communicate information, ideas and concepts necessary for academic success in the context area of Science.

**ELD.K12.ELL.SC.1:**

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Analyze how environmental factors affect personal health.

**Clarifications:**

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**HE.7.C.1.3:**

Explain the likelihood of injury or illness if engaging in unhealthy/risky behaviors.

**Clarifications:**

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Florida's Benchmarks for Excellent Student Thinking (B.E.S.T.) Standards

This course includes Florida's B.E.S.T. ELA Expectations (EE) and Mathematical Thinking and Reasoning Standards (MTRs) for students. Florida educators should intentionally embed these standards within the content and their instruction as applicable. For guidance on the implementation of the EE and MTRs, please visit https://www.cpalms.org/Standards/BEST_Standards.aspx and select the appropriate B.E.S.T. Standards package.

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Additional Instructional Resources:

GENERAL INFORMATION

Course Number: 2002070

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- **Courses > Grade Group:** Grades 6 to 8 Education
- **Courses > Subject:** Science > **SubSubject:** General Sciences
- **Abbreviated Title:** M/J COMPRE SCI 2
- **Course Length:** Year (Y)
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<td>SC.7.N.1.6:</td>
<td>Explain that empirical evidence is the cumulative body of observations of a natural phenomenon on which scientific explanations are based.</td>
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<tr>
<td>SC.7.N.1.7:</td>
<td>Explain that scientific knowledge is the result of a great deal of debate and confirmation within the science community.</td>
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<tr>
<td>SC.7.N.2.1:</td>
<td>Identify an instance from the history of science in which scientific knowledge has changed when new evidence or new interpretations are encountered.</td>
</tr>
<tr>
<td>SC.7.N.3.1:</td>
<td>Recognize and explain the difference between theories and laws and give several examples of scientific theories and the evidence that supports them.</td>
</tr>
<tr>
<td>SC.7.N.3.2:</td>
<td>Identify the benefits and limitations of the use of scientific models.</td>
</tr>
<tr>
<td>SC.7.P.10.1:</td>
<td>Illustrate that the sun's energy arrives as radiation with a wide range of wavelengths, including infrared, visible, and ultraviolet, and that white light is made up of a spectrum of many different colors.</td>
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<tr>
<td>SC.7.P.10.2:</td>
<td>Observe and explain that light can be reflected, refracted, and/or absorbed.</td>
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<tr>
<td>SC.7.P.10.3:</td>
<td>Recognize that light waves, sound waves, and other waves move at different speeds in different materials.</td>
</tr>
<tr>
<td>SC.7.P.11.1:</td>
<td>Recognize that adding heat to or removing heat from a system may result in a temperature change and possibly a change of state.</td>
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<tr>
<td>SC.7.P.11.2:</td>
<td>Investigate and describe the transformation of energy from one form to another.</td>
</tr>
<tr>
<td>SC.7.P.11.3:</td>
<td>Cite evidence to explain that energy cannot be created nor destroyed, only changed from one form to another.</td>
</tr>
<tr>
<td>SC.7.P.11.4:</td>
<td>Observe and describe that heat flows in predictable ways, moving from warmer objects to cooler ones until they reach the same temperature.</td>
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<tr>
<td>SC.9.D.1.E.6.2:</td>
<td>Connect surface features to surface processes that are responsible for their formation.</td>
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<tr>
<td>SC.9.D.1.E.6.3:</td>
<td>Analyze the scientific theory of plate tectonics and identify related major processes and features as a result of moving plates.</td>
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<tr>
<td>SC.9.D.1.L.15.6:</td>
<td>Discuss distinguishing characteristics of the domains and kingdoms of living organisms.</td>
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<tr>
<td>SC.9.D.1.L.15.13:</td>
<td>Describe the conditions required for natural selection, including: overproduction of offspring, inherited variation, and the struggle to survive, which result in differential reproductive success.</td>
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<tr>
<td>SC.9.D.1.L.16.2:</td>
<td>Discuss observed inheritance patterns caused by various modes of inheritance, including dominant, recessive, codominant, sex-linked, polygenic, and multiple alleles.</td>
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<tr>
<td>SC.9.D.1.L.16.16:</td>
<td>Describe the process of meiosis, including independent assortment and crossing over. Explain how reduction division results in the formation of haploid gametes or spores.</td>
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</table>
Compare and contrast the relationships among organisms, including predation, parasitism, competition, commensalism, and mutualism.

Use a food web to identify and distinguish producers, consumers, and decomposers. Explain the pathway of energy transfer through trophic levels and the reduction of available energy at successive trophic levels.

Differentiate among the various forms of energy and recognize that they can be transformed from one form to others.

Relate temperature to the average molecular kinetic energy.

LAFS.68.RST.1.1: Cite specific textual evidence to support analysis of science and technical texts.

LAFS.68.RST.1.2: Determine the central ideas or conclusions of a text; provide an accurate summary of the text distinct from prior knowledge or opinions.

LAFS.68.RST.1.3: Follow precisely a multistep procedure when carrying out experiments, taking measurements, or performing technical tasks.

LAFS.68.RST.2.4: Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 6–8 texts and topics.

LAFS.68.RST.2.5: Analyze the structure an author uses to organize a text, including how the major sections contribute to the whole and to an understanding of the topic.

LAFS.68.RST.2.6: Analyze the author's purpose in providing an explanation, describing a procedure, or discussing an experiment in a text.

LAFS.68.RST.3.7: Integrate quantitative or technical information expressed in words in a text with a version of that information expressed visually (e.g., in a flowchart, diagram, model, graph, or table).

LAFS.68.RST.3.8: Distinguish among facts, reasoned judgment based on research findings, and speculation in a text.

LAFS.68.RST.3.9: Compare and contrast the information gained from experiments, simulations, video, or multimedia sources with that gained from reading a text on the same topic.

LAFS.68.WHST.1.1: Write arguments focused on discipline-specific content.
   a. Introduce claim(s) about a topic or issue, acknowledge and distinguish the claim(s) from alternate or opposing claims, and organize the reasons and evidence logically.
   b. Support claim(s) with logical reasoning and relevant, accurate data and evidence that demonstrate an understanding of the topic or text, using credible sources.
   c. Use words, phrases, and clauses to create cohesion and clarify the relationships among claim(s), counterclaims, reasons, and evidence.
   d. Establish and maintain a formal style.
   e. Provide a concluding statement or section that follows from and supports the argument presented.

LAFS.68.WHST.1.2: Write informative/explanatory texts, including the narration of historical events, scientific procedures/experiments, or technical processes.
   a. Introduce a topic clearly, previewing what is to follow; organize ideas, concepts, and information into broader categories as appropriate to achieving purpose; include formatting (e.g., headings), graphics (e.g., charts, tables), and multimedia when useful to aiding comprehension.
   b. Develop the topic with relevant, well-choSEN facts, definitions, concrete details, quotations, or other information and examples.
   c. Use appropriate and varied transitions to create cohesion and clarify the relationships among ideas and concepts.
   d. Use precise language and domain-specific vocabulary to inform about or explain the topic.
   e. Establish and maintain a formal style and objective tone.
   f. Provide a concluding statement or section that follows from and supports the information or explanation presented.

LAFS.68.WHST.2.4: Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.

LAFS.68.WHST.2.5: With some guidance and support from peers and adults, develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on how well purpose and audience have been addressed.

LAFS.68.WHST.2.6: Use technology, including the Internet, to produce and publish writing and present the relationships between information and ideas clearly and efficiently.

LAFS.68.WHST.3.7: Conduct short research projects to answer a question (including a self-generated question), drawing on several sources and generating additional related, focused questions that allow for multiple avenues of exploration.

LAFS.68.WHST.3.8: Gather relevant information from multiple print and digital sources, using search terms effectively; assess the credibility and accuracy of each source; and quote or paraphrase the data and conclusions of others while avoiding plagiarism and following a standard format for citation.

LAFS.68.WHST.3.9: Draw evidence from informational texts to support analysis, reflection, and research.

LAFS.68.WHST.4.10: Write routinely over extended time frames (time for reflection and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific purposes, tasks, and audiences.

LAFS.7.SL.1.2: Analyze the main ideas and supporting details presented in diverse media and formats (e.g., visually, quantitatively, orally) and explain how the ideas clarify a topic, text, or issue under study.

LAFS.7.SL.1.3: Delineate a speaker's argument and specific claims, evaluating the soundness of the reasoning and the relevance and sufficiency of the evidence.

LAFS.7.SL.2.4: Present claims and findings, emphasizing salient points in a focused, coherent manner with pertinent descriptions, facts, details, and examples; use appropriate eye contact, adequate volume, and clear pronunciation.

LAFS.7.SL.2.5: Include multimedia components and visual displays in presentations to clarify claims and findings and emphasize salient points.

MAFS.7.SP.2.4: Use measures of center and measures of variability for numerical data from random samples to draw informal comparative inferences about two populations. For example, decide whether the words in a chapter of a seventh-grade science book are generally longer than the words in a chapter of a fourth-grade science book.

MAFS.7.SP.3.5: Understand that the probability of a chance event is a number between 0 and 1 that expresses the likelihood of the event occurring. Larger numbers indicate greater likelihood. A probability near 0 indicates an unlikely event, a probability around 1/2 indicates an event that is neither unlikely nor likely, and a probability near 1 indicates a likely event.

MAFS.8.SP.1.4: Understand that patterns of association can also be seen in bivariate categorical data by displaying frequencies and relative frequencies in a two-way table. Construct and interpret a two-way table summarizing data on two categorical variables collected from the same subjects. Use relative frequencies calculated for rows or columns to describe possible association between the two variables. For example, collect data from students in your class on whether or not they have a curfew on school nights and whether or not they have assigned chores at home. Is there evidence that those who have a curfew also tend to have chores?

Make sense of problems and persevere in solving them.

Mathematically proficient students start by explaining to themselves the meaning of a problem and looking for entry points to its solution. They analyze givens, constraints, relationships, and goals. They make conjectures about the form and meaning of the solution and plan a solution pathway rather than simply jumping into a solution attempt. They consider analogous problems, and try special cases and simpler forms of the original problem in order to gain insight into its solution. They monitor and evaluate their progress and change course if necessary. Older students might, depending on the context of the problem, transform algebraic expressions or change the viewing window on their graphing calculator to get the information they need. Mathematically proficient students can explain correspondences between equations, verbal descriptions, tables, and graphs or draw diagrams of important features and relationships, graph data, and search for regularity or trends. Younger students might rely on
using concrete objects or pictures to help conceptualize and solve a problem. Mathematically proficient students check their answers to problems using a different method, and they continually ask themselves, “Does this make sense?” They can understand the approaches of others to solving complex problems and identify correspondences between different approaches.

Standard Relation to Course: Supporting

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<tr>
<th>MAFS.K12.MP.2.1: Reason abstractly and quantitatively.</th>
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<tr>
<td>Mathematically proficient students make sense of quantities and their relationships in problem situations. They bring two complementary abilities to bear on problems involving quantitative relationships: the ability to decontextualize—to abstract a given situation and represent it symbolically and manipulate the representing symbols as if they have a life of their own, without necessarily attending to their referents—and the ability to contextualize, to pause as needed during the manipulation process in order to probe into the referents for the symbols involved. Quantitative reasoning entails habits of creating a coherent representation of the problem at hand; considering the units involved; attending to the meaning of quantities, not just how to compute them; and knowing and flexibly using different properties of operations and objects.</td>
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Standard Relation to Course: Supporting

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<tr>
<th>MAFS.K12.MP.3.1: Construct viable arguments and critique the reasoning of others.</th>
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<tr>
<td>Mathematically proficient students understand and use stated assumptions, definitions, and previously established results in constructing arguments. They make conjectures and build a logical progression of statements to explore the truth of their conjectures. They are able to analyze situations by breaking them into cases, and can recognize and use counterexamples. They justify their conclusions, communicate them to others, and respond to the arguments of others. They reason inductively about data, making plausible arguments that take into account the context from which the data arose. Mathematically proficient students are also able to compare the effectiveness of two plausible arguments, distinguish correct logic or reasoning from that which is flawed, and—if there is a flaw in an argument—explain what it is. Elementary students can construct arguments using concrete referents such as objects, drawings, diagrams, and actions. Such arguments can make sense and be correct, even though they are not generalized or made formal until later grades. Later, students learn to determine domains to which an argument applies. Students at all grades can listen or read the arguments of others, decide whether they make sense, and ask useful questions to clarify or improve the arguments.</td>
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Standard Relation to Course: Supporting

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<tr>
<th>MAFS.K12.MP.4.1: Model with mathematics.</th>
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<tr>
<td>Mathematically proficient students can apply the mathematics they know to solve problems arising in everyday life, society, and the workplace. In early grades, this might be as simple as writing an addition equation to describe a situation. In middle grades, a student might apply proportional reasoning to plan a school event or analyze a problem in the community. By high school, a student might use geometry to solve a design problem or use a function to describe how one quantity changes in relation to another. Mathematically proficient students who can apply what they know in a practical situation and map their relationships using such tools as diagrams, two-way tables, graphs, flowcharts and formulas. They can analyze those relationships mathematically to draw conclusions. They routinely interpret their mathematical results in the context of the situation and reflect on whether the results make sense, possibly improving the model if it has not served its purpose.</td>
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Standard Relation to Course: Supporting

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<tr>
<th>MAFS.K12.MP.5.1: Use appropriate tools strategically.</th>
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<tbody>
<tr>
<td>Mathematically proficient students consider the available tools when solving a mathematical problem. These tools might include pencil and paper, concrete models, a ruler, a protractor, a calculator, a spreadsheet, a computer algebra system, a statistical package, or dynamic geometry software. Proficient students are sufficiently familiar with tools appropriate for their grade or course to make sound decisions about when each of these tools might be helpful, recognizing both the insight the tool provides and the limitations of the tool. For example, mathematically proficient high school students analyze graphs of functions and solutions generated using a graphing calculator. They detect possible errors by strategically using estimation and other mathematical knowledge. When making mathematical models, they know that technology can enable them to visualize the results of varying assumptions, explore consequences, and compare predictions with data. Mathematically proficient students at various grade levels are able to identify relevant external mathematical resources, such as digital content located on a website, and use them to pose or solve problems. They are able to use technological tools to explore and deepen their understanding of concepts.</td>
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Standard Relation to Course: Supporting

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<tr>
<th>MAFS.K12.MP.6.1: Attend to precision.</th>
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<tr>
<td>Mathematically proficient students try to communicate precisely to others. They try to use clear definitions in discussion with others and in their own reasoning. They state the meaning of the symbols they choose, including using the equal sign consistently and appropriately. They are careful about specifying units of measure, and labeling axes to clarify the correspondence with quantities in a problem. They calculate accurately and efficiently, express numerical answers with a degree of precision appropriate for the problem context. In the elementary grades, students give carefully formulated explanations to each other. By the time they reach high school they have learned to examine claims and make explicit use of definitions.</td>
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Standard Relation to Course: Supporting

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<tr>
<th>MAFS.K12.MP.7.1: Look for and make use of structure.</th>
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<tr>
<td>Mathematically proficient students look closely to discern a pattern or structure. Young students, for example, might notice that three and seven more is the same amount as seven and three more, or they may sort a collection of shapes according to how many sides the shapes have. Later, students will see 7 × 8 equals the well remembered 7 × 5 + 7 × 3, in preparation for learning about the distributive property. In the expression 2 × 3 × 4, older students can see the 3 × 4 group as counting by fours, so 2 × 3 × 4 = 2 × (3 × 4), and 21 students recognize the significance of an existing line in a geometric figure and can use the strategy of drawing an auxiliary line for solving problems. They also can step back for an overview and shift perspective. They can see complicated things, such as some algebraic expressions, as single objects or as being composed of several objects. For example, they can see 5 - 3(x - y)^2 as 5 minus a positive number times a square and use that to realize that its value cannot be more than 5 for any real numbers x and y.</td>
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Standard Relation to Course: Supporting

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<tr>
<th>MAFS.K12.MP.8.1: Look for and express regularity in repeated reasoning.</th>
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| Mathematically proficient students notice if calculations are repeated, and look both for general methods and for shortcuts. Upper elementary students might notice when dividing 25 by 11 that they are repeating the same calculations over and over again, and conclude they have a repeating decimal. By paying attention to the calculation of slope as they repeatedly check whether points are on the line through (1, 2) with slope 3, middle school students might abstract the equation (y - 2)/(x - 1) = 3. Noticing the regularity in the way terms cancel when expanding (x - 1)(x + 1), (x - 1)(x^2 + x + 1), and (x - 1)(x^2 + x^2 + x + 1) might lead them to the general formula for the sum of a geometric series. As they work to solve a
problem, mathematically proficient students maintain oversight of the process, while attending to the details. They continually evaluate the reasonableness of their intermediate results.

Standard Relation to Course: Supporting

**ELD.K12.ELL.SC.1:** English language learners communicate information, ideas and concepts necessary for academic success in the content area of Science.

**ELD.K12.ELL.SI.1:** English language learners communicate for social and instructional purposes within the school setting.

**HE.7.C.1.3:**
- **Clarifications:** Food refrigeration, appropriate home heating and cooling, air/water quality, and garbage/trash collection.

**HE.7.C.1.7:**
- **Clarifications:** Sickle-cell anemia, diabetes, and acne.

### General Course Information and Notes

**GENERAL NOTES**

Laboratory investigations that include the use of scientific inquiry, research, measurement, problem solving, laboratory apparatus and technologies, experimental procedures, and safety procedures are an integral part of this course. The National Science Teachers Association (NSTA) recommends that at the middle school level, all students should have multiple opportunities every week to explore science laboratory investigations (labs). School laboratory investigations are defined by the National Research Council (NRC) as an experience in the laboratory, classroom, or the field that provides students with opportunities to interact directly with natural phenomena or with data collected by others using tools, materials, data collection techniques, and models (NRC, 2006, p. 3). Laboratory investigations in the middle school classroom should help all students develop a growing understanding of the complexity and ambiguity of empirical work, as well as the skills to calibrate and troubleshoot equipment used to make observations. Learners should understand measurement error; and have the skills to aggregate, interpret, and present the resulting data (NRC 2006, p. 77; NSTA, 2007).

**Honors and Advanced Level Course Note:** Advanced courses require a greater demand on students through increased academic rigor. Academic rigor is obtained through the application, analysis, evaluation, and creation of complex ideas that are often abstract and multi-faceted. Students are challenged to think and collaborate critically on the content they are learning. Honors level rigor will be achieved by increasing text complexity through text selection, focus on high-level qualitative measures, and complexity of task. Instruction will be structured to give students a deeper understanding of conceptual themes and organization within and across disciplines. Academic rigor is more than simply assigning to students a greater quantity of work.

**Special Notes:**

**Instructional Practices**

Teaching from a range of complex text is optimized when teachers in all subject areas implement the following strategies on a routine basis:

1. Ensuring wide reading from complex text that varies in length.
2. Making close reading and rereading of texts central to lessons.
3. Emphasizing text-specific complex questions, and cognitively complex tasks, reinforce focus on the text and cultivate engagement.
4. Emphasizing students supporting answers based upon evidence from the text.
5. Providing extensive research and writing opportunities (claims and evidence).

**Science and Engineering Practices** (NRC Framework for K-12 Science Education, 2010)

- Asking questions (for science) and defining problems (for engineering).
- Developing and using models.
- Planning and carrying out investigations.
- Analyzing and interpreting data.
- Using mathematics, information and computer technology, and computational thinking.
- Constructing explanations (for science) and designing solutions (for engineering).
- Engaging in argument from evidence.
- Obtaining, evaluating, and communicating information.

**Literacy Standards in Science**

Secondary science courses include reading standards for literacy in science and technical subjects 6-12 and writing standards for literacy in history/social studies, science, and technical subjects 6-12. The courses also include speaking and listening standards. For a complete list of standards required for this course click on the blue tile labeled course standards. You may also download the complete course including all required standards and notes sections using the export function located at the top of this page.

**English Language Development ELD Standards Special Notes Section:**

Teachers are required to provide listening, speaking, reading and writing instruction that allows English language learners (ELL) to communicate information, ideas and concepts for academic success in the content area of Science. For the given level of English language proficiency and with visual, graphic, or interactive support, students will interact with grade level words, expressions, sentences and discourse to process or produce language necessary for academic success. The ELD standard should specify a relevant content area concept or topic of study chosen by curriculum developers and teachers which maximizes an ELL's need for communication and social skills. To access an ELL supporting document which delineates performance definitions and descriptors, please click on the following link: https://cpalmsmediaprod.blob.core.windows.net/uploads/docs/standards/eld/sc.pdf

**Additional Instructional Resources:**

A.V.E. for Success Collection is provided by the Florida Association of School Administrators: http://www.fasa.net/4DCG/cms/review.html?

Action=CMS_Document&DocID=L39. Please be aware that these resources have not been reviewed by CPALMS and there may be a charge for the use of some of them in this collection.
Educator Certifications

<table>
<thead>
<tr>
<th>Science (Secondary Grades 7-12)</th>
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<tbody>
<tr>
<td>Middle Grades Integrated Curriculum (Middle Grades 5-9)</td>
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<td>Physics (Grades 6-12)</td>
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<tr>
<td>Earth/Space Science (Grades 6-12)</td>
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<tr>
<td>Middle Grades General Science (Middle Grades 5-9)</td>
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<td>Chemistry (Grades 6-12)</td>
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<td>Biology (Grades 6-12)</td>
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Compare and contrast the relationships among organisms, including predation, parasitism, competition, commensalism, and mutualism.

Identify the pathway of energy transfer through trophic levels and the relative amount of energy available at successive trophic levels.

Differentiate among the various forms of energy and recognize that they can be transformed from one form to others.

Relate temperature to the average molecular kinetic energy.

Mathematicians who participate in effortful learning both individually and with others:
- Analyze the problem in a way that makes sense given the task.
- Ask questions that will help with solving the task.
- Build perseverance by modifying methods as needed while solving a challenging task.
- Stay engaged and maintain a positive mindset when working to solve tasks.
- Help and support each other when attempting a new method or approach.

Clarifications:
- Teachers who encourage students to participate actively in effortful learning both individually and with others:
  - Cultivate a community of growth mindset learners.
  - Foster perseverance in students by choosing tasks that are challenging.
  - Develop students’ ability to analyze and problem solve.
  - Recognize students’ effort when solving challenging problems.

Demonstrate understanding by representing problems in multiple ways. Mathematicians who demonstrate understanding by representing problems in multiple ways:
- Build understanding through modeling and using manipulatives.
- Represent solutions to problems in multiple ways using objects, drawings, tables, graphs and equations.
- Progress from modeling problems with objects and drawings to using algorithms and equations.
- Express connections between concepts and representations.
- Choose a representation based on the given context or purpose.

Clarifications:
- Teachers who encourage students to demonstrate understanding by representing problems in multiple ways:
  - Help students make connections between concepts and representations.
  - Provide opportunities for students to use manipulatives when investigating concepts.
  - Guide students from concrete to pictorial to abstract representations as understanding progresses.
  - Show students that various representations can have different purposes and can be useful in different situations.

Complete tasks with mathematical fluency. Mathematicians who complete tasks with mathematical fluency:
- Select efficient and appropriate methods for solving problems within the given context.
- Maintain flexibility and accuracy while performing procedures and mental calculations.
- Complete tasks accurately and with confidence.
- Adapt procedures to apply them to a new context.
- Use feedback to improve efficiency when performing calculations.

Clarifications:
- Teachers who encourage students to complete tasks with mathematical fluency:
  - Provide students with the flexibility to solve problems by selecting a procedure that allows them to solve efficiently and accurately.
  - Offer multiple opportunities for students to practice efficient and generalizable methods.
  - Provide opportunities for students to reflect on the method they used and determine if a more efficient method could have been used.

Engage in discussions that reflect on the mathematical thinking of self and others. Mathematicians who engage in discussions that reflect on the mathematical thinking of self and others:
- Communicate mathematical ideas, vocabulary and methods effectively.
- Analyze the mathematical thinking of others.
- Compare the efficiency of a method to those expressed by others.
- Recognize errors and suggest how to correctly solve the task.
- Justify results by explaining methods and processes.
- Construct possible arguments based on evidence.

Clarifications:
- Teachers who encourage students to engage in discussions that reflect on the mathematical thinking of self and others:
  - Establish a culture in which students ask questions of the teacher and their peers, and error is an opportunity for learning.
  - Create opportunities for students to discuss their thinking with peers.
  - Select, sequence and present student work to advance and deepen understanding of correct and increasingly efficient methods.
  - Develop students’ ability to justify methods and compare their responses to the responses of their peers.

Use patterns and structure to help understand and connect mathematical concepts. Mathematicians who use patterns and structure to help understand and connect mathematical concepts:
- Focus on relevant details within a problem.
- Create plans and procedures to logically order events, steps or ideas to solve problems.
- Decompose a complex problem into manageable parts.
- Relate previously learned concepts to new concepts.
- Look for similarities among problems.
- Connect solutions of problems to more complicated large-scale situations.

Clarifications:
- Teachers who encourage students to use patterns and structure to help understand and connect mathematical concepts:
• Help students recognize the patterns in the world around them and connect these patterns to mathematical concepts.
• Support students to develop generalizations based on the similarities found among problems.
• Provide opportunities for students to create plans and procedures to solve problems.
• Develop students’ ability to construct relationships between their current understanding and more sophisticated ways of thinking.

Assess the reasonableness of solutions.
Mathematicians who assess the reasonableness of solutions:
• Estimate to discover possible solutions.
• Use benchmark quantities to determine if a solution makes sense.
• Check calculations when solving problems.
• Verify possible solutions by explaining the methods used.
• Evaluate results based on the given context.

Clarifications:
Teachers who encourage students to assess the reasonableness of solutions:
• Have students estimate or predict solutions prior to solving.
• Prompt students to continually ask, “Does this solution make sense? How do you know?”
• Reinforce that students check their work as they progress within and after a task.
• Strengthen students’ ability to verify solutions through justifications.

Apply mathematics to real-world contexts.
Mathematicians who apply mathematics to real-world contexts:
• Connect mathematical concepts to everyday experiences.
• Use models and methods to understand, represent and solve problems.
• Perform investigations to gather data or determine if a method is appropriate. • Redesign models and methods to improve accuracy or efficiency.

Clarifications:
Teachers who encourage students to apply mathematics to real-world contexts:
• Provide opportunities for students to create models, both concrete and abstract, and perform investigations.
• Challenge students to question the accuracy of their models and methods.
• Support students as they validate conclusions by comparing them to the given situation.
• Indicate how various concepts can be applied to other disciplines.

Cite evidence to explain and justify reasoning.

Clarifications:
K-1 Students include textual evidence in their oral communication with guidance and support from adults. The evidence can consist of details from the text without naming the text. During 1st grade, students learn how to incorporate the evidence in their writing.
2-3 Students include relevant textual evidence in their written and oral communication. Students should name the text when they refer to it. In 3rd grade, students should use a combination of direct and indirect citations.
4-5 Students continue with previous skills and reference comments made by speakers and peers. Students cite texts that they’ve directly quoted, paraphrased, or used for information. When writing, students will use the form of citation dictated by the instructor or the style guide referenced by the instructor.
6-8 Students continue with previous skills and use a style guide to create a proper citation.
9-12 Students continue with previous skills and should be aware of existing style guides and the ways in which they differ.

Read and comprehend grade-level complex texts proficiently.

Clarifications:
See Text Complexity for grade-level complexity bands and a text complexity rubric.

Make inferences to support comprehension.

Clarifications:
Students will make inferences before the words infer or inference are introduced. Kindergarten students will answer questions like “Why is the girl smiling?” or make predictions about what will happen based on the title page. Students will use the terms and apply them in 2nd grade and beyond.

Use appropriate collaborative techniques and active listening skills when engaging in discussions in a variety of situations.

Clarifications:
In kindergarten, students learn to listen to one another respectfully.
In grades 1-2, students build upon these skills by justifying what they are thinking. For example: “I think _______ because _______” The collaborative conversations are becoming academic conversations.
In grades 3-12, students engage in academic conversations discussing claims and justifying their reasoning, refining and applying skills. Students build on ideas, propel the conversation, and support claims and counterclaims with evidence.

Use the accepted rules governing a specific format to create quality work.

Clarifications:
Students will incorporate skills learned into work products to produce quality work. For students to incorporate these skills appropriately, they must receive instruction. A 3rd grade student creating a poster board display must have instruction in how to effectively present information to do quality work.

Use appropriate voice and tone when speaking or writing.

Clarifications:
In kindergarten and 1st grade, students learn the difference between formal and informal language. For example, the way we talk to our friends differs from the way we speak to adults. In 2nd grade and beyond, students practice appropriate social and academic language to discuss texts.
A.V.E. for Success Collection is provided by the Florida Association of School Administrators:

To access an ELL support document which delineates performance definitions and descriptors, please click on the following link:

https://cpalmsmediaprod.blob.core.windows.net/uploads/docs/standards/eld/sc.pdf

Additional Instructional Resources:
A.V.E. for Success Collection is provided by the Florida Association of School Administrators: http://www.fasa.net/4DCGI/cms/review.html?Action=CMS_Document&DocID=139. Please be aware that these resources have not been reviewed by CPALMS and there may be a charge for the use of some of them in this collection.

GENERAL INFORMATION
Course Path: Section: Grades PreK to 12 Education
Educator Certifications

<table>
<thead>
<tr>
<th>Science (Secondary Grades 7-12)</th>
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<tbody>
<tr>
<td>Middle Grades Integrated Curriculum (Middle Grades 5-9)</td>
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<tr>
<td>Physics (Grades 6-12)</td>
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<td>Earth/Space Science (Grades 6-12)</td>
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<td>Middle Grades General Science (Middle Grades 5-9)</td>
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<td>Chemistry (Grades 6-12)</td>
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<tr>
<td>Biology (Grades 6-12)</td>
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<tr>
<td>Name</td>
<td>Description</td>
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<td>-----------------------------------------------------------------------------</td>
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<tr>
<td>SC.7.E.6.1:</td>
<td>Describe the layers of the solid Earth, including the lithosphere, the hot conveeting mantle, and the dense metallic liquid and solid cores.</td>
</tr>
<tr>
<td>SC.7.E.6.2:</td>
<td>Identify the patterns within the rock cycle and relate them to surface events (weathering and erosion) and sub-surface events (plate tectonics and mountain building).</td>
</tr>
<tr>
<td>SC.7.E.6.3:</td>
<td>Identify current methods for measuring the age of Earth and its parts, including the law of superposition and radioactive dating.</td>
</tr>
<tr>
<td>SC.7.E.6.4:</td>
<td>Explain and give examples of how physical evidence supports scientific theories that Earth has evolved over geologic time due to natural processes.</td>
</tr>
<tr>
<td>SC.7.E.6.5:</td>
<td>Explore the scientific theory of plate tectonics by describing how the movement of Earth's crustal plates causes both slow and rapid changes in Earth's surface, including volcanic eruptions, earthquakes, and mountain building.</td>
</tr>
<tr>
<td>SC.7.E.6.6:</td>
<td>Identify the impact that humans have had on Earth, such as deforestation, urbanization, desertification, erosion, air and water quality, changing the flow of water.</td>
</tr>
<tr>
<td>SC.7.E.6.7:</td>
<td>Recognize that heat flow and movement of material within Earth causes earthquakes and volcanic eruptions, and creates mountains and ocean basins.</td>
</tr>
<tr>
<td>SC.7.E.15.1:</td>
<td>Recognize that fossil evidence is consistent with the scientific theory of evolution that living things evolved from earlier species.</td>
</tr>
<tr>
<td>SC.7.E.15.2:</td>
<td>Explore the scientific theory of evolution by recognizing and explaining ways in which genetic variation and environmental factors contribute to evolution by natural selection and diversity of organisms.</td>
</tr>
<tr>
<td>SC.7.E.15.3:</td>
<td>Explore the scientific theory of evolution by relating how the inability of a species to adapt within a changing environment may contribute to the extinction of that species.</td>
</tr>
<tr>
<td>SC.7.E.16.1:</td>
<td>Understand and explain that every organism requires a set of instructions that specifies its traits, that this hereditary information (DNA) contains genes located in the chromosomes of each cell, and that heredity is the passage of these instructions from one generation to another.</td>
</tr>
<tr>
<td>SC.7.E.16.2:</td>
<td>Determine the probabilities for genotype and phenotype combinations using Punnett Squares and pedigrees.</td>
</tr>
<tr>
<td>SC.7.E.16.3:</td>
<td>Compare and contrast the general processes of sexual reproduction requiring meiosis and asexual reproduction requiring mitosis.</td>
</tr>
<tr>
<td>SC.7.E.16.4:</td>
<td>Recognize and explore the impact of biotechnology (cloning, genetic engineering, artificial selection) on the individual, society and the environment.</td>
</tr>
<tr>
<td>SC.7.E.17.1:</td>
<td>Explain and illustrate the roles of and relationships among producers, consumers, and decomposers in the process of energy transfer in a food web.</td>
</tr>
<tr>
<td>SC.7.E.17.2:</td>
<td>Compare and contrast the relationships among organisms such as mutualism, predation, parasitism, competition, and commensalism.</td>
</tr>
<tr>
<td>SC.7.E.17.3:</td>
<td>Describe and investigate various limiting factors in the local ecosystem and their impact on native populations, including food, shelter, water, space, disease, parasitism, predation, and nesting sites.</td>
</tr>
<tr>
<td>SC.7.N.1.1:</td>
<td>Define a problem from the seventh grade curriculum, use appropriate reference materials to support scientific understanding, plan and carry out scientific investigation of various types, such as systematic observations or experiments, identify variables, collect and organize data, interpret data in charts, tables, and graphics, analyze information, make predictions, and defend conclusions.</td>
</tr>
<tr>
<td>SC.7.N.1.2:</td>
<td>Differentiate replication (by others) from repetition (multiple trials).</td>
</tr>
<tr>
<td>SC.7.N.1.3:</td>
<td>Distinguish between an experiment (which must involve the identification and control of variables) and other forms of scientific investigation and explain that not all scientific knowledge is derived from experimentation.</td>
</tr>
<tr>
<td>SC.7.N.1.4:</td>
<td>Identify test variables (independent variables) and outcome variables (dependent variables) in an experiment.</td>
</tr>
<tr>
<td>SC.7.N.1.5:</td>
<td>Describe the methods used in the pursuit of a scientific explanation as seen in different fields of science such as biology, geology, and physics.</td>
</tr>
<tr>
<td>SC.7.N.1.6:</td>
<td>Explain that empirical evidence is the cumulative body of observations of a natural phenomenon on which scientific explanations are based.</td>
</tr>
<tr>
<td>SC.7.N.1.7:</td>
<td>Explain that scientific knowledge is the result of a great deal of debate and confirmation within the science community.</td>
</tr>
<tr>
<td>SC.7.N.2.1:</td>
<td>Identify an instance from the history of science in which scientific knowledge has changed when new evidence or new interpretations are encountered.</td>
</tr>
<tr>
<td>SC.7.N.3.1:</td>
<td>Recognize and explain the difference between theories and laws and give several examples of scientific theories and the evidence that supports them.</td>
</tr>
<tr>
<td>SC.7.N.3.2:</td>
<td>Identify the benefits and the use of scientific models.</td>
</tr>
<tr>
<td>SC.7.P.10.1:</td>
<td>Illustrate that the sun's energy arrives as radiation with a wide range of wavelengths, including infrared, visible, and ultraviolet, and that white light is made up of a spectrum of many different colors.</td>
</tr>
<tr>
<td>SC.7.P.10.2:</td>
<td>Observe and explain that light can be reflected, refracted, and/or absorbed.</td>
</tr>
<tr>
<td>SC.7.P.10.3:</td>
<td>Recognize that light waves, sound waves, and other waves move at different speeds in different materials.</td>
</tr>
<tr>
<td>SC.7.P.11.1:</td>
<td>Recognize that adding heat to or removing heat from a system may result in a temperature change and possibly a change of state.</td>
</tr>
<tr>
<td>SC.7.P.11.2:</td>
<td>Investigate and describe the transformation of energy from one form to another.</td>
</tr>
<tr>
<td>SC.7.P.11.3:</td>
<td>Cite evidence to explain that energy cannot be created nor destroyed, only changed from one form to another.</td>
</tr>
<tr>
<td>SC.7.P.11.4:</td>
<td>Observe and describe that heat flows in predictable ways, moving from warmer objects to cooler ones until they reach the same temperature.</td>
</tr>
<tr>
<td>SC.8.E.5.1:</td>
<td>Recognize that there are enormous distances between objects in space and apply our knowledge of light and space travel to understand this distance.</td>
</tr>
<tr>
<td>SC.8.E.5.2:</td>
<td>Recognize that the universe contains many billions of galaxies and that each galaxy contains many billions of stars.</td>
</tr>
<tr>
<td>SC.8.E.5.3:</td>
<td>Distinguish the hierarchical relationships between planets and other astronomical bodies relative to solar system, galaxy, and universe, including distance, size, and composition.</td>
</tr>
<tr>
<td>SC.8.E.5.4:</td>
<td>Explore the Law of Universal Gravitation by explaining the role that gravity plays in the formation of planets, stars, and solar systems and in determining their motions.</td>
</tr>
<tr>
<td>SC.8.E.5.5:</td>
<td>Describe and classify specific physical properties of stars: apparent magnitude (brightness), temperature (color), size, and luminosity (absolute brightness).</td>
</tr>
<tr>
<td>SC.8.E.5.6:</td>
<td>Create models of solar properties including: rotation, structure of the Sun, convection, sunspots, solar flares, and prominences.</td>
</tr>
</tbody>
</table>
| LAFS.68.WHST.1.2: | Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes.  
  a. Introduce a topic clearly, previewing what is to follow; organize ideas, concepts, and information into broader categories as appropriate to achieving purpose; include formatting (e.g., headings), graphics (e.g., charts, tables), and multimedia when useful to aiding comprehension.  
  b. Develop the topic with relevant, well-chosen facts, definitions, concrete details, quotations, or other information and examples.  
  c. Use appropriate and varied transitions to create cohesion and clarify the relationships among ideas and concepts.  
  d. Use precise language and domain-specific vocabulary to inform about or explain the topic.  
  e. Establish and maintain a formal style and objective tone.  
  f. Provide a concluding statement or section that follows from and supports the argument presented. |
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<tbody>
<tr>
<td>LAFS.68.WHST.2.4:</td>
<td>Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.</td>
</tr>
<tr>
<td>LAFS.68.WHST.2.5:</td>
<td>With some guidance and support from peers and adults, develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on how well purpose and audience have been addressed.</td>
</tr>
<tr>
<td>LAFS.68.WHST.2.6:</td>
<td>Use technology, including the Internet, to produce and publish writing and present the relationships between information and ideas clearly and efficiently.</td>
</tr>
<tr>
<td>LAFS.68.WHST.3.7:</td>
<td>Conduct short research projects to answer a question (including a self-generated question), drawing on several sources and generating additional related, focused questions that allow for multiple avenues of exploration.</td>
</tr>
<tr>
<td>LAFS.68.WHST.3.8:</td>
<td>Gather relevant information from multiple print and digital sources, using search terms effectively; assess the credibility and accuracy of each source; and quote or paraphrase the data and conclusions of others while avoiding plagiarism and following a standard format for citation.</td>
</tr>
<tr>
<td>LAFS.68.WHST.3.9:</td>
<td>Draw evidence from informational texts to support analysis reflection, and research.</td>
</tr>
<tr>
<td>LAFS.68.WHST.4.10:</td>
<td>Write routinely over extended time frames (time for reflection and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences.</td>
</tr>
</tbody>
</table>

| LAFS.8.SL.1.1: | Engage effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grade 8 topics, texts, and issues, building on others’ ideas and expressing their own clearly.  
  a. Come to discussions prepared, having read or researched material under study; explicitly draw on that preparation by referring to evidence on the topic, text, or issue to probe and reflect on ideas under discussion.  
  b. Follow rules for collegial discussions and decision-making, track progress toward specific goals and deadlines, and define individual roles as needed.  
  c. Pose questions that connect the ideas of several speakers and respond to others’ questions and comments with relevant evidence, observations, and ideas.  
  d. Acknowledge new information expressed by others, and, when warranted, qualify or justify their own views in light of the evidence presented. |
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<tbody>
<tr>
<td>LAFS.8.SL.1.2:</td>
<td>Analyze the purpose of information presented in diverse media and formats (e.g., visually, quantitatively, orally) and evaluate the motives (e.g., social, commercial, political) behind its presentation.</td>
</tr>
<tr>
<td>LAFS.8.SL.1.3:</td>
<td>Delineate a speaker’s argument and specific claims, evaluating the soundness of the reasoning and relevance and sufficiency of the evidence and identifying when irrelevant evidence is introduced.</td>
</tr>
<tr>
<td>LAFS.8.SL.2.4:</td>
<td>Present claims and findings, emphasizing salient points in a focused, coherent manner with relevant evidence, sound valid reasoning, and well-chosen details; use appropriate eye contact, adequate volume, and clear pronunciation.</td>
</tr>
<tr>
<td>LAFS.8.SL.2.5:</td>
<td>Integrate multimedia and visual displays into presentations to clarify information, strengthen claims and evidence, and add interest.</td>
</tr>
<tr>
<td>MAFS.8.F.2.5:</td>
<td>Describe qualitatively the functional relationship between two quantities by analyzing a graph (e.g., where the function is increasing or decreasing, linear or nonlinear). Sketch a graph that exhibits the qualitative features of a function that has been described verbally.</td>
</tr>
</tbody>
</table>

<p>| Clarifications: Fluency Expectations or Examples of Culminating Standards |
|---|---|
| MAFS.8.G.3.9: | When students learn to solve problems involving volumes of cones, cylinders, and spheres — together with their previous grade 7 work in angle measure, area, surface area and volume (7.G.2.4-2.6) — they will have acquired a well-developed set of geometric measurement skills. These skills, along with proportional reasoning (7.RP) and multistep numerical problem solving (7.EE.2.3), can be combined and used in flexible ways as part of modeling during high school — not to mention after high school for college and careers. |
| MAFS.8.SP.1.4: | Understand that patterns of association can also be seen in bivariate categorical data by displaying frequencies and relative frequencies in a two-way table. Construct and interpret a two-way table summarizing data on two categorical variables collected from the same subjects. Use relative frequencies calculated for rows or columns to describe possible association between the two variables. For example, collect data from students in your class on whether or not they have a curfew on school nights and whether or not they have assigned chores at home. Is there evidence that those who have a curfew also tend to have chores? |</p>
<table>
<thead>
<tr>
<th>MAFS.K12.MP.1.1:</th>
<th>Make sense of problems and persevere in solving them.</th>
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<tbody>
<tr>
<td>MAFS.K12.MP.1.1:</td>
<td>Mathematically proficient students start by explaining to themselves the meaning of a problem and looking for entry points to its solution. They analyze givers, constraints, relationships, and goals. They make conjectures about the form and meaning of the solution and plan a solution pathway rather than simply jumping into a solution attempt. They consider analogous problems, and try special cases and simpler forms of the original problem in order to gain insight into its solution. They monitor and evaluate their progress and change course if necessary. Older students might, depending on the context of the problem, transform algebraic expressions or change the viewing window on their graphing calculator to get the information they need. Mathematically proficient students can explain correspondences between equations, verbal descriptions, tables, and graphs or draw diagrams of important features and relationships, graph data, and search for regularity or trends. Younger students might rely on using concrete objects or pictures to help conceptualize and solve a problem. Mathematically proficient students check their answers to problems using a different method, and they continually ask themselves, “Does this make sense?” They can understand the approaches of others to solving complex problems and identify correspondences between different approaches.</td>
</tr>
<tr>
<td>MAFS.K12.MP.1.1:</td>
<td>Reason abstractly and quantitatively.</td>
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</table>
| MAFS.K12.MP.1.1: | Mathematically proficient students make sense of quantities and their relationships in problem situations. They bring two complementary abilities to bear on problems involving quantitative relationships: the ability to decontextualize—to abstract a given situation and represent it symbolically...
and manipulate the representing symbols as if they have a life of their own, without necessarily attending to their referents—and the ability to contextualize, to pause as needed during the manipulation process in order to probe into the referents for the symbols involved. Quantitative reasoning entails habits of creating a coherent representation of the problem at hand; considering the units involved; attending to the meaning of quantities, not just how to compute them; and knowing and flexibly using different properties of operations and objects.

Standards:

**MAFS.K12.MP.1:** Construct viable arguments and critique the reasoning of others.

Mathematically proficient students understand and use stated assumptions, definitions, and previously established results in constructing arguments. They make conjectures and build a logical progression of statements to explore the truth of their conjectures. They are able to analyze situations by breaking them into cases, and can recognize and use counterexamples. They justify their conclusions, communicate them to others, and respond to the arguments of others. They reason inductively about data, making plausible arguments that take into account the context from which the data arose. Mathematically proficient students are also able to compare the effectiveness of two plausible arguments, distinguish correct logic or reasoning from that which is flawed, and—if there is a flaw in an argument—explain what it is. Elementary students can construct arguments using concrete referents such as objects, drawings, diagrams, and actions. Such arguments can make sense and be correct, even though they are not general or made formal until later grades. Later, students learn to determine domains to which an argument applies. Students at all grades can listen or read the arguments of others, decide whether they make sense, and ask useful questions to clarify or improve the arguments.

**MAFS.K12.MP.4:** Use appropriate tools strategically.

Mathematically proficient students consider the available tools when solving a mathematical problem. These tools might include pencil and paper, concrete models, a ruler, a protractor, a calculator, a spreadsheet, a computer algebra system, a statistical package, or dynamic geometry software. Proficient students are sufficiently familiar with tools appropriate for their grade or course to make sound decisions about when each of these tools might be helpful, recognizing both the insight to be gained and their limitations. For example, mathematically proficient high school students analyze graphs of functions and solutions generated using a graphing calculator. They detect possible errors by strategically using estimation and other mathematical knowledge. When making mathematical models, they know that technology can enable them to make sense of routine calculations more efficiently than by hand.

**MAFS.K12.MP.5:** Look for and express regularity in repeated reasoning.

Mathematically proficient students notice if calculations are repeated, and look both for general methods and for shortcuts. Upper elementary students might notice when dividing 25 by 11 that they are repeating the same calculations over and over again, and conclude they have a repeating decimal. By paying attention to the calculation of slope as they repeatedly check whether points are on the line through (1, 2) with slope 3, middle school students might abstract the equation (y – 2)/(x – 1) = 3, noticing the regularity in the way terms cancel when expanding (x – 1)(x + 1), (x – 1)(x² + x + 1), and (x – 1)(x⁴ + x³ + x² + x + 1). Later, students learn to determine domains to which an argument applies. Students at all grades can listen or read the arguments of others, decide whether they make sense, and ask useful questions to clarify or improve the arguments.
General Course Information and Notes

GENERAL NOTES

Laboratory investigations that include the use of scientific inquiry, research, measurement, problem solving, laboratory apparatus and technologies, experimental procedures, and safety procedures are an integral part of this course. The National Science Teachers Association (NSTA) recommends that at the middle school level, all students should have multiple opportunities every week to explore science laboratory investigations (labs). School laboratory investigations are defined by the National Research Council (NRC) as an experience in the laboratory, classroom, or the field that provides students with opportunities to interact directly with natural phenomena or with data collected by others using tools, materials, data collection techniques, and models (NRC, 2006, p. 3). Laboratory investigations in the middle school classroom should help all students develop a growing understanding of the complexity and ambiguity of empirical work, as well as the skills to calibrate and troubleshoot equipment used to make observations. Learners should understand measurement error; and have the skills to aggregate, interpret, and present the resulting data (NRC 2006, p. 77; NSTA, 2007).

Honors and Advanced Level Course Note: Advanced courses require a greater demand on students through increased academic rigor. Academic rigor is obtained through the application, analysis, evaluation, and creation of complex ideas that are often abstract and multi-faceted. Students are challenged to think and collaborate critically on the content they are learning. Honors level rigor will be achieved by increasing text complexity through text selection, focus on high-level qualitative measures, and complexity of task. Instruction will be structured to give students a deeper understanding of conceptual themes and organization within and across disciplines. Academic rigor is more than simply assigning to students a greater quantity of work.

Special Notes:

Instructional Practices
Teaching from a range of complex text is optimized when teachers in all subject areas implement the following strategies on a routine basis:

1. Ensuring wide reading from complex text that varies in length.
2. Making close reading and rereading of texts central to lessons.
3. Emphasizing text-specific complex questions, and cognitively complex tasks, reinforce focus on the text and cultivate independence.
4. Emphasizing students supporting answers based upon evidence from the text.
5. Providing extensive research and writing opportunities (claims and evidence).


- Asking questions (for science) and defining problems (for engineering).
- Developing and using models.
- Planning and carrying out investigations.
- Analyzing and interpreting data.
- Using mathematics, information and computer technology, and computational thinking.
- Constructing explanations (for science) and designing solutions (for engineering).
- Engaging in argument from evidence.
- Obtaining, evaluating, and communicating information.

Literacy Standards in Science

Secondary science courses include reading standards for literacy in science and technical subjects 6-12 and writing standards for literacy in history/social studies, science, and technical subjects 6-12. The courses also include speaking and listening standards. For a complete list of standards required for this course click on the blue tile labeled course standards. You may also download the complete course including all required standards and notes sections using the export function located at the top of this page.

English Language Development ELD Standards Special Notes Section:

Teachers are required to provide listening, speaking, reading and writing instruction that allows English language learners (ELL) to communicate information, ideas and concepts for academic success in the content area of Science. For the given level of English language proficiency and with visual, graphic, or interactive support, students will interact with grade level words, expressions, sentences and discourse to process or produce language necessary for academic success. The ELD standard should specify a relevant content area concept or topic of study chosen by curriculum developers and teachers which maximizes an ELL's need for communication and social skills. To access an ELL supporting document which delineates performance definitions and descriptors, please click on the following link:
https://palmsmediaprod.blob.core.windows.net/uploads/docs/standards/eld/sc.pdf

GENERAL INFORMATION

Course Number: 2002085
Course Path: Section: Grades PreK to 12 Education
Courses: > Grade Group: Grades 6 to 8 Education
Courses: > Subject: Science > SubSubject: General Sciences
Abbreviated Title: M/J COMPSCI2 ACC HON
Course Length: Year (Y)
Course Attributes:
- Class Size Core Required
Course Level: 3

Course Status: Course Approved
Grade Level(s): 6,7,8
## Educator Certifications

<table>
<thead>
<tr>
<th>Subject</th>
<th>Grade Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Biology</td>
<td>(Grades 6-12)</td>
</tr>
<tr>
<td>Earth/Space Science</td>
<td>(Grades 6-12)</td>
</tr>
<tr>
<td>Middle Grades General Science</td>
<td>(Middle Grades 5-9)</td>
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<tr>
<td>Chemistry</td>
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<td>Physics</td>
<td>(Grades 6-12)</td>
</tr>
<tr>
<td>Science</td>
<td>(Secondary Grades 7-12)</td>
</tr>
<tr>
<td>Name</td>
<td>Description</td>
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<tr>
<td>SC.7.E.6.1</td>
<td>Describe the layers of the solid Earth, including the lithosphere, the hot convecting mantle, and the dense metallic liquid and solid cores.</td>
</tr>
<tr>
<td>SC.7.E.6.2</td>
<td>Identify the patterns within the rock cycle and relate them to surface events (weathering and erosion) and sub-surface events (plate tectonics and mountain building).</td>
</tr>
<tr>
<td>SC.7.E.6.3</td>
<td>Identify current methods for measuring the age of Earth and its parts, including the law of superposition and radioactive dating.</td>
</tr>
<tr>
<td>SC.7.E.6.4</td>
<td>Explain and give examples of how physical evidence supports scientific theories that Earth has evolved over geologic time due to natural processes.</td>
</tr>
<tr>
<td>SC.7.E.6.5</td>
<td>Explore the scientific theory of plate tectonics by describing how the movement of Earth's crustal plates causes both slow and rapid changes in Earth's surface, including volcanic eruptions, earthquakes, and mountain building.</td>
</tr>
<tr>
<td>SC.7.E.6.6</td>
<td>Identify the impact that humans have had on Earth, such as deforestation, urbanization, desertification, erosion, air and water quality, changing the flow of water.</td>
</tr>
<tr>
<td>SC.7.E.6.7</td>
<td>Recognize that heat flow and movement of material within Earth causes earthquakes and volcanic eruptions, and creates mountains and ocean basins.</td>
</tr>
<tr>
<td>SC.7.L.15.1</td>
<td>Recognize that fossil evidence is consistent with the scientific theory of evolution that living things evolved from earlier species.</td>
</tr>
<tr>
<td>SC.7.L.15.2</td>
<td>Explore the scientific theory of evolution by recognizing and explaining ways in which genetic variation and environmental factors contribute to evolution by natural selection and diversity of organisms.</td>
</tr>
<tr>
<td>SC.7.L.15.3</td>
<td>Explore the scientific theory of evolution by relating how the inability of a species to adapt within a changing environment may contribute to the extinction of that species.</td>
</tr>
<tr>
<td>SC.7.L.16.1</td>
<td>Understand and explain that every organism requires a set of instructions that specifies its traits, that this hereditary information (DNA) contains genes located in the chromosomes of each cell, and that heredity is the passage of these instructions from one generation to another.</td>
</tr>
<tr>
<td>SC.7.L.16.2</td>
<td>Determine the probabilities for genotype and phenotype combinations using Punnett Squares and pedigrees.</td>
</tr>
<tr>
<td>SC.7.L.16.3</td>
<td>Compare and contrast the general processes of sexual reproduction requiring meiosis and asexual reproduction requiring mitosis.</td>
</tr>
<tr>
<td>SC.7.L.16.4</td>
<td>Recognize and explore the impact of biotechnology (cloning, genetic engineering, artificial selection) on the individual, society and the environment.</td>
</tr>
<tr>
<td>SC.7.L.17.1</td>
<td>Explain and illustrate the roles of and relationships among producers, consumers, and decomposers in the process of energy transfer in a food web.</td>
</tr>
<tr>
<td>SC.7.L.17.2</td>
<td>Compare and contrast the relationships among organisms such as mutualism, predation, parasitism, competition, and commensalism.</td>
</tr>
<tr>
<td>SC.7.L.17.3</td>
<td>Describe and investigate various limiting factors in the local ecosystem and their impact on native populations, including food, shelter, water, space, disease, parasitism, predation, and nesting sites.</td>
</tr>
<tr>
<td>SC.7.N.1.1</td>
<td>Define a problem from the seventh grade curriculum, use appropriate reference materials to support scientific understanding, plan and carry out scientific investigation of various types, such as systematic observations or experiments, identify variables, collect and organize data, interpret data in charts, tables, and graphics, analyze information, make predictions, and defend conclusions.</td>
</tr>
<tr>
<td>SC.7.N.1.2</td>
<td>Distinguish replication (by others) from repetition (multiple trials).</td>
</tr>
<tr>
<td>SC.7.N.1.3</td>
<td>Identify test variables (independent variables) and outcome variables (dependent variables) in an experiment.</td>
</tr>
<tr>
<td>SC.7.N.1.4</td>
<td>Describe the methods used in the pursuit of a scientific explanation as seen in different fields of science such as biology, geology, and physics.</td>
</tr>
<tr>
<td>SC.7.N.1.5</td>
<td>Explain that empirical evidence is the cumulative body of observations of a natural phenomenon on which scientific explanations are based.</td>
</tr>
<tr>
<td>SC.7.N.1.6</td>
<td>Explain that scientific knowledge is the result of a great deal of debate and confirmation within the science community.</td>
</tr>
<tr>
<td>SC.7.N.1.7</td>
<td>Identify an instance from the history of science in which scientific knowledge has changed when new evidence or new interpretations are encountered.</td>
</tr>
<tr>
<td>SC.7.N.3.1</td>
<td>Recognize and explain the difference between theories and laws and give several examples of scientific theories and the evidence that supports them.</td>
</tr>
<tr>
<td>SC.7.N.3.2</td>
<td>Identify the benefits and uses of the scientific method.</td>
</tr>
<tr>
<td>SC.7.P.10.1</td>
<td>Illustrate that the sun's energy arrives as radiation with a wide range of wavelengths, including infrared, visible, and ultraviolet, and that white light is made up of a spectrum of many different colors.</td>
</tr>
<tr>
<td>SC.7.P.10.2</td>
<td>Observe and explain that light can be reflected, refracted, and/or absorbed.</td>
</tr>
<tr>
<td>SC.7.P.10.3</td>
<td>Recognize that light waves, sound waves, and other waves move at different speeds in different materials.</td>
</tr>
<tr>
<td>SC.7.P.11.1</td>
<td>Recognize that adding heat to or removing heat from a system may result in a temperature change and possibly a change of state.</td>
</tr>
<tr>
<td>SC.7.P.11.2</td>
<td>Investigate and describe the transformation of energy from one form to another.</td>
</tr>
<tr>
<td>SC.7.P.11.3</td>
<td>Cite evidence to explain that energy cannot be created nor destroyed, only changed from one form to another.</td>
</tr>
<tr>
<td>SC.7.P.11.4</td>
<td>Observe and describe that heat flows in predictable ways, moving from warmer objects to cooler ones until they reach the same temperature.</td>
</tr>
<tr>
<td>SC.8.E.5.1</td>
<td>Recognize that there are enormous distances between objects in space and apply our knowledge of light and space travel to understand this distance.</td>
</tr>
<tr>
<td>SC.8.E.5.2</td>
<td>Recognize that the universe contains many billions of galaxies and that each galaxy contains many billions of stars.</td>
</tr>
<tr>
<td>SC.8.E.5.3</td>
<td>Distinguish the hierarchical relationships between planets and other astronomical bodies relative to solar system, galaxy, and universe, including distance, size, and composition.</td>
</tr>
<tr>
<td>SC.8.E.5.4</td>
<td>Explore the Law of Universal Gravitation by explaining the role that gravity plays in the formation of planets, stars, and solar systems and in determining their motions.</td>
</tr>
<tr>
<td>SC.8.E.5.5</td>
<td>Describe and classify specific physical properties of stars: apparent magnitude (brightness), temperature (color), size, and luminosity (absolute brightness).</td>
</tr>
<tr>
<td>SC.8.E.5.6</td>
<td>Create models of solar properties including: rotation, structure of the Sun, convection, sunspots, solar flares, and prominences.</td>
</tr>
</tbody>
</table>
Compare and contrast the properties of objects in the Solar System including the Sun, planets, and moons to those of Earth, such as gravitational force, distance from the Sun, speed, movement, temperature, and atmospheric conditions.

Compare various historical models of the Solar System, including geocentric and heliocentric.

Explain the impact of objects in space on each other including:
1. The Sun on the Earth including seasons and gravitational attraction
2. The Moon on the Earth, including phases, tides, and eclipses, and the relative position of each body.

Assess how technology is essential to science for such purposes as access to outer space and other remote locations, sample collection, measurement, data collection and storage, computation, and communication of information.

Identify and compare characteristics of the electromagnetic spectrum such as wavelength, frequency, use, and hazards and recognize its application to an understanding of planetary images and satellite photographs.

Summarize the effects of space exploration on the economy and culture of Florida.

Describe and investigate the process of photosynthesis, such as the roles of light, carbon dioxide, water and chlorophyll; production of food; release of oxygen.

Construct a scientific model of the carbon cycle to show how matter and energy are continuously transferred within and between organisms and their physical environment.

Cite evidence that living systems follow the Laws of Conservation of Mass and Energy.

Define a problem from the eighth grade curriculum using appropriate reference materials to support scientific understanding, plan and carry out scientific investigations of various types, such as systematic observations or experiments, identify variables, collect and organize data, interpret data in charts, tables, and graphics, analyze information, make predictions, and defend conclusions.

Distinguish between scientific and pseudoscientific ideas.

Discuss distinguishing characteristics of the domains and kingdoms of living organisms.

Discuss the conditions required for natural selection, including: overproduction of offspring, inherited variation, and the struggle to survive, which result in differential reproductive success.

Discuss observed inheritance patterns caused by various modes of inheritance, including dominant, recessive, codominant, sex-linked, polygenic, and multiple alleles.

Describe the process of meiosis, including independent assortment and crossing over. Explain how reduction division results in the formation of haploid gametes or spores.

Compare and contrast the relationships among organisms, including predation, parasitism, competition, commensalism, and mutualism.

Use a food web to identify and distinguish producers, consumers, and decomposers. Explain the pathway of energy transfer through trophic levels and the reduction of available energy at successive trophic levels.

Describe and differentiate the layers of Earth and the interactions among them.

Connect surface features to surface processes that are responsible for their formation.

Analyze the scientific theory of plate tectonics and identify related major processes and features as a result of moving plates.

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MA.K12.MTR.2.1: Express connections between concepts and representations.
Choose a representation based on the given context or purpose.

Clarifications:
Teachers who encourage students to demonstrate understanding by representing problems in multiple ways:
- Help students make connections between concepts and representations.
- Provide opportunities for students to use manipulatives when investigating concepts.
- Guide students from concrete to pictorial to abstract representations as understanding progresses.
- Show students that various representations can have different purposes and can be useful in different situations.

MA.K12.MTR.3.1: Complete tasks with mathematical fluency.
Mathematicians who complete tasks with mathematical fluency:
- Select efficient and appropriate methods for solving problems within the given context.
- Maintain flexibility and accuracy while performing procedures and mental calculations.
- Complete tasks accurately and with confidence.
- Adapt procedures to apply them to a new context.
- Use feedback to improve efficiency when performing calculations.

Clarifications:
Teachers who encourage students to complete tasks with mathematical fluency:
- Provide students with the flexibility to solve problems by selecting a procedure that allows them to solve efficiently and accurately.
- Offer multiple opportunities for students to practice efficient and generalizable methods.
- Provide opportunities for students to reflect on the method they used and determine if a more efficient method could have been used.

MA.K12.MTR.4.1: Engage in discussions that reflect on the mathematical thinking of self and others.
Mathematicians who engage in discussions that reflect on the mathematical thinking of self and others:
- Communicate mathematical ideas, vocabulary and methods effectively.
- Analyze the mathematical thinking of others.
- Compare the efficiency of a method to those expressed by others.
- Recognize errors and suggest how to correctly solve the task.
- Justify results by explaining methods and processes.
- Construct possible arguments based on evidence.

Clarifications:
Teachers who encourage students to engage in discussions that reflect on the mathematical thinking of self and others:
- Establish a culture in which students ask questions of the teacher and their peers, and error is an opportunity for learning.
- Create opportunities for students to discuss their thinking with peers.
- Select, sequence and present student work to advance and deepen understanding of correct and increasingly efficient methods.
- Develop students’ ability to justify methods and compare their responses to the responses of their peers.

MA.K12.MTR.5.1: Use patterns and structure to help understand and connect mathematical concepts.
Mathematicians who use patterns and structure to help understand and connect mathematical concepts:
- Focus on relevant details within a problem.
- Create plans and procedures to logically order events, steps or ideas to solve problems.
- Decompose a complex problem into manageable parts.
- Relate previously learned concepts to new concepts.
- Look for similarities among problems.
- Connect solutions of problems to more complicated large-scale situations.

Clarifications:
Teachers who encourage students to use patterns and structure to help understand and connect mathematical concepts:
- Help students recognize the patterns in the world around them and connect these patterns to mathematical concepts.
- Support students to develop generalizations based on the similarities found among problems.
- Provide opportunities for students to create plans and procedures to solve problems.
- Develop students’ ability to construct relationships between their current understanding and more sophisticated ways of thinking.

Mathematicians who assess the reasonableness of solutions:
- Estimate to discover possible solutions.
- Use benchmark quantities to determine if a solution makes sense.
- Check calculations when solving problems.
- Verify possible solutions by explaining the methods used.
- Evaluate results based on the given context.

Clarifications:
Teachers who encourage students to assess the reasonableness of solutions:
- Have students estimate or predict solutions prior to solving.
- Prompt students to continually ask, “Does this solution make sense? How do you know?”
- Reinforce that students check their work as they progress within and after a task.
- Strengthen students’ ability to verify solutions through justifications.

MA.K12.MTR.5.1: Apply mathematics to real-world contexts.
Mathematicians who apply mathematics to real-world contexts:
- Connect mathematical concepts to everyday experiences.
- Use models and methods to understand, represent and solve problems.
MA.K12.MTR.7.1:
- Perform investigations to gather data or determine if a method is appropriate.
- Redesign models and methods to improve accuracy or efficiency.

Clariﬁcations:
- Teachers who encourage students to apply mathematics to real-world contexts:
- Provide opportunities for students to create models, both concrete and abstract, and perform investigations.
- Challenge students to question the accuracy of their models and methods.
- Support students as they validate conclusions by comparing them to the given situation.
- Indicate how various concepts can be applied to other disciplines.

Cite evidence to explain and justify reasoning.

Clariﬁcations:
- K-1 Students include textual evidence in their oral communication with guidance and support from adults. The evidence can consist of details from the text without naming the text. During 1st grade, students learn how to incorporate the evidence in their writing.
- 2-3 Students include relevant textual evidence in their written and oral communication. Students should name the text when they refer to it. In 3rd grade, students should use a combination of direct and indirect citations.
- 4-5 Students continue with previous skills and reference comments made by speakers and peers. Students cite texts that they’ve directly quoted, paraphrased, or used for information. When writing, students will use the form of citation dictated by the instructor or the style guide referenced by the instructor.
- 6-8 Students continue with previous skills and use a style guide to create a proper citation.
- 9-12 Students continue with previous skills and should be aware of existing style guides and the ways in which they differ.

ELA.K12.EE.1.1:
- Read and comprehend grade-level complex texts proficiently.

Clariﬁcations:
- See Text Complexity for grade-level complexity bands and a text complexity rubric.

ELA.K12.EE.2.1:
- Make inferences to support comprehension.

Clariﬁcations:
- Students will make inferences before the words infer or inference are introduced. Kindergarten students will answer questions like “Why is the girl smiling?” or make predictions about what will happen based on the title page. Students will use the terms and apply them in 2nd grade and beyond.

ELA.K12.EE.3.1:
- Use appropriate collaborative techniques and active listening skills when engaging in discussions in a variety of situations.

Clariﬁcations:
- In kindergarten, students learn to listen to one another respectfully. In grades 1-2, students build upon these skills by justifying what they are thinking. For example: “I think _____ because _____.” The collaborative conversations are becoming academic conversations.
- In grades 3-12, students engage in academic conversations discussing claims and justifying their reasoning, reﬁning and applying skills. Students build on ideas, propel the conversation, and support claims and counterclaims with evidence.

ELA.K12.EE.4.1:
- Use the accepted rules governing a speciﬁc format to create quality work.

Clariﬁcations:
- Students will incorporate skills learned into work products to produce quality work. For students to incorporate these skills appropriately, they must receive instruction. A 3rd grade student creating a poster board display must have instruction in how to effectively present information to do quality work.

ELA.K12.EE.5.1:
- Use appropriate voice and tone when speaking or writing.

Clariﬁcations:
- In kindergarten and 1st grade, students learn the difference between formal and informal language. For example, the way we talk to our friends differs from the way we speak to adults. In 2nd grade and beyond, students practice appropriate social and academic language to discuss texts.

ELA.K12.EE.6.1:
- Students continue with previous skills and reference comments made by speakers and peers. Students cite texts that they’ve directly quoted, paraphrased, or used for information. When writing, students will use the form of citation dictated by the instructor or the style guide referenced by the instructor.

Clariﬁcations:
- Students will make inferences before the words infer or inference are introduced. Kindergarten students will answer questions like “Why is the girl smiling?” or make predictions about what will happen based on the title page. Students will use the terms and apply them in 2nd grade and beyond.

ELD.K12.ELL.SC.1:
- English language learners communicate information, ideas and concepts necessary for academic success in the content area of Science.

ELD.K12.ELL.SI.1:
- English language learners communicate for social and instructional purposes within the school setting.

HE.7.C.1.4:
- Describe ways to reduce or prevent injuries and adolescent health problems.

Clariﬁcations:
- Helmet use, seat-belt use, pedestrian safety, unsupervised handling of firearms, and proper use of over-the-counter medications.

General Course Information and Notes

GENERAL NOTES

Laboratory investigations that include the use of scientific inquiry, research, measurement, problem solving, laboratory apparatus and technologies, experimental procedures, and safety procedures are an integral part of this course. The National Science Teachers Association (NSTA) recommends that at the middle school level, all students should have multiple opportunities every week to explore science laboratory investigations (labs). School laboratory investigations are defined by the National Research Council (NRC) as an experience in the laboratory, classroom, or the field that provides students with opportunities to interact directly with natural phenomena or with data collected by others using tools, materials, data collection techniques, and models (NRC, 2006, p. 3). Laboratory investigations in the middle school classroom should help all students develop a growing understanding of the complexity and ambiguity of empirical work, as well as the skills to calibrate and troubleshoot equipment used to make observations. Learners should understand measurement error; and have the skills to aggregate, interpret, and present the resulting data (NRC, 2006, p. 77; NSTA, 2007).

Honors and Advanced Level Course Note: Advanced courses require a greater demand on students through increased academic rigor. Academic rigor is obtained through the application, analysis, evaluation, and creation of complex ideas that are often abstract and multi-faceted. Students are challenged to think and collaborate
Educator Certifications:

- Biology (Grades 6-12)
- Earth/Space Science (Grades 6-12)
- Middle Grades General Science (Middle Grades 5-9)
- Chemistry (Grades 6-12)
- Physics (Grades 6-12)
- Science (Secondary Grades 7-12)

Special Notes:

**Instructional Practices**

Teaching from a range of complex text is optimized when teachers in all subject areas implement the following strategies on a routine basis:

1. Ensuring wide reading from complex text that varies in length.
2. Making close reading and rereading of texts central to lessons.
3. Emphasizing text-specific complex questions, and cognitively complex tasks, reinforce focus on the text and cultivate independence.
4. Emphasizing students supporting answers based upon evidence from the text.
5. Providing extensive research and writing opportunities (claims and evidence).

**Science and Engineering Practices** (NRC Framework for K-12 Science Education, 2010)

- Asking questions (for science) and defining problems (for engineering).
- Developing and using models.
- Planning and carrying out investigations.
- Analyzing and interpreting data.
- Using mathematics, information and computer technology, and computational thinking.
- Constructing explanations (for science) and designing solutions (for engineering).
- Engaging in argument from evidence.
- Obtaining, evaluating, and communicating information.

**Florida's Benchmarks for Excellent Student Thinking (B.E.S.T.) Standards**

This course includes Florida's B.E.S.T. ELA Expectations (EE) and Mathematical Thinking and Reasoning Standards (MTRs) for students. Florida educators should intentionally embed these standards within the content and their instruction as applicable. For guidance on the implementation of the EE and MTRs, please visit https://www.cpalms.org/Standards/BEST_Standards.aspx and select the appropriate B.E.S.T. Standards package.

**English Language Development ELD Standards Special Notes Section:**

Teachers are required to provide listening, speaking, reading and writing instruction that allows English language learners (ELL) to communicate information, ideas and concepts for academic success in the content area of Science. For the given level of English language proficiency and with visual, graphic, or interactive support, students will interact with grade level words, expressions, sentences and discourse to process or produce language necessary for academic success. The ELD standard should specify a relevant content area concept or topic of study chosen by curriculum developers and teachers which maximizes an ELL's need for communication and social skills. To access an ELL supporting document which delineates performance definitions and descriptors, please click on the following link: https://cpalmsmediaprod.blob.core.windows.net/uploads/docs/standards/eld/sc.pdf

**GENERAL INFORMATION**

**Course Number:** 2002085

**Course Path:** Section: Grades PreK to 12 Education
Courses > Grade Group: Grades 6 to 8 Education
Courses > Subject: Science > SubSubject: General Sciences

**Abbreviated Title:** M/J COMPSCI2 ACC HON

**Course Length:** Year (Y)

**Course Attributes:**
- Class Size Core Required

**Course Level:** 3

**Course Status:** State Board Approved

**Grade Level(s):** 6,7,8
General Course Information and Notes

GENERAL NOTES


GENERAL INFORMATION

Course Number: 2002086
Course Path: Section: Grades PreK to 12 Education Courses > Grade Group: Grades 6 to 8 Education Courses > Subject: Science > SubSubject: General Sciences
Abbreviated Title: M/J SCI 2 CLS
Course Length: Year (Y)
Course Attributes:
- Advanced International Certificate of Education (AICE)
Course Level: 3

Grade Level(s): 6,7,8

Educator Certifications

<table>
<thead>
<tr>
<th>Biology (Grades 6-12)</th>
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<tr>
<td>Middle Grades General Science (Middle Grades 5-9)</td>
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<td>Physics (Grades 6-12)</td>
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<td>Science (Secondary Grades 7-12)</td>
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M/J Science 2 Cambridge Lower Secondary (#2002086) 2022 - And Beyond

General Course Information and Notes

GENERAL NOTES


GENERAL INFORMATION

Course Number: 2002086
Course Path: Sections: Courses > Subject: Science > SubSubject: General Sciences
Abbreviated Title: M/J SCI 2 CLS
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General Course Information and Notes

GENERAL NOTES

The curriculum description for this IB course is provided at:
http://www.ibo.org/en/programmes/

GENERAL INFORMATION

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<td>Course Path: Section: Grades PreK to 12 Education Courses &gt; Grade Group: Grades 6 to 8 Education Courses &gt; Subject: Science &gt; SubSubject: General Sciences</td>
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<tr>
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Educator Certifications

<p>| Science (Elementary Grades 1-6) |
| Science (Secondary Grades 7-12) |
| Middle Grades Integrated Curriculum (Middle Grades 5-9) |
| Chemistry (Grades 6-12) |
| Biology (Grades 6-12) |
| Middle Grades General Science (Middle Grades 5-9) |
| Physics (Grades 6-12) |
| Earth/Space Science (Grades 6-12) |</p>
<table>
<thead>
<tr>
<th>Name</th>
<th>Description</th>
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<tbody>
<tr>
<td>SC.8.E.5.1</td>
<td>Recognize that there are enormous distances between objects in space and apply our knowledge of light and space travel to understand this distance.</td>
</tr>
<tr>
<td>SC.8.E.5.2</td>
<td>Recognize that the universe contains many billions of galaxies and that each galaxy contains many billions of stars.</td>
</tr>
<tr>
<td>SC.8.E.5.3</td>
<td>Distinguish the hierarchical relationships between planets and other astronomical bodies relative to solar system, galaxy, and universe, including distance, size, and composition.</td>
</tr>
<tr>
<td>SC.8.E.5.4</td>
<td>Explore the Law of Universal Gravitation by explaining the role that gravity plays in the formation of planets, stars, and solar systems and in determining their motions.</td>
</tr>
<tr>
<td>SC.8.E.5.5</td>
<td>Describe and classify specific physical properties of stars: apparent magnitude (brightness), temperature (color), size, and luminosity (absolute brightness).</td>
</tr>
<tr>
<td>SC.8.E.5.6</td>
<td>Create models of solar properties including: rotation, structure of the Sun, convection, sunspots, solar flares, and prominences.</td>
</tr>
<tr>
<td>SC.8.E.5.7</td>
<td>Compare and contrast the properties of objects in the Solar System including the Sun, planets, and moons to those of Earth, such as gravitational force, distance from the Sun, speed, movement, temperature, and atmospheric conditions.</td>
</tr>
<tr>
<td>SC.8.E.5.8</td>
<td>Compare various historical models of the Solar System, including geocentric and heliocentric.</td>
</tr>
<tr>
<td>SC.8.E.5.9</td>
<td>Explain the impact of objects in space on each other including: 1. the Sun on the Earth including seasons and gravitational attraction 2. the Moon on the Earth, including phases, tides, and eclipses, and the relative position of each body.</td>
</tr>
<tr>
<td>SC.8.E.5.10</td>
<td>Assess how technology is essential to science for such purposes as access to outer space and other remote locations, sample collection, measurement, data collection and storage, computation, and communication of information.</td>
</tr>
<tr>
<td>SC.8.E.5.11</td>
<td>Identify and compare characteristics of the electromagnetic spectrum such as wavelength, frequency, use, and hazards and recognize its application to an understanding of planetary images and satellite photographs.</td>
</tr>
<tr>
<td>SC.8.E.5.12</td>
<td>Summarize the effects of space exploration on the economy and culture of Florida.</td>
</tr>
<tr>
<td>SC.8.L.1B.1</td>
<td>Describe and investigate the process of photosynthesis, such as the roles of light, carbon dioxide, water and chlorophyll; production of food; release of oxygen.</td>
</tr>
<tr>
<td>SC.8.L.1B.2</td>
<td>Describe and investigate how cellular respiration breaks down food to provide energy and releases carbon dioxide.</td>
</tr>
<tr>
<td>SC.8.L.1B.3</td>
<td>Construct a scientific model of the carbon cycle to show how matter and energy are continuously transferred within and between organisms and their physical environment.</td>
</tr>
<tr>
<td>SC.8.L.1B.4</td>
<td>Cite evidence that living systems follow the Laws of Conservation of Mass and Energy.</td>
</tr>
<tr>
<td>SC.B.N.1.1</td>
<td>Define a problem from the eighth grade curriculum using appropriate reference materials to support scientific understanding, plan and carry out scientific investigations of various types, such as systematic observations or experiments, identify variables, collect and organize data, interpret data in charts, tables, and graphics, analyze information, make predictions, and defend conclusions.</td>
</tr>
<tr>
<td>SC.B.N.1.2</td>
<td>Design and conduct a study using repeated trials and replication.</td>
</tr>
<tr>
<td>SC.B.N.1.3</td>
<td>Use phrases such as &quot;results support&quot; or &quot;fail to support&quot; in science, understanding that science does not offer conclusive 'proof' of a knowledge claim.</td>
</tr>
<tr>
<td>SC.B.N.1.4</td>
<td>Explain how hypotheses are valuable if they lead to further investigations, even if they turn out not to be supported by the data.</td>
</tr>
<tr>
<td>SC.B.N.1.5</td>
<td>Analyze the methods used to develop a scientific explanation as seen in different fields of science.</td>
</tr>
<tr>
<td>SC.B.N.1.6</td>
<td>Understand that scientific investigations involve the collection of relevant empirical evidence, the use of logical reasoning, and the application of imagination in devising hypotheses, predictions, explanations and models to make sense of the collected evidence.</td>
</tr>
<tr>
<td>SC.B.N.2.1</td>
<td>Distinguish between scientific and pseudoscientific ideas.</td>
</tr>
<tr>
<td>SC.B.N.2.2</td>
<td>Discuss what characterizes science and its methods.</td>
</tr>
<tr>
<td>SC.B.N.3.1</td>
<td>Select models useful in relating the results of their own investigations.</td>
</tr>
<tr>
<td>SC.B.N.3.2</td>
<td>Explain why theories may be modified but are rarely discarded.</td>
</tr>
<tr>
<td>SC.B.N.4.1</td>
<td>Explain that science is one of the processes that can be used to inform decision making at the community, state, national, and international levels.</td>
</tr>
<tr>
<td>SC.B.N.4.2</td>
<td>Explain how political, social, and economic concerns can affect science, and vice versa.</td>
</tr>
<tr>
<td>SC.B.P.8.1</td>
<td>Explore the scientific theory of atoms (also known as atomic theory) by using models to explain the motion of particles in solids, liquids, and gases.</td>
</tr>
<tr>
<td>SC.B.P.8.2</td>
<td>Differentiate between weight and mass recognizing that weight is the amount of gravitational pull on an object and is distinct from, though proportional to, mass.</td>
</tr>
<tr>
<td>SC.B.P.8.3</td>
<td>Explore and describe the densities of various materials through measurement of their masses and volumes.</td>
</tr>
<tr>
<td>SC.B.P.8.4</td>
<td>Classify and compare substances on the basis of characteristic physical properties that can be demonstrated or measured; for example, density, thermal or electrical conductivity, solubility, magnetic properties, melting and boiling points, and know that these properties are independent of the amount of the sample.</td>
</tr>
<tr>
<td>SC.B.P.8.5</td>
<td>Recognize that there are a finite number of elements and that their atoms combine in a multitude of ways to produce compounds that make up all of the living and nonliving things that we encounter.</td>
</tr>
<tr>
<td>SC.B.P.8.6</td>
<td>Recognize that elements are grouped in the periodic table according to similarities of their properties.</td>
</tr>
<tr>
<td>SC.B.P.8.7</td>
<td>Explore the scientific theory of atoms (also known as atomic theory) by recognizing that atoms are the smallest unit of an element and are composed of sub-atomic particles (electrons surrounding a nucleus containing protons and neutrons).</td>
</tr>
<tr>
<td>SC.B.P.8.8</td>
<td>Identify basic examples of and compare and classify the properties of compounds, including acids, bases, and salts.</td>
</tr>
<tr>
<td>SC.B.P.8.9</td>
<td>Distinguish among mixtures (including solutions) and pure substances.</td>
</tr>
<tr>
<td>SC.B.P.9.1</td>
<td>Explore the Law of Conservation of Mass by demonstrating and concluding that mass is conserved when substances undergo physical and chemical changes.</td>
</tr>
<tr>
<td>SC.B.P.9.2</td>
<td>Differentiate between physical changes and chemical changes.</td>
</tr>
<tr>
<td>SC.B.P.9.3</td>
<td>Investigate and describe how temperature influences chemical changes.</td>
</tr>
</tbody>
</table>
Cite specific textual evidence to support analysis of science and technical texts.

Determine the central ideas or conclusions of a text; provide an accurate summary of the text distinct from prior knowledge or opinions.

Follow precisely a multistep procedure when carrying out experiments, taking measurements, or performing technical tasks.

Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 6–8 texts and topics.

Analyze the structure an author uses to organize a text, including how the major sections contribute to the whole and to an understanding of the topic.

Analyze the author's purpose in providing an explanation, describing a procedure, or discussing an experiment in a text.

Integrate quantitative or technical information expressed in words with a version of that information expressed visually (e.g., in a flowchart, diagram, model, graph, or table).

Distinguish among facts, reasoned judgment based on research findings, and speculation in a text.

Compare and contrast the information gained from experiments, simulations, video, or multimedia sources with that gained from reading a text on the same topic.

By the end of grade 8, read and comprehend science/technical texts in the grades 6–8 text complexity band independently and proficiently.

Write arguments focused on discipline-specific content.

a. Introduce claim(s) about a topic or issue, acknowledge and distinguish the claim(s) from alternate or opposing claims, and organize the reasons and evidence logically.

b. Support claim(s) with logical reasoning and relevant, accurate data and evidence that demonstrate an understanding of the topic or text, using credible sources.

c. Use words, phrases, and clauses to create cohesion and clarify the relationships among claim(s), counterclaims, reasons, and evidence.

d. Establish and maintain a formal style.

e. Provide a concluding statement or section that follows from and supports the argument presented.

Write informative/explanatory texts, including the narration of historical events, scientific procedures/experiments, or technical processes.

a. Introduce a topic clearly, previewing what is to follow; organize ideas, concepts, and information into broader categories as appropriate to achieving purpose; include formatting (e.g., headings), graphics (e.g., charts, tables), and multimedia when useful to aiding comprehension.

b. Develop the topic with relevant, well-chosen facts, definitions, concrete details, quotations, or other information and examples.

c. Use appropriate and varied transitions to create cohesion and clarify the relationships among ideas and concepts.

d. Use precise language and domain-specific vocabulary to inform about or explain the topic.

e. Establish and maintain a formal style and objective tone.

f. Provide a concluding statement or section that follows from and supports the information or explanation presented.

Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.

With some guidance and support from peers and adults, develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on how well purpose and audience have been addressed.

Use technology, including the Internet, to produce and publish writing and present the relationships between information and ideas clearly and efficiently.

Conduct short research projects to answer a question (including a self-generated question), drawing on several sources and generating additional related, focused questions that allow for multiple avenues of exploration.

Gather relevant information from multiple print and digital sources, using search terms effectively; assess the credibility and accuracy of each source; and quote or paraphrase the data and conclusions of others while avoiding plagiarism and following a standard format for citation.

Draw evidence from informational texts to support analysis reflection, and research.

Write routinely over extended time frames (time for reflection and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences.

Engage effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grade 8 topics, texts, and issues, building on others' ideas and expressing their own clearly.

a. Come to discussions prepared, having read or researched material under study; explicitly draw on that preparation by referring to evidence on the topic, text, or issue to probe and reflect on ideas under discussion.

b. Follow rules for collegial discussions and decision-making, track progress toward specific goals and deadlines, and define individual roles as needed.

c. Pose questions that connect the ideas of several speakers and respond to others' questions and comments with relevant evidence, observations, and ideas.

d. Acknowledge new information expressed by others, and, when warranted, qualify or justify their own views in light of the evidence presented.

Analyze the purpose of information presented in diverse media and formats (e.g., visually, quantitatively, orally) and evaluate the motives (e.g., social, commercial, political) behind its presentation.

Delineate a speaker's argument and specific claims, evaluating the soundness of the reasoning and relevance and sufficiency of the evidence and identifying when irrelevant evidence is introduced.

Present claims and findings, emphasizing salient points in a focused, coherent manner with relevant evidence, sound valid reasoning, and well-chosen details; use appropriate eye contact, adequate volume, and clear pronunciation.

Integrate multimedia and visual displays into presentations to clarify information, strengthen claims and evidence, and add interest.

Describe qualitatively the functional relationship between two quantities by analyzing a graph (e.g., where the function is increasing or decreasing, linear or nonlinear). Sketch a graph that exhibits the qualitative features of a function that has been described verbally.

Know the formulas for the volumes of cones, cylinders, and spheres and use them to solve real-world and mathematical problems.

Clarifications:
Fluency Expectations or Examples of Culminating Standards

When students learn to solve problems involving volumes of cones, cylinders, and spheres — together with their previous grade 7 work in angle measure, area, surface area and volume (7.G.2.4–2.6) — they will have acquired a well-developed set of geometric measurement skills. These skills, along with proportional reasoning (7.RP) and multistep numerical problem solving (7.EE.2.3), can be combined and used in flexible ways as part of modeling during high school — not to mention after high school for college and careers.

Make sense of problems and persevere in solving them.
Mathematically proficient students start by explaining to themselves the meaning of a problem and looking for entry points to its solution. They analyze givens, constraints, relationships, and goals. They make conjectures about the form and meaning of the solution and plan a solution pathway rather than simply jumping into a solution attempt. They consider analogous problems, and try special cases and simpler forms of the original problem in order to gain insight into its solution. They monitor and evaluate their progress and change course if necessary. Older students might, depending on the context of the problem, transform algebraic expressions or change the viewing window on their graphing calculator to get the information they need. Mathematically proficient students can explain correspondences between equations, verbal descriptions, tables, and graphs or draw diagrams of important features and relationships, graph data, and search for regularity or trends. Younger students might rely on using concrete objects or pictures to help conceptualize and solve a problem. Mathematically proficient students check their answers to problems using a different method, and they continually ask themselves, “Does this make sense?” They can understand the approaches of others to solving complex problems and identify correspondences between different approaches.

**Standard Relation to Course: Supporting**

Mathematically proficient students make sense of quantities and their relationships in problem situations. They bring two complementary abilities to bear on problems involving quantitative relationships: the ability to decontextualize—to abstract a given situation and represent it symbolically and manipulate the representing symbols as if they have a life of their own, without necessarily attending to their referents—and the ability to contextualize, to pause as needed during the manipulation process in order to probe into the referents for the symbols involved. Quantitative reasoning entails habits of creating a coherent representation of the problem at hand; considering the units involved; attending to the meaning of quantities, not just how to compute them; and knowing and flexibly using different properties of operations and objects.

**Standard Relation to Course: Supporting**

Mathematically proficient students understand and use stated assumptions, definitions, and previously established results in constructing arguments. They make conjectures and build a logical progression of statements to explore the truth of their conjectures. They are able to analyze situations by breaking them into cases, and can recognize and use counterexamples. They justify their conclusions, communicate them to others, and respond to the arguments of others. They reason inductively about data, making plausible arguments that take into account the context from which the data arose. Mathematically proficient students are also able to compare the effectiveness of two plausible arguments, distinguish correct logic or reasoning from that which is flawed, and—if there is a flaw in an argument—explain what it is. Elementary students can construct arguments using concrete referents such as objects, drawings, diagrams, and actions. Such arguments can make sense and be correct, even though they are not generalized or made formal until later grades. Later, students learn to determine domains to which an argument applies. Students at all grades can listen or read the arguments of others, decide whether they make sense, and ask useful questions to clarify or improve the arguments.

**Standard Relation to Course: Supporting**

Mathematically proficient students can apply the mathematics they know to solve problems arising in everyday life, society, and the workplace. In early grades, this might be as simple as writing an addition equation to describe a situation. In middle grades, a student might apply proportional reasoning to plan a school event or analyze a problem in a community. By high school, a student might use geometry to solve a design problem or use a function to describe how one quantity changes with respect to another. Mathematically proficient students at various grade levels are able to identify relevant external mathematical resources, such as digital content located on a website, and use them to pose or solve problems. They are able to use technological tools to explore and deepen their understanding of concepts.

**Standard Relation to Course: Supporting**

Mathematically proficient students try to communicate precisely to others. They try to use clear definitions in discussion with others and in their own reasoning. They state the meaning of the symbols they choose, including using the equal sign consistently and appropriately. They are careful about specifying units of measure, and labeling axes to clarify the correspondence with quantities in a problem. They calculate accurately and efficiently, express numerical answers with a degree of precision appropriate for the problem context. In the elementary grades, students give carefully formulated explanations to each other. By the time they reach high school they have learned to examine claims and make explicit use of definitions.

**Standard Relation to Course: Supporting**

Mathematically proficient students look closely to discern a pattern or structure. Young students, for example, might notice that three and seven more is the same amount as seven and three more, or they may sort a collection of shapes according to how many sides the shapes have. Later, students will see 7 × 8 equals the well remembered 7 × 5 + 7 × 3, in preparation for learning about the distributive property. In the expression x² + 9x + 14, older students can see the 14 as 2 × 7 and the 9 as 2 × 7. They recognize the significance of an existing line in a geometric figure and can use the strategy of drawing an auxiliary line for solving problems. They also can step back for an overview and shift perspective. They can see complicated things, such as some algebraic expressions, as single objects or as being composed of several objects. For example, they can see 5 – 3(x – y)² as 5 minus a positive number times a square and use that to realize that its value cannot be more than 5 for any real numbers x and y.
Look for and express regularity in repeated reasoning.

Mathematically proficient students notice if calculations are repeated, and look both for general methods and for shortcuts. Upper elementary students might notice when dividing 25 by 11 that they are repeating the same calculations over and over again, and conclude they have a repeating decimal. By paying attention to the calculation of slope as they repeatedly check whether points are on the line through (1, 2) with slope $m$, middle school students might abstract the equation $(y - 2) = mx - 1$. Noticing the regularity in the way terms cancel when expanding $(x - 1)(x + 1)$, $(x - 1)(x^2 + x + 1)$, and $(x - 1)(x^3 + x^2 + x + 1)$ might lead them to the general formula for the sum of a geometric series. As they work to solve a problem, mathematically proficient students maintain oversight of the process, while attending to the details. They continually evaluate the reasonableness of their intermediate results.

**Standard Relation to Course: Supporting**

**ELD.K12.ELL.SC.1:** English language learners communicate information, ideas and concepts necessary for academic success in the content area of Science.

**ELD.K12.ELL.SI.1:** English language learners communicate for social and instructional purposes within the school setting.

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**General Course Information and Notes**

**GENERAL NOTES**

Laboratory investigations that include the use of scientific inquiry, research, measurement, problem solving, laboratory apparatus and technologies, experimental procedures, and safety procedures are an integral part of this course. The National Science Teachers Association (NSTA) recommends that at the middle school level, all students should have multiple opportunities every week to explore science laboratory investigations (labs). School laboratory investigations are defined by the National Research Council (NRC) as an experience in the laboratory, classroom, or the field that provides students with opportunities to interact directly with natural phenomena or with data collected by others using tools, materials, data collection techniques, and models (NRC, 2006, p. 3). Laboratory investigations in the middle school classroom should help all students develop a growing understanding of the complexity and ambiguity of empirical work, as well as the skills to calibrate and troubleshoot equipment used to make observations. Learners should understand measurement error; and have the skills to aggregate, interpret, and present the resulting data (NRC 2006, p. 77; NSTA, 2007).

**Special Notes:**

**Instructional Practices**

Teaching from a range of complex text is optimized when teachers in all subject areas implement the following strategies on a routine basis:

1. Ensuring wide reading from complex text that varies in length.
2. Making close reading and rereading of texts central to lessons.
3. Emphasizing text-specific complex questions, and cognitively complex tasks, reinforce focus on the text and cultivate independence.
4. Emphasizing students supporting answers based upon evidence from the text.
5. Providing extensive research and writing opportunities (claims and evidence).

**Science and Engineering Practices** (NRC Framework for K-12 Science Education, 2010)

- Asking questions (for science) and defining problems (for engineering).
- Developing and using models.
- Planning and carrying out investigations.
- Analyzing and interpreting data.
- Using mathematics, information and computer technology, and computational thinking.
- Constructing explanations (for science) and designing solutions (for engineering).
- Engaging in argument from evidence.
- Obtaining, evaluating, and communicating information.

Additional content that may be included in the Grade 8 NAEP Science assessment includes:

- Rocks and rock formations bear evidence of the minerals, materials, temperature/pressure conditions, and forces that created them. (SC.4.E.6.1 and SC.4.E.6.2)
- Earth as a whole has a magnetic field that is detectable at the surface with a compass, with north and south poles and lines of force. (SC.912.P.10.16)
- The Sun is the major source of energy for phenomena on Earth's surface. (SC.3.L.17.2; SC.3.E.5.2; SC.3.E.6.1; SC.4.P.10.4; SC.4.L.17.2)
- Water, which covers the majority of Earth's surface, circulates through the crust, oceans, and atmosphere in what is known as the water cycle. (SC.5.E.7.1; SC.5.E.7.2; SC.5.E.7.6)
- A tiny fraction of the light energy from the Sun is Earth's primary source of energy, heating Earth surfaces and providing the energy that results in wind, ocean currents, and storms. (SC.2.E.7.2; SC.3.E.6.1)
- Following fertilization, cell division produces a small cluster of cells that then differentiate by appearance and function to form the basic tissues of an embryo. (SC.912.L.16.13)
- Characteristics of organisms are influenced by heredity and environment. (SC.4.L.16.2 and SC.4.L.16.3)
- Nuclear reactions take place in the Sun. (SC.912.P.10.10; SC.912.P.10.11)


**Literacy Standards in Science**

Secondary science courses include reading standards for literacy in science and technical subjects 6-12 and writing standards for literacy in history/social studies, science, and technical subjects 6-12. The courses also include speaking and listening standards. For a complete list of standards required for this course click on the blue tile labeled course standards. You may also download the complete course including all required standards and notes sections using the export function located at the top of this page.

**English Language Development ELD Standards Special Notes Section:**

Teachers are required to provide listening, speaking, reading and writing instruction that allows English language learners (ELL) to communicate information, ideas and concepts for academic success in the content area of Science. For the given level of English language proficiency and with visual, graphic, or interactive support, students will interact with grade level words, expressions, sentences and discourse to process or produce language necessary for academic success The ELD standard should specify a relevant content area concept or topic of study chosen by curriculum developers and teachers which maximizes an ELL's need for communication and social skills. To access an ELL supporting document which delineates performance definitions and descriptors, please click on the following link:
### GENERAL INFORMATION

**Course Number:** 2002100

**Course Path:** Science
**Grade Group:** Middle Grades
**Subject:** General Sciences

**Abbreviated Title:** M/J COMP SCI 3

**Course Length:** Year (Y)

**Course Attributes:**
- Class Size Core Required
- Course Level: 2

**Course Status:** Course Approved

**Grade Level(s):** 6,7,8

### Educator Certifications

<table>
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Mathematicians who participate in effortful learning both individually and with others:

- Analyze the problem in a way that makes sense given the task.
- Ask questions that will help with solving the task.
- Build perseverance by modifying methods as needed while solving a challenging task.
- Stay engaged and maintain a positive mindset when working to solve tasks.
- Help and support each other when attempting a new method or approach.

**Clarifications:**

- Teachers who encourage students to participate actively in effortful learning both individually and with others:
  - Cultivate a community of growth mindset learners.
  - Foster perseverance in students by choosing tasks that are challenging.
  - Develop students' ability to analyze and problem solve.
  - Recognize students' effort when solving challenging problems.

Demonstrate understanding by representing problems in multiple ways.
Mathematicians who demonstrate understanding by representing problems in multiple ways:

- Build understanding through modeling and using manipulatives.
- Represent solutions to problems in multiple ways using objects, drawings, tables, graphs and equations.
- Progress from modeling problems with objects and drawings to using algorithms and equations.
- Express connections between concepts and representations.
- Choose a representation based on the given context or purpose.

**Clarifications:**

- Teachers who encourage students to demonstrate understanding by representing problems in multiple ways:
  - Help students make connections between concepts and representations.
  - Provide opportunities for students to use manipulatives when investigating concepts.
  - Guide students from concrete to pictorial to abstract representations as understanding progresses.
  - Show students that various representations can have different purposes and can be useful in different situations.

Complete tasks with mathematical fluency.
Mathematicians who complete tasks with mathematical fluency:

- Select efficient and appropriate methods for solving problems within the given context.
- Maintain flexibility and accuracy while performing procedures and mental calculations.
- Complete tasks accurately and with confidence.
- Adapt procedures to apply them to a new context.
- Use feedback to improve efficiency when performing calculations.

**Clarifications:**

- Teachers who encourage students to complete tasks with mathematical fluency:
  - Provide students with the flexibility to solve problems by selecting a procedure that allows them to solve efficiently and accurately.
  - Offer multiple opportunities for students to practice efficient and generalizable methods.
  - Provide opportunities for students to reflect on the method they used and determine if a more efficient method could have been used.

Engage in discussions that reflect on the mathematical thinking of self and others.
Mathematicians who engage in discussions that reflect on the mathematical thinking of self and others:

- Communicate mathematical ideas, vocabulary and methods effectively.
- Analyze the mathematical thinking of others.
- Compare the efficiency of a method to those expressed by others.
- Recognize errors and suggest how to correctly solve the task.
- Justify results by explaining methods and processes.
- Construct possible arguments based on evidence.

**Clarifications:**

- Teachers who encourage students to engage in discussions that reflect on the mathematical thinking of self and others:
  - Establish a culture in which students ask questions of the teacher and their peers, and error is an opportunity for learning.
  - Create opportunities for students to discuss their thinking with peers.
  - Select, sequence and present student work to advance and deepen understanding of correct and increasingly efficient methods.
  - Develop students' ability to justify methods and compare their responses to the responses of their peers.

Use patterns and structure to help understand and connect mathematical concepts.
Mathematicians who use patterns and structure to help understand and connect mathematical concepts:

- Focus on relevant details within a problem.
- Create plans and procedures to logically order events, steps or ideas to solve problems.
- Decompose a complex problem into manageable parts.
- Relate previously learned concepts to new concepts.
- Look for similarities among problems.
- Connect solutions of problems to more complicated large-scale situations.

**Clarifications:**

- Teachers who encourage students to use patterns and structure to help understand and connect mathematical concepts:
  - Help students recognize the patterns in the world around them and connect these patterns to mathematical concepts.
  - Support students to develop generalizations based on the similarities found among problems.
  - Provide opportunities for students to create plans and procedures to solve problems.
  - Develop students' ability to construct relationships between their current understanding and more sophisticated ways of thinking.

Assess the reasonableness of solutions.
English language learners communicate information, ideas and concepts
Mathematicians who assess the reasonableness of solutions:
- Estimate to discover possible solutions.
- Use benchmark quantities to determine if a solution makes sense.
- Check calculations when solving problems.
- Verify possible solutions by explaining the methods used.
- Evaluate results based on the given context.

**Clarifications:**
Teachers who encourage students to assess the reasonableness of solutions:
- Have students estimate or predict solutions prior to solving.
- Prompt students to continually ask, “Does this solution make sense? How do you know?”
- Reinforce that students check their work as they progress within and after a task.
- Strengthen students’ ability to verify solutions through justifications.

Apply mathematics to real-world contexts.
Mathematicians who apply mathematics to real-world contexts:
- Connect mathematical concepts to everyday experiences.
- Use models and methods to understand, represent and solve problems.
- Perform investigations to gather data or determine if a method is appropriate. • Redesign models and methods to improve accuracy or efficiency.

**Clarifications:**
Teachers who encourage students to apply mathematics to real-world contexts:
- Provide opportunities for students to create models, both concrete and abstract, and perform investigations.
- Challenge students to question the accuracy of their models and methods.
- Support students as they validate conclusions by comparing them to the given situation.
- Indicate how various concepts can be applied to other disciplines.

Cite evidence to explain and justify reasoning.

**Clarifications:**
K-1 Students include textual evidence in their oral communication with guidance and support from adults. The evidence can consist of details from the text without naming the text. During 1st grade, students learn how to incorporate the evidence in their writing.
2-3 Students include relevant textual evidence in their written and oral communication. Students should name the text when they refer to it. In 3rd grade, students should use a combination of direct and indirect citations.
4-5 Students continue with previous skills and reference comments made by speakers and peers. Students cite texts that they’ve directly quoted, paraphrased, or used for information. When writing, students will use the form of citation dictated by the instructor or the style guide referenced by the instructor.
6-8 Students continue with previous skills and use a style guide to create a proper citation.
9-12 Students continue with previous skills and should be aware of existing style guides and the ways in which they differ.

Read and comprehend grade-level complex texts proficiently.

**Clarifications:**
See Text Complexity for grade-level complexity bands and a text complexity rubric.

Make inferences to support comprehension.

**Clarifications:**
Students will make inferences before the words infer or inference are introduced. Kindergarten students will answer questions like “Why is the girl smiling?” or make predictions about what will happen based on the title page. Students will use the terms and apply them in 2nd grade and beyond.

Use appropriate collaborative techniques and active listening skills when engaging in discussions in a variety of situations.

**Clarifications:**
In kindergarten, students learn to listen to one another respectfully. In grades 1-2, students build upon these skills by justifying what they are thinking. For example: “I think ______ because ______.” The collaborative conversations are becoming academic conversations.
In grades 3-12, students engage in academic conversations discussing claims and justifying their reasoning, refining and applying skills. Students build on ideas, propel the conversation, and support claims and counterclaims with evidence.

Use the accepted rules governing a specific format to create quality work.

**Clarifications:**
Students will incorporate skills learned into work products to produce quality work. For students to incorporate these skills appropriately, they must receive instruction. A 3rd grade student creating a poster board display must have instruction in how to effectively present information to do quality work.

Use appropriate voice and tone when speaking or writing.

**Clarifications:**
In kindergarten and 1st grade, students learn the difference between formal and informal language. For example, the way we talk to our friends differs from the way we speak to adults. In 2nd grade and beyond, students practice appropriate social and academic language to discuss texts.

**General Course Information and Notes**

**ELA.K12.EE.6.1:**
English language learners communicate information, ideas and concepts necessary for academic success in the content area of Science.

**ELD.K12.EE.1.1:**
English language learners communicate for social and instructional purposes within the school setting.
Laboratory investigations that include the use of scientific inquiry, research, measurement, problem solving, laboratory apparatus and technologies, experimental procedures, and safety procedures are an integral part of this course. The National Science Teachers Association (NSTA) recommends that at the middle school level, all students should have multiple opportunities every week to explore science laboratory investigations (labs). School laboratory investigations are defined by the National Research Council (NRC) as an experience in the laboratory, classroom, or the field that provides students with opportunities to interact directly with natural phenomena or with data collected by others using tools, materials, data collection techniques, and models (NRC, 2006, p. 3). Laboratory investigations in the middle school classroom should help all students develop a growing understanding of the complexity and ambiguity of empirical work, as well as the skills to calibrate and troubleshoot equipment used to make observations. Learners should understand measurement error; and have the skills to aggregate, interpret, and present the resulting data (NRC 2006, p. 77; NSTA, 2007).

**Special Notes:**

**Instructional Practices**

Teaching from a range of complex text is optimized when teachers in all subject areas implement the following strategies on a routine basis:

1. Ensuring wide reading from complex text that varies in length.
2. Making close reading and rereading of texts central to lessons.
3. Emphasizing text-specific complex questions, and cognitively complex tasks, reinforce focus on the text and cultivate independence.
4. Emphasizing students supporting answers based upon evidence from the text.
5. Providing extensive research and writing opportunities (claims and evidence).

**Science and Engineering Practices** (NRC Framework for K-12 Science Education, 2010)

- Asking questions (for science) and defining problems (for engineering).
- Developing and using models.
- Planning and carrying out investigations.
- Analyzing and interpreting data.
- Using mathematics, information and computer technology, and computational thinking.
- Constructing explanations (for science) and designing solutions (for engineering).
- Engaging in argument from evidence.
- Obtaining, evaluating, and communicating information.

Additional content that may be included in the Grade 8 NAEP Science assessment includes:

- Rocks and rock formations bear evidence of the minerals, materials, temperature/pressure conditions, and forces that created them. (SC.4.E.6.1 and SC.4.E.6.2)
- Earth as a whole has a magnetic field that is detectable at the surface with a compass, with north and south poles and lines of force. (SC.912.P.10.16)
- The Sun is the major source of energy for phenomena on Earth's surface. (SC.3.L.17.2; SC.3.E.5.2; SC.3.E.6.1; SC.4.P.10.4; SC.4.L.17.2)
- Water, which covers the majority of Earth's surface, circulates through the crust, oceans, and atmosphere in what is known as the water cycle. (SC.5.E.7.1; SC.5.E.7.2; SC.5.E.7.8)
- A tiny fraction of the light energy from the Sun is Earth's primary source of energy, heating Earth surfaces and providing the energy that results in wind, ocean currents, and storms. (SC.2.E.7.2; SC.3.E.6.1)
- Following fertilization, cell division produces a small cluster of cells that then differentiate by appearance and function to form the basic tissues of an embryo. (SC.912.L.16.13)
- Characteristics of organisms are influenced by heredity and environment. (SC.4.L.16.2 and SC.4.L.16.3)
- Nuclear reactions take place in the Sun. (SC.912.P.10.10; SC.912.P.10.11)


**Florida's Benchmarks for Excellent Student Thinking (B.E.S.T.) Standards**

This course includes Florida's B.E.S.T. ELA Expectations (EE) and Mathematical Thinking and Reasoning Standards (MTRs) for students. Florida educators should intentionally embed these standards within the content and their instruction as applicable. For guidance on the implementation of the EE and MTRs, please visit https://www.cpalms.org/Standards/BEST_Standards.aspx and select the appropriate B.E.S.T. Standards package.

**English Language Development ELD Standards Special Notes Section:**

Teachers are required to provide listening, speaking, reading and writing instruction that allows English language learners (ELL) to communicate information, ideas and concepts for academic success in the content area of Science. For the given level of English language proficiency and with visual, graphic, or interactive support, students will interact with grade level words, expressions, sentences and discourse to process or produce language necessary for academic success The ELD standard should specify a relevant content area concept or topic of study chosen by curriculum developers and teachers which maximizes an ELL's need for communication and social skills. To access an ELL supporting document which delineates performance definitions and descriptors, please click on the following link:

https://cpalmsmediaprod.blob.core.windows.net/uploads/docs/standards/eld/sc.pdf

**Additional Instructional Resources:**


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**GENERAL INFORMATION**

**Course Number:** 2002100

**Course Path:** Section: Grades PreK to 12 Education
Courses > Grade Group: Grades 6 to 8 Education
Courses > Subject: Science > SubSubject: General Sciences

**Abbreviated Title:** M/J COMP SCI 3

**Course Length:** Year (Y)
**Course Attributes:**
- Class Size Core Required

**Course Level:** 2

**Course Status:** State Board Approved

**Grade Level(s):** 6, 7, 8

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<td>Classify and compare substances on the basis of characteristic physical properties that can be demonstrated or measured; for example, density, thermal or electrical conductivity, solubility, magnetic properties, melting and boiling points, and know that these properties are independent of the amount of the sample.</td>
</tr>
<tr>
<td>SC.BP.8.5:</td>
<td>Recognize that there are a finite number of elements and that their atoms combine in a multitude of ways to produce compounds that make up all of the living and nonliving things that we encounter.</td>
</tr>
<tr>
<td>SC.BP.8.6:</td>
<td>Recognize that elements are grouped in the periodic table according to similarities of their properties.</td>
</tr>
<tr>
<td>SC.BP.8.7:</td>
<td>Explore the scientific theory of atoms (also known as atomic theory) by recognizing that atoms are the smallest unit of an element and are composed of sub-atomic particles (electrons surrounding a nucleus containing protons and neutrons).</td>
</tr>
<tr>
<td>SC.BP.8.8:</td>
<td>Identify basic examples of and compare and classify the properties of compounds, including acids, bases, and salts.</td>
</tr>
<tr>
<td>SC.BP.8.9:</td>
<td>Distinguish among mixtures (including solutions) and pure substances.</td>
</tr>
</tbody>
</table>
Explore the Law of Conservation of Mass by demonstrating and concluding that mass is conserved when substances undergo physical and chemical changes.

SC.912.P.9.1: Differentiate between physical changes and chemical changes.

SC.912.P.9.2: Investigate and describe how temperature influences chemical changes.

SC.912.E.5.4: Explain the physical properties of the Sun and its dynamic nature and connect them to conditions and events on Earth.

SC.912.L.18.7: Identify the reactants, products, and basic functions of photosynthesis.

SC.912.L.18.8: Identify the reactants, products, and basic functions of aerobic and anaerobic cellular respiration.

SC.912.L.18.9: Explain the interrelated nature of photosynthesis and cellular respiration.

SC.912.P.8.1: Relate properties of atoms and their position in the periodic table to the arrangement of their electrons.

SC.912.P.8.2: Differentiate between physical and chemical properties and physical and chemical changes of matter.

SC.912.P.8.4: Explore the scientific theory of atoms (also known as atomic theory) by describing the structure of atoms in terms of protons, neutrons and electrons, and differentiate among these particles in terms of their mass, electrical charges and locations within the atom.

SC.912.P.8.5: Relate properties of atoms and their position in the periodic table to the arrangement of their electrons.

SC.912.P.8.7: Interpret formula representations of molecules and compounds in terms of composition and structure.

SC.912.P.8.11: Relate acidity and basicity to hydronium and hydroxyl ion concentration and pH.

LAFS.68.RST.1.1: Cite specific textual evidence to support analysis of science and technical texts.

LAFS.68.RST.1.2: Determine the central ideas or conclusions of a text; provide an accurate summary of the text distinct from prior knowledge or opinions.

LAFS.68.RST.1.3: Follow precisely a multistep procedure when carrying out experiments, taking measurements, or performing technical tasks.

LAFS.68.RST.2.4: Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 6–8 texts and topics.

LAFS.68.RST.2.5: Analyze the structure an author uses to organize a text, including how the major sections contribute to the whole and to an understanding of the topic.

LAFS.68.RST.2.6: Analyze the author's purpose in providing an explanation, describing a procedure, or discussing an experiment in a text.

LAFS.68.RST.3.7: Integrate quantitative or technical information expressed in words in a text with that gained from reading a text on the same topic.

LAFS.68.RST.3.8: Distinguish among facts, reasoned judgment based on research findings, and speculation in a text.

LAFS.68.RST.3.9: Compare and contrast the information gained from experiments, simulations, video, or multimedia sources with that gained from reading a text on the same topic.

LAFS.68.RST.4.10: By the end of grade 8, read and comprehend science/technical texts in the grades 6–8 text complexity band independently and proficiently.

Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes.

a. Introduce a topic clearly, previewing what is to follow; organize ideas, concepts, and information into broader categories as appropriate to achieving purpose; include formatting (e.g., headings), graphics (e.g., charts, tables), and multimedia when useful to aiding comprehension.

b. Develop the topic with relevant, well-chosen facts, definitions, concrete details, quotations, or other information and examples.

c. Use appropriate and varied transitions to create cohesion and clarify the relationships among ideas and concepts.

d. Use precise language and domain-specific vocabulary to inform about or explain the topic.

e. Establish and maintain a formal style.

f. Provide a concluding statement or section that follows from and supports the argument presented.

LAFS.68.WHST.1.1: Write arguments focused on discipline-specific content.

a. Introduce claim(s) about a topic or issue, acknowledge and distinguish the claim(s) from alternate or opposing claims, and organize the reasons and evidence logically.

b. Support claim(s) with logical reasoning and relevant, accurate data and evidence that demonstrate an understanding of the topic or text, using credible sources.

c. Use words, phrases, and clauses to create cohesion and clarify the relationships among claim(s), counterclaims, reasons, and evidence.

d. Establish and maintain a formal style.

e. Provide a concluding statement or section that follows from and supports the argument presented.

LAFS.68.WHST.1.2: Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes.

a. Introduce a topic clearly, previewing what is to follow; organize ideas, concepts, and information into broader categories as appropriate to achieving purpose; include formatting (e.g., headings), graphics (e.g., charts, tables), and multimedia when useful to aiding comprehension.

b. Develop the topic with relevant, well-chosen facts, definitions, concrete details, quotations, or other information and examples.

c. Use appropriate and varied transitions to create cohesion and clarify the relationships among ideas and concepts.

d. Use precise language and domain-specific vocabulary to inform about or explain the topic.

e. Establish and maintain a formal style and objective tone.

f. Provide a concluding statement or section that follows from and supports the information or explanation presented.

LAFS.68.WHST.2.4: Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.

LAFS.68.WHST.2.5: With some guidance and support from peers and adults, develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on how well purpose and audience have been addressed.

LAFS.68.WHST.2.6: Use technology, including the Internet, to produce and publish writing and present the relationships between information and ideas clearly and efficiently.

LAFS.68.WHST.3.7: Conduct short research projects to answer a question (including a self-generated question), drawing on several sources and generating additional related, focused questions that allow for multiple avenues of exploration.

LAFS.68.WHST.3.8: Gather relevant information from multiple print and digital sources, using search terms effectively; assess the credibility and accuracy of each source; and quote or paraphrase the data and conclusions of others while avoiding plagiarism and following a standard format for citation.

LAFS.68.WHST.3.9: Draw evidence from informational texts to support analysis reflection, and research.

LAFS.68.WHST.4.10: Write routinely over extended time frames (time for reflection and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences.

LAFS.8.SL.1.1: Engage effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grade 8 topics, texts, and issues, building on others' ideas and expressing their own clearly.

a. Come to discussions prepared, having read or researched material under study; explicitly draw on that preparation by referring to evidence on the topic, text, or issue to probe and reflect on ideas under discussion.

b. Follow rules for collegial discussions and decision-making, track progress toward specific goals and deadlines, and define individual roles as needed.

c. Pose questions that connect the ideas of several speakers and respond to others' questions and comments with relevant evidence, observations, and ideas.

d. Acknowledge new information expressed by others, and, when warranted, qualify or justify their own views in light of the evidence presented.

LAFS.8.SL.1.2: Analyze the purpose of information presented in diverse media and formats (e.g., visually, quantitatively, orally) and evaluate the motives (e.g., social, commercial, political) behind its presentation.
### Mathematics Standards

#### MAFS.8.SL.1.3:
Delineate a speaker's argument and specific claims, evaluating the soundness of the reasoning and relevance and sufficiency of the evidence and identifying when irrelevant evidence is introduced.

#### MAFS.8.SL.2.4:
Present claims and findings, emphasizing salient points in a focused, coherent manner with relevant evidence, sound valid reasoning, and well-chosen details; use appropriate eye contact, adequate volume, and clear pronunciation.

#### MAFS.8.SL.2.5:
Integrate multimedia and visual displays into presentations to clarify information, strengthen claims and evidence, and add interest.

#### MAFS.8.F.2.5:
Describe qualitatively the functional relationship between two quantities by analyzing a graph (e.g., where the function is increasing or decreasing, linear or nonlinear). Sketch a graph that exhibits the qualitative features of a function that has been described verbally.

#### MAFS.8.G.3.9:
Know the formulas for the volumes of cones, cylinders, and spheres and use them to solve real-world and mathematical problems.

#### Clarifications:

- **Fluency Expectations or Examples of Culminating Standards**
  - When students learn to solve problems involving volumes of cones, cylinders, and spheres — together with their previous grade 7 work in angle measure, area, surface area and volume (7.G.2.4–2.6) — they will have acquired a well-developed set of geometric measurement skills. These skills, along with proportional reasoning (7.RP) and multistep numerical problem solving (7.EE.2.3), can be combined and used in flexible ways as part of modeling during high school — not to mention after high school for college and careers.

#### MAFS.8.SP.1.4:
Understand that patterns of association can also be seen in bivariate categorical data by displaying frequencies and relative frequencies in a two-way table. Construct and interpret a two-way table summarizing data on two categorical variables collected from the same subjects. Use relative frequencies calculated for rows or columns to describe possible association between the two variables. For example, collect data from students in your class on whether or not they have a curfew on school nights and whether or not they have assigned chores at home. Is there evidence that those who have a curfew also tend to have chores?

### Make sense of problems and persevere in solving them.

Mathematically proficient students start by explaining to themselves the meaning of a problem and looking for entry points to its solution. They analyze givens, constraints, relationships, and goals. They make conjectures about the form and meaning of the solution and plan a solution pathway rather than simply jumping into a solution attempt. They consider analogous problems, and try special cases and simpler forms of the original problem in order to gain insight into its solution. They monitor and evaluate their progress and change course if necessary. Older students might, depending on the context of the problem, transform algebraic expressions or change the viewing window on their graphing calculator to get a better sense of what is happening mathematically. Mathematically proficient students can explain correspondences between equations, verbal descriptions, tables, and graphs or draw diagrams of important features and relationships, graph data, and search for regularity or trends. Younger students might rely on using concrete objects or pictures to help conceptualize and solve a problem. Mathematically proficient students check their answers to problems using a different method, and they continually ask themselves, "Does this make sense?" They can understand the approaches of others to solving complex problems and identify correspondences between different approaches.

#### Standard Relation to Course: Supporting

- **Reason abstractly and quantitatively.** Mathematically proficient students make sense of quantities and their relationships in problem situations. They bring two complementary abilities to bear on problems involving quantitative relationships: the ability to decontextualize—to abstract a given situation and represent it symbolically and manipulate the representing symbols as if they have a life of their own, without necessarily attending to their referents—and the ability to contextualize, to pause as needed during the manipulation process in order to probe into the referents for the symbols involved. Quantitative reasoning entails habits of creating a coherent representation of the problem at hand; considering the units involved; attending to the meaning of quantities, not just how to compute them; and knowing and flexibly using different units of operations and objects.

- **Construct viable arguments and critique the reasoning of others.** Mathematically proficient students understand and use stated assumptions, definitions, and previously established results in constructing arguments. They make conjectures and build a logical progression of statements to explore the truth of their conjectures. They are able to analyze situations by breaking them into cases, and can recognize and use counterexamples. They justify their conclusions, communicate them to others, and respond to the arguments of others. They reason inductively about data, making plausible arguments that take into account the context from which the data arose. Mathematically proficient students are also able to compare the effectiveness of two plausible arguments, distinguish correct logic or reasoning from that which is flawed, and—if there is a flaw in an argument—explain what it is. Elementary students can construct arguments using concrete referents such as objects, drawings, diagrams, and actions. Such arguments can make sense and be correct, even though they are not generalized or made formal until later grades. Older students learn to determine domains to which an argument applies. Students at all grades can listen or read the arguments of others, decide whether they make sense, and ask useful questions to clarify or improve the arguments.

- **Model with mathematics.** Mathematically proficient students can apply the mathematics they know to solve problems arising in everyday life, society, and the workplace. In early grades, this might be as simple as writing an addition equation to describe a situation. In middle grades, a student might apply proportional reasoning to plan a school event or analyze a problem in the community. By high school, a student might use geometry to solve a design problem or use a function to describe how one quantity of interest depends on another. Mathematically proficient students who can apply what they know are comfortable making assumptions and approximations to simplify a complicated situation, realizing that these may need revision later. They are able to identify important quantities in a practical situation and map their relationships using such tools as diagrams, two-way tables, graphs, flowcharts and formulas. They can analyze those relationships mathematically to draw conclusions. They routinely interpret their mathematical results in the context of the situation and reflect on whether the results make sense, possibly improving the model if it has not served its purpose.

- **Use appropriate tools strategically.** Mathematically proficient students consider the available tools when solving a mathematical problem. These tools might include pencil and paper, concrete models, a ruler, a protractor, a calculator, a spreadsheet, a computer algebra system, a statistical package, or dynamic geometry software. Proficient students are sufficiently familiar with tools appropriate for their grade or course to make sound decisions about when each of these tools might be helpful, recognizing both the insight to be gained and their limitations. For example, mathematically proficient high school students analyze graphs of functions and solutions generated using a graphing calculator. They detect possible errors by strategically using estimation and other mathematical knowledge. When making mathematical models, they know that technology can enable them to visualize the results of varying assumptions, explore consequences, and compare predictions with data. Mathematically proficient students at various grade levels are able to
identify relevant external mathematical resources, such as digital content located on a website, and use them to pose or solve problems. They are able to use technological tools to explore and deepen their understanding of concepts.

Standard Relation to Course: Supporting

MAFS.K12.MP.6.1:
Attend to precision.
Mathematically proficient students try to communicate precisely to others. They try to use clear definitions in discussion with others and in their own reasoning. They state the meaning of the symbols they choose, including using the equal sign consistently and appropriately. They are careful about specifying units of measure, and labeling axes to clarify the correspondence with quantities in a problem. They calculate accurately and efficiently, express numerical answers with a degree of precision appropriate for the problem context. In the elementary grades, students give carefully formulated explanations to each other. By the time they reach high school they have learned to examine claims and make explicit use of definitions.

Standard Relation to Course: Supporting

MAFS.K12.MP.7.1:
Look for and make use of structure.
Mathematically proficient students look closely to discern a pattern or structure. Young students, for example, might notice that three and seven more is the same amount as seven and three more, or that may sort a collection of shapes according to how many sides the shapes have. Later, students will see $7 \times 8$ equals the well remembered $7 \times 5 + 7$ in preparation for learning about the distributive property. In the expression $x^2 + 9x + 14$, older students can see the $14$ as $2 \times 7$ and the $9$ as $2 + 7$. They recognize the significance of an existing line in a geometric figure and can use the strategy of drawing an auxiliary line for solving problems. They also can step back for an overview and shift perspective. They can see complicated things, such as some algebraic expressions, as single objects or as being composed of several objects. For example, they can see $5 - 3(x - y)^2$ as $5$ minus a positive number times a square and use that to realize that its value cannot be more than $5$ for any real numbers $x$ and $y$.

Standard Relation to Course: Supporting

MAFS.K12.MP.8.1:
Look for and express regularity in repeated reasoning.
Mathematically proficient students notice if calculations are repeated, and look both for general methods and for shortcuts. Upper elementary students might notice when dividing $25$ by $11$ that they are repeating the same calculations over and over again, and conclude they have a repeating decimal. By paying attention to the calculation of slope as they repeatedly check whether points are on the line through $(1, 2)$ with slope $3$, middle school students might abstract the equation $y = 2x + 1$, $(x - 1)^2 + x + 1$, and $(x - 1)(x^2 + x + 1)$ might lead them to the general formula for the sum of a geometric series. As they work to solve a problem, mathematically proficient students maintain oversight of the process, while attending to the details. They continually evaluate the reasonableness of their intermediate results.

Standard Relation to Course: Supporting

ELD.K12.ELL.SI.1:
English language learners communicate information, ideas and concepts necessary for academic success in the content area of Science.

ELD.K12.ELL.SC.1:
English language learners communicate for social and instructional purposes within the school setting.

General Course Information and Notes

GENERAL NOTES

Laboratory investigations that include the use of scientific inquiry, research, measurement, problem solving, laboratory apparatus and technologies, experimental procedures, and safety procedures are an integral part of this course. The National Science Teachers Association (NSTA) recommends that at the middle school level, all students should have multiple opportunities every week to explore science laboratory investigations (labs). School laboratory investigations are defined by the National Research Council (NRC) as an experience in the laboratory, classroom, or the field that provides students with opportunities to interact directly with natural phenomena or with data collected by others using tools, materials, data collection techniques, and models (NRC, 2006, p. 3). Laboratory investigations in the middle school classroom should help all students develop a growing understanding of the complexity and ambiguity of empirical work, as well as the skills to calibrate and troubleshoot equipment used to make observations. Learners should understand measurement error; and have the skills to aggregate, interpret, and present the resulting data (NRC 2006, p. 77; NSTA, 2007).

Honors and Advanced Level Course Note: Advanced courses require a greater demand on students through increased academic rigor. Academic rigor is obtained through the application, analysis, evaluation, and creation of complex ideas that are often abstract and multi-faceted. Students are challenged to think and collaborate critically on the content they are learning. Honors level rigor will be achieved by increasing text complexity through text selection, focus on high-level qualitative measures, and complexity of task. Instruction will be structured to give students a deeper understanding of conceptual themes and organization within and across disciplines. Academic rigor is more than simply assigning to students a greater quantity of work.

Special Notes:

Instructional Practices
Teaching from a range of complex text is optimized when teachers in all subject areas implement the following strategies on a routine basis:

1. Ensuring wide reading from complex text that varies in length.
2. Making close reading and rereading of texts central to lessons.
3. Emphasizing text-specific complex questions, and cognitively complex tasks, reinforce focus on the text and cultivate independence.
4. Emphasizing students supporting answers based upon evidence from the text.
5. Providing extensive research and writing opportunities (claims and evidence).

- Asking questions (for science) and defining problems (for engineering).
- Developing and using models.
- Planning and carrying out investigations.
- Analyzing and interpreting data.
- Using mathematics, information and computer technology, and computational thinking.
- Constructing explanations (for science) and designing solutions (for engineering).
- Engaging in argument from evidence.
Obtaining, evaluating, and communicating information.

Additional content that may be included in the Grade 8 NAEP Science assessment includes:

- Rocks and rock formations bear evidence of the minerals, materials, temperature/pressure conditions, and forces that created them. (SC.4.E.6.1 and SC.4.E.6.2)
- Earth as a whole has a magnetic field that is detectable at the surface with a compass, with north and south poles and lines of force. (SC.912.P.10.16)
- The Sun is the major source of energy for phenomena on Earth's surface. (SC.3.L.17.2; SC.3.E.5.2; SC.3.E.6.1; SC.4.P.10.4; SC.4.L.17.2)
- Water, which covers the majority of Earth's surface, circulates through the crust, oceans, and atmosphere in what is known as the water cycle. (SC.5.E.7.1; SC.5.E.7.2; SC.5.E.7.6)
- A tiny fraction of the light energy from the Sun is Earth's primary source of energy, heating Earth surfaces and providing the energy that results in wind, ocean currents, and storms. (SC.2.E.7.2; SC.3.E.6.1)
- Following fertilization, cell division produces a small cluster of cells that then differentiate by appearance and function to form the basic tissues of an embryo. (SC.912.L.16.13)
- Characteristics of organisms are influenced by heredity and environment. (SC.4.L.16.2 and SC.4.L.16.3)
- Nuclear reactions take place in the Sun. (SC.912.P.10.10; SC.912.P.10.11)

The NAEP frameworks for Science may be accessed at http://www.nagb.org/publications/frameworks/science-09.pdf

**Literacy Standards in Science**

Secondary science courses include reading standards for literacy in science and technical subjects 6-12 and writing standards for literacy in history/social studies, science, and technical subjects 6-12. The courses also include speaking and listening standards. For a complete list of standards required for this course click on the blue tile on the export function located at the top of this page.

**English Language Development ELD Standards Special Notes Section:**

Teachers are required to provide listening, speaking, reading and writing instruction that allows English language learners (ELL) to communicate information, ideas and concepts for academic success in the content area of Science. For the given level of English language proficiency and with visual, graphic, or interactive support, students will interact with grade level words, expressions, sentences and discourse to process or produce language necessary for academic success The ELD standard should specify a relevant content area concept or topic of study chosen by curriculum developers and teachers which maximizes an ELL's need for communication and social skills.

To access an ELL supporting document which delineates performance definitions and descriptors, please click on the following link: https://cpalmsmediaprod.blob.core.windows.net/uploads/docs/standards/eld/sc.pdf

**Additional Instructional Resources:**

A.V.E. for Success Collection is provided by the Florida Association of School Administrators: http://www.fasa.net/4DCGI/cms/review.html?Action=CMS_Document&DocID=139. Please be aware that these resources have not been reviewed by CPALMS and there may be a charge for the use of some of them in this collection.
### Course Standards

<table>
<thead>
<tr>
<th>Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>SC.8.E.5.1</td>
<td>Recognize that there are enormous distances between objects in space and apply our knowledge of light and space travel to understand this distance.</td>
</tr>
<tr>
<td>SC.8.E.5.2</td>
<td>Recognize that the universe contains many billions of galaxies and that each galaxy contains many billions of stars.</td>
</tr>
<tr>
<td>SC.8.E.5.3</td>
<td>Distinguish the hierarchical relationships between planets and other astronomical bodies relative to solar system, galaxy, and universe, including distance, size, and composition.</td>
</tr>
<tr>
<td>SC.8.E.5.4</td>
<td>Explore the Law of Universal Gravitation by explaining the role that gravity plays in the formation of planets, stars, and solar systems and in determining their motions.</td>
</tr>
<tr>
<td>SC.8.E.5.5</td>
<td>Describe and classify specific physical properties of stars: apparent magnitude (brightness), temperature (color), size, and luminosity (absolute brightness).</td>
</tr>
<tr>
<td>SC.8.E.5.6</td>
<td>Create models of solar properties including: rotation, structure of the Sun, convection, sunspots, solar flares, and prominences.</td>
</tr>
<tr>
<td>SC.8.E.5.7</td>
<td>Compare and contrast the properties of objects in the Solar System including the Sun, planets, and moons to those of Earth, such as gravitational force, distance from the Sun, speed, movement, temperature, and atmospheric conditions.</td>
</tr>
<tr>
<td>SC.8.E.5.8</td>
<td>Compare various historical models of the Solar System, including geocentric and heliocentric.</td>
</tr>
<tr>
<td>SC.8.E.5.9</td>
<td>Explain the impact of objects in space on each other including: 1. the Sun on the Earth including seasons and gravitational attraction 2. the Moon on the Earth, including phases, tides, and eclipses, and the relative position of each body.</td>
</tr>
<tr>
<td>SC.8.E.5.10</td>
<td>Assess how technology is essential to science for such purposes as access to outer space and other remote locations, sample collection, measurement, data collection and storage, computation, and communication of information.</td>
</tr>
<tr>
<td>SC.8.E.5.11</td>
<td>Identify and compare characteristics of the electromagnetic spectrum such as wavelength, frequency, use, and hazards and recognize its application to an understanding of planetary images and satellite photographs.</td>
</tr>
<tr>
<td>SC.8.E.5.12</td>
<td>Summarize the effects of space exploration on the economy and culture of Florida.</td>
</tr>
<tr>
<td>SC.8.L.18.1</td>
<td>Describe and investigate the process of photosynthesis, such as the roles of light, carbon dioxide, water and chlorophyll; production of food; release of oxygen.</td>
</tr>
<tr>
<td>SC.8.L.18.2</td>
<td>Describe and investigate how cellular respiration breaks down food to provide energy and releases carbon dioxide.</td>
</tr>
<tr>
<td>SC.8.L.18.3</td>
<td>Construct a scientific model of the carbon cycle to show how matter and energy are continuously transferred within and between organisms and their physical environment.</td>
</tr>
<tr>
<td>SC.8.L.18.4</td>
<td>Cite evidence that living systems follow the Laws of Conservation of Mass and Energy.</td>
</tr>
<tr>
<td>SC.BN.1.1</td>
<td>Define a problem from the eighth grade curriculum using appropriate reference materials to support scientific understanding, plan and carry out scientific investigations of various types, such as systematic observations or experiments, identify variables, collect and organize data, interpret data in charts, tables, and graphics, analyze information, make predictions, and defend conclusions.</td>
</tr>
<tr>
<td>SC.BN.1.2</td>
<td>Design and conduct a study using repeated trials and replication.</td>
</tr>
<tr>
<td>SC.BN.1.3</td>
<td>Use phrases such as &quot;results support&quot; or &quot;fail to support&quot; in science, understanding that science does not offer conclusive 'proof' of a knowledge claim.</td>
</tr>
<tr>
<td>SC.BN.1.4</td>
<td>Explain how hypotheses are valuable if they lead to further investigations, even if they turn out not to be supported by the data.</td>
</tr>
<tr>
<td>SC.BN.1.5</td>
<td>Analyze the methods used to develop a scientific explanation as seen in different fields of science.</td>
</tr>
<tr>
<td>SC.BN.1.6</td>
<td>Understand that scientific investigations involve the collection of relevant empirical evidence, the use of logical reasoning, and the application of imagination in devising hypotheses, predictions, explanations and models to make sense of the collected evidence.</td>
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<tr>
<td>SC.BN.2.1</td>
<td>Distinguish between scientific and pseudoscientific ideas.</td>
</tr>
<tr>
<td>SC.BN.2.2</td>
<td>Discuss what characterizes science and its methods.</td>
</tr>
<tr>
<td>SC.BN.3.1</td>
<td>Select models useful in relating the results of their own investigations.</td>
</tr>
<tr>
<td>SC.BN.3.2</td>
<td>Explain why theories may be modified but are rarely discarded.</td>
</tr>
<tr>
<td>SC.BN.4.1</td>
<td>Explain that science is one of the processes that can be used to inform decision making at the community, state, national, and international levels.</td>
</tr>
<tr>
<td>SC.BN.4.2</td>
<td>Explain how political, social, and economic concerns can affect science, and vice versa.</td>
</tr>
<tr>
<td>SC.BP.8.1</td>
<td>Explore the scientific theory of atoms (also known as atomic theory) by using models to explain the motion of particles in solids, liquids, and gases.</td>
</tr>
<tr>
<td>SC.BP.8.2</td>
<td>Differentiate between weight and mass recognizing that weight is the amount of gravitational pull on an object and is distinct from, though proportional to, mass.</td>
</tr>
<tr>
<td>SC.BP.8.3</td>
<td>Explore and describe the densities of various materials through measurement of their masses and volumes.</td>
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<td>SC.BP.8.4</td>
<td>Classify and compare substances on the basis of characteristic physical properties that can be demonstrated or measured; for example, density, thermal or electrical conductivity, solubility, magnetic properties, melting and boiling points, and know that these properties are independent of the amount of the sample.</td>
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<td>SC.BP.8.7</td>
<td>Explore the scientific theory of atoms (also known as atomic theory) by recognizing that atoms are the smallest unit of an element and are composed of sub-atomic particles (electrons surrounding a nucleus containing protons and neutrons).</td>
</tr>
<tr>
<td>SC.BP.8.8</td>
<td>Identify basic examples of and compare and classify the properties of compounds, including acids, bases, and salts.</td>
</tr>
<tr>
<td>SC.BP.8.9</td>
<td>Distinguish among mixtures (including solutions) and pure substances.</td>
</tr>
</tbody>
</table>
SC.8.P.9.1: Explore the Law of Conservation of Mass by demonstrating and concluding that mass is conserved when substances undergo physical and chemical changes.
SC.8.P.9.2: Differentiate between physical changes and chemical changes.
SC.8.P.9.3: Investigate and describe how temperature influences chemical changes.
SC.912.E.5.4: Explain the physical properties of the Sun and its dynamic nature and connect them to conditions and events on Earth.
SC.912.L.18.7: Identify the reactants, products, and basic functions of photosynthesis.
SC.912.L.18.8: Identify the reactants, products, and basic functions of aerobic and anaerobic cellular respiration.
SC.912.L.18.9: Explain the interrelated nature of photosynthesis and cellular respiration.
SC.912.P.8.1: Differentiate among the four states of matter.
SC.912.P.8.2: Differentiate between physical and chemical properties and physical and chemical changes of matter.
SC.912.P.8.4: Explore the scientific theory of atoms (also known as atomic theory) by describing the structure of atoms in terms of protons, neutrons and electrons, and differentiate among these particles in terms of their mass, electrical charges and locations within the atom.
SC.912.P.8.5: Relate properties of atoms and their position in the periodic table to the arrangement of their electrons.
SC.912.P.8.7: Interpret formula representations of molecules and compounds in terms of composition and structure.
SC.912.P.8.11: Relate acidity and basicity to hydronium and hydroxyl ion concentration and pH.

Mathematicians who participate in effortful learning both individually and with others:
- Analyze the problem in a way that makes sense given the task.
- Ask questions that will help with solving the task.
- Build perseverance by modifying methods as needed while solving a challenging task.
- Stay engaged and maintain a positive mindset when working to solve tasks.
- Help and support each other when attempting a new method or approach.

Teachers who encourage students to participate actively in effortful learning both individually and with others:
- Cultivate a community of growth mindset learners.
- Foster perseverance in students by choosing tasks that are challenging.
- Develop students' ability to analyze and problem solve.
- Recognize students' effort when solving challenging problems.

Mathematicians who demonstrate understanding by representing problems in multiple ways:
- Build understanding through modeling and using manipulatives.
- Represent solutions to problems in multiple ways using objects, drawings, tables, graphs and equations.
- Progress from modeling problems with objects and drawings to using algorithms and equations.
- Express connections between concepts and representations.
- Choose a representation based on the given context or purpose.

Teachers who encourage students to demonstrate understanding by representing problems in multiple ways:
- Help students make connections between concepts and representations.
- Provide opportunities for students to use manipulatives when investigating concepts.
- Guide students from concrete to pictorial to abstract representations as understanding progresses.
- Show students that various representations can have different purposes and can be useful in different situations.

Mathematicians who complete tasks with mathematical fluency:
- Select efficient and appropriate methods for solving problems within the given context.
- Maintain flexibility and accuracy while performing procedures and mental calculations.
- Complete tasks accurately and with confidence.
- Adapt procedures to apply them to a new context.
- Use feedback to improve efficiency when performing calculations.

Teachers who encourage students to complete tasks with mathematical fluency:
- Provide students with the flexibility to solve problems by selecting a procedure that allows them to solve efficiently and accurately.
- Offer multiple opportunities for students to practice efficient and generalizable methods.
- Provide opportunities for students to reflect on the method they used and determine if a more efficient method could have been used.

Mathematicians who engage in discussions that reflect on the mathematical thinking of self and others:
- Communicate mathematical ideas, vocabulary and methods effectively.
- Analyze the mathematical thinking of others.
- Compare the efficiency of a method to those expressed by others.
- Recognize errors and suggest how to correctly solve the task.
- Justify results by explaining methods and processes.
- Construct possible arguments based on evidence.

Teachers who encourage students to engage in discussions that reflect on the mathematical thinking of self and others:
- Establish a culture in which students ask questions of the teacher and their peers, and error is an opportunity for learning.
- Create opportunities for students to discuss their thinking with peers.
- Select, sequence and present student work to advance and deepen understanding of correct and increasing efficient methods.
- Develop students' ability to justify methods and compare their responses to the responses of their peers.

Use patterns and structure to help understand and connect mathematical concepts.
Mathematicians who use patterns and structure to help understand and connect mathematical concepts:

- Focus on relevant details within a problem.
- Create plans and procedures to logically order events, steps or ideas to solve problems.
- Decompose a complex problem into manageable parts.
- Relate previously learned concepts to new concepts.
- Look for similarities among problems.
- Connect solutions of problems to more complicated large-scale situations.

**Clarifications:**
Teachers who encourage students to use patterns and structure to help understand and connect mathematical concepts:

- Help students recognize the patterns in the world around them and connect these patterns to mathematical concepts.
- Support students to develop generalizations based on the similarities found among problems.
- Provide opportunities for students to create plans and procedures to solve problems.
- Develop students’ ability to construct relationships between their current understanding and more sophisticated ways of thinking.

Assess the reasonableness of solutions.

Mathematicians who assess the reasonableness of solutions:

- Estimate to discover possible solutions.
- Use benchmark quantities to determine if a solution makes sense.
- Check calculations when solving problems.
- Verify possible solutions by explaining the methods used.
- Evaluate results based on the given context.

**Clarifications:**
Teachers who encourage students to assess the reasonableness of solutions:

- Have students estimate or predict solutions prior to solving.
- Prompt students to continually ask, “Does this solution make sense? How do you know?”
- Reinforce that students check their work as they progress within and after a task.
- Strengthen students’ ability to verify solutions through justifications.

Apply mathematics to real-world contexts.

Mathematicians who apply mathematics to real-world contexts:

- Connect mathematical concepts to everyday experiences.
- Use models and methods to understand, represent and solve problems.
- Perform investigations to gather data or determine if a method is appropriate.
- Redesign models and methods to improve accuracy or efficiency.

**Clarifications:**
Teachers who encourage students to apply mathematics to real-world contexts:

- Provide opportunities for students to create models, both concrete and abstract, and perform investigations.
- Challenge students to question the accuracy of their models and methods.
- Support students as they validate conclusions by comparing them to the given situation.
- Indicate how various concepts can be applied to other disciplines.

Cite evidence to explain and justify reasoning.

**Clarifications:**
K-1 Students include textual evidence in their oral communication with guidance and support from adults. The evidence can consist of details from the text without naming the text. During 1st grade, students learn how to incorporate the evidence in their writing. 2-3 Students include relevant textual evidence in their written and oral communication. Students should name the text when they refer to it. In 3rd grade, students should use a combination of direct and indirect citations.

4-5 Students continue with previous skills and reference comments made by speakers and peers. Students cite texts that they’ve directly quoted, paraphrased, or used for information. When writing, students will use the form of citation dictated by the instructor or the style guide referenced by the instructor.

6-8 Students continue with previous skills and use a style guide to create a proper citation.

9-12 Students continue with previous skills and should be aware of existing style guides and the ways in which they differ.

Read and comprehend grade-level complex texts proficiently.

**Clarifications:**
See Text Complexity for grade-level complexity bands and a text complexity rubric.

Make inferences to support comprehension.

**Clarifications:**
Students will make inferences before the words infer or inference are introduced. Kindergarten students will answer questions like “Why is the girl smiling?” or make predictions about what will happen based on the title page. Students will use the terms and apply them in 2nd grade and beyond.

Use appropriate collaborative techniques and active listening skills when engaging in discussions in a variety of situations.

**Clarifications:**
In kindergarten, students learn to listen to one another respectfully.

In grades 1-2, students build upon these skills by justifying what they are thinking. For example: “I think ______ because ______.” The collaborative conversations are becoming academic conversations.

In grades 3-12, students engage in academic conversations discussing claims and justifying their reasoning, refining and applying skills. Students build on ideas, propel the conversation, and support claims and counterclaims with evidence.
Use the accepted rules governing a specific format to create quality work.

ELA.K12.EE.5.1: Students will incorporate skills learned into work products to produce quality work. For students to incorporate these skills appropriately, they must receive instruction. A 3rd grade student creating a poster board display must have instruction in how to effectively present information to do quality work.

Use appropriate voice and tone when speaking or writing.

ELA.K12.EE.6.1: Clarifications: In kindergarten and 1st grade, students learn the difference between formal and informal language. For example, the way we talk to our friends differs from the way we speak to adults. In 2nd grade and beyond, students practice appropriate social and academic language to discuss texts.

ELD.K12.ELL.SC.1: English language learners communicate information, ideas and concepts necessary for academic success in the content area of Science.

ELD.K12.ELL.SI.1: English language learners communicate for social and instructional purposes within the school setting.

General Course Information and Notes

**GENERAL NOTES**

Laboratory investigations that include the use of scientific inquiry, research, measurement, problem solving, laboratory apparatus and technologies, experimental procedures, and safety procedures are an integral part of this course. The National Science Teachers Association (NSTA) recommends that at the middle school level, all students should have multiple opportunities every week to explore science laboratory investigations (labs). School laboratory investigations are defined by the National Research Council (NRC) as an experience in the laboratory, classroom, or the field that provides students with opportunities to interact directly with natural phenomena or with data collected by others using tools, materials, data collection techniques, and models (NRC, 2006, p. 3). Laboratory investigations in the middle school classroom should help all students develop a growing understanding of the complexity and ambiguity of empirical work, as well as the skills to calibrate and troubleshoot equipment used to make observations. Learners should understand measurement error; and have the skills to aggregate, interpret, and present the resulting data (NRC 2006, p. 77; NSTA, 2007).

**Honors and Advanced Level Course Note:** Advanced courses require a greater demand on students through increased academic rigor. Academic rigor is obtained through the application, analysis, evaluation, and creation of complex ideas that are often abstract and multi-faceted. Students are challenged to think and collaborate critically on the content they are learning. Honors level rigor will be achieved by increasing text complexity through text selection, focus on high-level qualitative measures, and complexity of task. Instruction will be structured to give students a deeper understanding of conceptual themes and organization within and across disciplines. Academic rigor is more than simply assigning to students a greater quantity of work.

**Special Notes:**

**Instructional Practices**

Teaching from a range of complex text is optimized when teachers in all subject areas implement the following strategies on a routine basis:

1. Ensuring wide reading from complex text that varies in length.
2. Making close reading and rereading of texts central to lessons.
3. Emphasizing text-specific complex questions, and cognitively complex tasks, reinforce focus on the text and cultivate independence.
4. Emphasizing students supporting answers based upon evidence from the text.
5. Providing extensive research and writing opportunities (claims and evidence).

**Science and Engineering Practices** (NRC Framework for K-12 Science Education, 2010)

- Asking questions (for science) and defining problems (for engineering).
- Developing and using models.
- Planning and carrying out investigations.
- Analyzing and interpreting data.
- Using mathematics, information and computer technology, and computational thinking.
- Constructing explanations (for science) and designing solutions (for engineering).
- Engaging in argument from evidence.
- Obtaining, evaluating, and communicating information.

Additional content that may be included in the Grade 8 NAEP Science assessment includes:

- Rocks and rock formations bear evidence of the minerals, materials, temperature/pressure conditions, and forces that created them. (SC.4.E.6.1 and SC.4.E.6.2)
- Earth as a whole has a magnetic field that is detectable at the surface with a compass, with north and south poles and lines of force. (SC.912.P.10.16)
- The Sun is the major source of energy for phenomena on Earth's surface. (SC.3.L.17.2; SC.3.E.5.2; SC.3.E.6.1; SC.4.P.10.4; SC.4.L.17.2)
- Water, which covers the majority of Earth's surface, circulates through the crust, oceans, and atmosphere in what is known as the water cycle. (SC.5.E.7.1; SC.5.E.7.2; SC.5.E.7.6)
- A tiny fraction of the light energy from the Sun is Earth's primary source of energy, heating Earth surfaces and providing the energy that results in wind, ocean currents, and storms. (SC.2.E.7.2; SC.3.E.6.1)
- Following fertilization, cell division produces a small cluster of cells that then differentiate by appearance and function to form the basic tissues of an embryo. (SC.912.L.16.13)
- Characteristics of organisms are influenced by heredity and environment. (SC.4.L.16.2 and SC.4.L.16.3)
- Nuclear reactions take place in the Sun. (SC.912.P.10.10; SC.912.P.10.11)


**Florida's Benchmarks for Excellent Student Thinking (B.E.S.T.) Standards**

This course includes Florida's B.E.S.T. ELA Expectations (EE) and Mathematical Thinking and Reasoning Standards (MTRs) for students. Florida educators should intentionally embed these standards within the content and their instruction as applicable. For guidance on the implementation of the EEs and MTRs, please visit https://www.cpalms.org/Standards/BEST_Standards.aspx and select the appropriate B.E.S.T. Standards package.

**English Language Development ELD Standards Special Notes Section:**
Teachers are required to provide listening, speaking, reading and writing instruction that allows English language learners (ELL) to communicate information, ideas and concepts for academic success in the content area of Science. For the given level of English language proficiency and with visual, graphic, or interactive support, students will interact with grade level words, expressions, sentences and discourse to process or produce language necessary for academic success. The ELD standard should specify a relevant content area concept or topic of study chosen by curriculum developers and teachers which maximizes an ELL’s need for communication and social skills.

To access an ELL supporting document which delineates performance definitions and descriptors, please click on the following link:
https://cpalmsmediaprod.blob.core.windows.net/uploads/docs/standards/eld/sc.pdf

Additional Instructional Resources:
A.V.E for Success Collection is provided by the Florida Association of School Administrators: http://www.fasa.net/4DCGI/cms/review.html?
Action=CMS_Document&DocID=139. Please be aware that these resources have not been reviewed by CPALMS and there may be a charge for the use of some of them in this collection.

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GENERAL INFORMATION

**Course Number:** 2002110

**Course Path:**
- Section: Grades PreK to 12 Education
- Grade Group: Grades 6 to 8 Education
- Subject: Science
- SubSubject: General Sciences
- Abbreviated Title: M/J COMP SCI 3 ADV

**Course Length:** Year (Y)

**Course Attributes:**
- Class Size Core Required

**Course Level:**
- 3

**Course Status:** State Board Approved

**Grade Level(s):** 6, 7, 8

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**Educator Certifications**

<table>
<thead>
<tr>
<th>Science (Secondary Grades 7-12)</th>
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</thead>
<tbody>
<tr>
<td>Middle Grades Integrated Curriculum (Middle Grades 5-9)</td>
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<tr>
<td>Physics (Grades 6-12)</td>
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<td>Biology (Grades 6-12)</td>
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</tbody>
</table>
M/J Science 3 Cambridge Lower Secondary
(#2002115) 2014 - 2022 (current)

General Course Information and Notes

GENERAL NOTES


GENERAL INFORMATION

Course Number: 2002115
Course Path: Section: Grades PreK to 12 Education Courses > Grade Group: Grades 6 to 8 Education Courses > Subject: Science > SubSubject: General Sciences
Abbreviated Title: M/J SCI 3 CLS
Course Length: Year (Y)
Course Attributes:
- Advanced International Certificate of Education (AICE)
Course Level: 3

Grade Level(s): 6, 7, 8

Educator Certifications

<table>
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<tr>
<th>Biology (Grades 6-12)</th>
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M/J Science 3 Cambridge Lower Secondary
(#2002115) 2022 - And Beyond

General Course Information and Notes

**GENERAL NOTES**


**GENERAL INFORMATION**

**Course Number:** 2002115

**Course Path:** Grades PreK to 12 Education Courses > Grade Group: Grades 6 to 8 Education Courses > Subject: Science > SubSubject: General Sciences >  
**Abbreviated Title:** M/J SCI 3 CLS  
**Course Length:** Year (Y)  
**Course Attributes:**  
- Advanced International Certificate of Education (AICE)  
**Course Level:** 3

**Course Type:** Core Academic Course  
**Course Status:** State Board Approved  
**Grade Level(s):** 6,7,8

**Educator Certifications**

- Biology (Grades 6-12)  
- Earth/Space Science (Grades 6-12)  
- Middle Grades General Science (Middle Grades 5-9)  
- Chemistry (Grades 6-12)  
- Physics (Grades 6-12)  
- Science (Secondary Grades 7-12)
M/J International Baccalaureate MYP Comprehensive Science 3 (#2002120) 2014 - And Beyond (current)

General Course Information and Notes

GENERAL NOTES

The curriculum description for this IB course is provided at http://www.ibo.org/en/programmes/.

GENERAL INFORMATION

Course Number: 2002120
Course Path: Section: Grades PreK to 12 Education Courses > Grade Group: Grades 6 to 8 Education Courses > Subject: Science > SubSubject: General Sciences
Abbreviated Title: M/J IB MYP COMP SCI3
Course Length: Year (Y)
Course Attributes:
- International Baccalaureate (IB)
Course Level: 3

Educator Certifications

<table>
<thead>
<tr>
<th>Science (Elementary Grades 1-6)</th>
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<tr>
<td>Science (Secondary Grades 7-12)</td>
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### Course Standards

<table>
<thead>
<tr>
<th>Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>SC.6.E.7.1:</td>
<td>Differentiate among radiation, conduction, and convection, the three mechanisms by which heat is transferred through Earth's system.</td>
</tr>
<tr>
<td>SC.6.E.7.2:</td>
<td>Investigate and apply how the cycling of water between the atmosphere and hydrosphere has an effect on weather patterns and climate.</td>
</tr>
<tr>
<td>SC.6.E.7.3:</td>
<td>Describe how global patterns such as the jet stream and ocean currents influence local weather in measurable terms such as temperature, air pressure, wind direction and speed, and humidity and precipitation.</td>
</tr>
<tr>
<td>SC.6.E.7.4:</td>
<td>Differentiate and show interactions among the geosphere, hydrosphere, cryosphere, atmosphere, and biosphere.</td>
</tr>
<tr>
<td>SC.6.E.7.5:</td>
<td>Explain how energy provided by the sun influences global patterns of atmospheric movement and the temperature differences between air, water, and land.</td>
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<tr>
<td>SC.6.E.7.6:</td>
<td>Distinguish between weather and climate.</td>
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<tr>
<td>SC.6.E.7.7:</td>
<td>Investigate how natural disasters have affected human life in Florida.</td>
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<td>SC.6.E.7.8:</td>
<td>Describe ways human beings protect themselves from hazardous weather and sun exposure.</td>
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<td>SC.6.E.7.9:</td>
<td>Describe how the composition and structure of the atmosphere protects life and insulates the planet.</td>
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<td>SC.6.N.1.2:</td>
<td>Explain why scientific investigations should be replicable.</td>
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<tr>
<td>SC.6.N.1.3:</td>
<td>Explain the difference between an experiment and other types of scientific investigation, and explain the relative benefits and limitations of each.</td>
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<td>SC.6.N.1.4:</td>
<td>Discuss, compare, and negotiate methods used, results obtained, and explanations among groups of students conducting the same investigation.</td>
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<td>SC.6.N.1.5:</td>
<td>Recognize that science involves creativity, not just in designing experiments, but also in creating explanations that fit evidence.</td>
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<tr>
<td>SC.6.N.2.1:</td>
<td>Distinguish science from other activities involving thought.</td>
</tr>
<tr>
<td>SC.6.N.2.2:</td>
<td>Explain that scientific knowledge is durable because it is open to change as new evidence or interpretations are encountered.</td>
</tr>
<tr>
<td>SC.6.N.3.1:</td>
<td>Recognize that scientists who make contributions to scientific knowledge come from all kinds of backgrounds and possess varied talents, interests, and goals.</td>
</tr>
<tr>
<td>SC.6.N.3.2:</td>
<td>Recognize and explain that a scientific theory is a well-supported and widely accepted explanation of nature and is not simply a claim posed by an individual. Thus, the use of the term theory in science is very different than how it is used in everyday life.</td>
</tr>
<tr>
<td>SC.6.N.3.3:</td>
<td>Give several examples of scientific laws.</td>
</tr>
<tr>
<td>SC.6.N.3.4:</td>
<td>Identify the role of models in the context of the sixth grade science benchmarks.</td>
</tr>
<tr>
<td>SC.6.E.7.6:</td>
<td>Differentiate between weather and climate.</td>
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<td>SC.7.L.17.1:</td>
<td>Explore the scientific theory of evolution by relating how the inability of a species to adapt within a changing environment may contribute to the extinction of that species.</td>
</tr>
<tr>
<td>SC.7.L.17.2:</td>
<td>Compare and contrast the relationships among organisms such as mutualism, predation, parasitism, competition, and commensalism.</td>
</tr>
<tr>
<td>SC.7.L.17.3:</td>
<td>Describe and investigate various limiting factors in the local ecosystem and their impact on native populations, including food, shelter, water, space, disease, parasitism, predation, and nesting sites.</td>
</tr>
<tr>
<td>SC.7.L.17.4:</td>
<td>Differentiate replication (by others) from repetition (multiple trials).</td>
</tr>
<tr>
<td>SC.7.L.17.5:</td>
<td>Disturb between an experiment (which must involve the identification and control of variables) and other forms of scientific investigation and explain that not all scientific knowledge is derived from experimentation.</td>
</tr>
<tr>
<td>SC.7.L.17.6:</td>
<td>Identify test variables (independent variables) and outcome variables (dependent variables) in an experiment.</td>
</tr>
<tr>
<td>SC.7.L.17.7:</td>
<td>Describe the methods used in the pursuit of a scientific explanation as seen in different fields of science such as biology, geology, and physics.</td>
</tr>
<tr>
<td>SC.7.L.17.8:</td>
<td>Explain that empirical evidence is the cumulative body of observations of a natural phenomenon on which scientific explanations are based.</td>
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<tr>
<td>SC.7.L.17.9:</td>
<td>Explain that scientific knowledge is a result of a great deal of debate and confirmation within the science community.</td>
</tr>
<tr>
<td>SC.7.N.2.1:</td>
<td>Identify an instance from the history of science in which scientific knowledge has changed when new evidence or new interpretations are encountered.</td>
</tr>
<tr>
<td>SC.7.N.3.1:</td>
<td>Recognize and explain the difference between theories and laws and give several examples of scientific theories and the evidence that supports them.</td>
</tr>
<tr>
<td>SC.7.N.3.2:</td>
<td>Identify the benefits and limitations of the use of scientific models.</td>
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<td>SC.8.N.1.2:</td>
<td>Design and conduct a study using repeated trials and replication.</td>
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<td>SC.8.N.1.3:</td>
<td>Use phrases such as &quot;results support&quot; or &quot;fail to support&quot; in science, understanding that science does not offer conclusive ‘proof’ of a knowledge claim.</td>
</tr>
<tr>
<td>SC.8.N.1.4:</td>
<td>Explain how hypotheses are valuable if they lead to further investigations, even if they turn out not to be supported by the data.</td>
</tr>
<tr>
<td>SC.8.N.1.5:</td>
<td>Analyze the methods used to develop a scientific explanation as seen in different fields of science.</td>
</tr>
<tr>
<td>SC.8.N.1.6:</td>
<td>Understand that scientific investigations involve the collection of relevant empirical evidence, the use of logical reasoning, and the application of imagination in devising hypotheses, predictions, explanations and models to make sense of the collected evidence.</td>
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<td>SC.8.N.2.1:</td>
<td>Distinguish between scientific and pseudoscientific ideas.</td>
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<td>SC.8.N.2.2:</td>
<td>Discuss what characterizes science and its methods.</td>
</tr>
<tr>
<td>SC.8.N.3.1:</td>
<td>Select models useful in relating the results of their own investigations.</td>
</tr>
<tr>
<td>SC.8.N.3.2:</td>
<td>Explain why theories may be modified but are rarely discarded.</td>
</tr>
<tr>
<td>SC.8.N.4.1:</td>
<td>Explain that science is one of the processes that can be used to inform decision making at the community, state, national, and international levels.</td>
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<tr>
<td>SC.8.N.4.2:</td>
<td>Explain how political, social, and economic concerns can affect science, and vice versa.</td>
</tr>
</tbody>
</table>
| MAFS.6.SP.1.1: | Recognize a statistical question as one that anticipates variability in the data related to the question and accounts for it in the answers. For example, “How old am I?” is not a statistical question, but “How old are the students in my school?” is a statistical question because one anticipates variability in
MAFS.6.SP.1.2: Understand that a set of data collected to answer a statistical question has a distribution which can be described by its center, spread, and overall shape.

MAFS.6.SP.1.3: Recognize that a measure of center for a numerical data set summarizes all of its values with a single number, while a measure of variation describes how its values vary with a single number.

MAFS.6.SP.2.4: Display numerical data in plots on a number line, including dot plots, histograms, and box plots.

MAFS.6.SP.2.5: Summarize numerical data sets in relation to their context, such as by:
   a. Reporting the number of observations.
   b. Describing the nature of the attribute under investigation, including how it was measured and its units of measurement.
   c. Giving quantitative measures of center (median and/or mean) and variability (interquartile range and/or mean absolute deviation), as well as describing any overall pattern and any striking deviations from the overall pattern with reference to the context in which the data were gathered.
   d. Relating the choice of measures of center and variability to the shape of the data distribution and the context in which the data were gathered.

MAFS.7.SP.1.1: Understand that statistics can be used to gain information about a population by examining a sample of the population; generalizations about a population from a sample are valid only if the sample is representative of that population. Understand that random sampling tends to produce representative samples and support valid inferences.

MAFS.8.F.2.5: Know that straight lines are widely used to model relationships between two quantitative variables. For scatter plots that suggest a linear association, informally fit a straight line, and informally assess the model fit by judging the closeness of the data points to the line.

MAFS.K12.MP.1.1: Make sense of problems and persevere in solving them.

MAFS.K12.MP.2.1: Reason abstractly and quantitatively.

MAFS.K12.MP.3.1: Construct viable arguments and critique the reasoning of others.

MAFS.K12.MP.4.1: Model with mathematics.

MAFS.K12.MP.5.1: Use appropriate tools strategically.

Reason abstractly and quantitatively.

Mathematically proficient students make sense of quantities and their relationships in problem situations. They bring two complementary abilities to bear on problems involving quantitative relationships: the ability to decontextualize—to abstract a given situation and represent it symbolically and manipulate the representing symbols as if they have a life of their own, without necessarily attending to their referents—and the ability to contextualize, to pause as needed during the manipulation process in order to probe into the referents for the symbols involved. Quantitative reasoning entails habits of creating a coherent representation of the problem at hand; considering the units involved; attending to the meaning of quantities, not just how to compute them; and knowing and flexibly using different properties of operations and objects.

Construct viable arguments and critique the reasoning of others.

Mathematically proficient students understand and use stated assumptions, definitions, and previously established results in constructing arguments. They make conjectures and build a logical progression of statements to explore the truth of their conjectures. They are able to analyze situations by breaking them into cases, and can recognize and use counterexamples. They justify their conclusions, communicate them to others, and respond to the arguments of others. They reason inductively about data, making plausible arguments that take into account the context from which the data arose. Mathematically proficient students are able to compare the effectiveness of two plausible arguments, distinguish correct logic or reasoning from that which is flawed, and—if there is a flaw in an argument—explain what it is. Elementary students can construct arguments using concrete referents such as objects, drawings, diagrams, and actions. Such arguments can make sense and be correct, even though they are not generalized or made formal until later grades. Later, students learn to determine domains to which an argument applies. Students at all grades can listen or read the arguments of others, decide whether they make sense, and ask useful questions to clarify or improve the arguments.

Model with mathematics.

Mathematically proficient students can apply the mathematics they know to solve problems arising in everyday life, society, and the workplace. In early grades, this might be as simple as writing an addition equation to describe a situation. In middle grades, a student might apply proportional reasoning to plan a school event or analyze a problem in the community. By high school, a student might use geometry to solve a design problem or use a function to describe how one quantity of interest depends on another. Mathematically proficient students who can apply what they know are comfortable making assumptions and approximations to simplify a complicated situation, realizing that these may need revision later. They are able to identify important quantities in a practical situation and map their relationships using such tools as diagrams, two-way tables, graphs, flowcharts and formulas. They can analyze those relationships mathematically to draw conclusions. They routinely interpret their mathematical results in the context of the situation and reflect on whether the results make sense, possibly improving the model if it has not served its purpose.

Use appropriate tools strategically.

Mathematically proficient students consider the available tools when solving a mathematical problem. These tools might include pencil and paper, concrete models, a ruler, a protractor, a calculator, a spreadsheet, a computer algebra system, a statistical package, or dynamic geometry software. Proficient students are sufficiently familiar with tools appropriate for their grade or course to make sound decisions about when each of these tools might be helpful, recognizing both the insight to be gained and their limitations. For example, mathematically proficient high school students analyze graphs of functions and solutions generated using a graphing calculator. They detect possible errors by strategically using estimation and other mathematical knowledge. When making mathematical models, they know that technology can enable them to visualize the results of varying assumptions, explore consequences, and compare predictions with data. Mathematically proficient students at various grade levels are able to identify relevant external mathematical resources, such as digital content located on a website, and use them to pose or solve problems. They are able to use technological tools to explore and deepen their understanding of concepts.

Attend to precision.

Mathematically proficient students can explain correspondences between equations, verbal descriptions, tables, and graphs or draw diagrams of important features and relationships, graph data, and search for regularity or trends. Younger students might rely on using concrete objects or pictures to help conceptualize and solve a problem. Mathematically proficient students check their answers to problems using a different method, and they continually ask themselves, “Does this make sense?” They can understand the approaches of others to solving complex problems and identify correspondences between different approaches.

Attend to precision.
Mathematically proficient students try to communicate precisely to others. They try to use clear definitions in discussion with others and in their own reasoning. They state the meaning of the symbols they choose, including using the equal sign consistently and appropriately. They are careful about specifying units of measure, and labeling axes to clarify the correspondence with quantities in a problem. They calculate accurately and efficiently, express numerical answers with a degree of precision appropriate for the problem context. In the elementary grades, students give carefully formulated explanations to each other. By the time they reach high school they have learned to examine claims and make explicit use of definitions.

**Look for and use structure.**

Mathematically proficient students look closely to discern a pattern or structure. Young students, for example, might notice that three and seven more is the same amount as seven and three more, or they may sort a collection of shapes according to how many sides the shapes have. Later, students will see 7 × 8 equals the well remembered 7 × 5 + 7 × 3, in preparation for learning about the distributive property. In the expression 2 + 3(x – 1)(x² + x + 1), older students can see the 9 as 2 × 4 + 1, and 20 as 1 + 2 × 8. They recognize the significance of an existing line in a geometric figure and can use the strategy of drawing an auxiliary line for solving problems. They also can step back for an overview and shift perspective. They can see complicated things, such as some algebraic expressions, as single objects or as being composed of several objects. For example, they can see 5 – (x – 1)² as 5 minus a positive number times a square and use that to realize that its value cannot be more than 5 for any real numbers x and y.

**Look for and express regularity in repeated reasoning.**

Mathematically proficient students notice if calculations are repeated, and look both for general methods and for shortcuts. Upper elementary students might notice when dividing 25 by 11 that they are repeating the same calculations over and over again, and conclude they have a repeating decimal. By paying attention to the calculation of slope as they repeatedly check whether points are on the line through (1, 2) with slope 3, middle school students might abstract the equation \((y – 2)/(x – 1) = 3\). Noticing the regularity in the way terms cancel when expanding \((x – 1)(x² + 1)\), \((x – 1)(x³ + x² + x + 1)\), and \((x – 1)(x⁴ + x³ + x² + x + 1)\) might lead them to the general formula for the sum of a geometric series. As they work to solve a problem, mathematically proficient students maintain oversight of the process, while attending to the details. They continually evaluate the reasonableness of their intermediate results.

**General Course Information and Notes**

**GENERAL NOTES**

This course is an integrated Science, Technology, Engineering and Mathematics (STEM) course for middle school students. M/J STEM Environmental Science includes an integration of standards from science, mathematics, and English language arts (ELA) through the application to STEM problem solving using environmental sciences, knowledge and science and engineering practices. Environmental sciences through applications such as ecosystem management, human-environmental impact, ecology and agriculture, land and resource management, and civil and environmental engineering, are emphasized in this course. Laboratory investigations that include the use of scientific inquiry, research, measurement, problem solving, laboratory apparatus and technologies, experimental procedures, and safety procedures are an integral part of this course. The National Science Teachers Association (NSTA) recommends that at the middle school level, all students should have multiple opportunities every week to explore science laboratory investigations (labs). School laboratory investigations are defined by the National Research Council (NRC) as an experience in the laboratory, classroom, or the field that provides students with opportunities to interact directly with natural phenomena or with data collected by others using tools, materials, data collection techniques, and models (NRC, 2006, p. 3). Laboratory investigations in the middle school classroom should help all students develop a growing understanding of the complexity and ambiguity of empirical work, as well as the skills to calibrate and troubleshoot equipment used to make observations. Learners should understand measurement error; and have the skills to aggregate, interpret, and present the resulting data (NRC 2006, p. 77; NSTA, 2007).

**Special Notes:**

**Instructional Practices**

Teaching from a range of complex text is optimized when teachers in all subject areas implement the following strategies on a routine basis:

1. Ensuring wide reading from complex text that varies in length.
2. Making close reading and rereading of texts central to lessons.
3. Emphasizing text-specific complex questions, and cognitively complex tasks, reinforce focus on the text and cultivate independence.
4. Emphasizing students supporting answers based upon evidence from the text.
5. Providing extensive research and writing opportunities (claims and evidence).

**Science and Engineering Practices (NRC Framework for K-12 Science Education, 2010)**

- Asking questions (for science) and defining problems (for engineering).
- Developing and using models.
- Planning and carrying out investigations.
- Analyzing and interpreting data.
- Using mathematics, information and computer technology, and computational thinking.
- Constructing explanations (for science) and designing solutions (for engineering).
- Engaging in argument from evidence.
- Obtaining, evaluating, and communicating information.

ISTE Standards (http://www.iste.org/docs/pdfs/20-14_ISTE_Standards-S_PDF.pdf) should be incorporated in many contexts throughout the course.

**Course Standards**

Use grade appropriate Nature of Science and Mathematics Content benchmarks (i.e. if this course is offered to seventh grade students, then the SC.7.N benchmarks should be integrated into the course content, and SC.6.N and SC.8.N benchmarks should be omitted from the seventh grade course).
Educator Certifications

Secondary science courses include reading standards for literacy in science and technical subjects 6-12 and writing standards for literacy in history/social studies, science, and technical subjects 6-12. The courses also include speaking and listening standards. For a complete list of standards required for this course click on the blue tile labeled course standards. You may also download the complete course including all required standards and notes sections using the export function located at the top of this page.

English Language Development ELD Standards Special Notes Section:

Teachers are required to provide listening, speaking, reading and writing instruction that allows English language learners (ELL) to communicate information, ideas and concepts for academic success in the content area of Science. For the given level of English language proficiency and with visual, graphic, or interactive support, students will interact with grade level words, expressions, sentences and discourse to process or produce language necessary for academic success The ELD standard should specify a relevant content area concept or topic of study chosen by curriculum developers and teachers which maximizes an ELL's need for communication and social skills.

To access an ELL supporting document which delineates performance definitions and descriptors, please click on the following link: https://cpalmsmediaprod.blob.core.windows.net/uploads/docs/standards/eld/sc.pdf.

GENERAL INFORMATION

Course Number: 2002200

Course Path: Grades PreK to 12 Education
Courses > Grade Group: Grades 6 to 8 Education
Courses > Subject: Science > SubSubject: General Sciences
Abbreviated Title: M/J STEM ENV SCI

Course Length: Year (Y)
Course Attributes:
- Class Size Core Required

Course Type: Core Academic Course
Course Status: Course Approved
Grade Level(s): 6,7,8

Educator Certifications

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Differentiate among radiation, conduction, and convection, the three mechanisms by which heat is transferred through Earth’s system. 

Explain how hypotheses are valuable if they lead to further investigations. 

Discuss why theories may be modified but are rarely discarded. 

Distinguish between an experiment and other types of investigations. 

Recognize that science involves creativity, not just in designing experiments, but also in creating explanations that fit evidence. 

Give several examples of scientific theories and the evidence that supports them. 

Identify an instance from the history of science in which scientific knowledge has changed when new evidence or new interpretations are encountered. 

Recognize and explain that a scientific theory is a well-supported and widely accepted explanation of nature and is not simply a claim posed by an individual. Thus, the use of the term theory in science is very different than how it is used in everyday life. 

Recognize and explain that a law is a description of a specific relationship under given conditions in the natural world. Thus, scientific laws are different from societal laws. 

Give several examples of scientific laws. 

Identify the role of models in the context of the sixth grade science benchmarks. 

Identify the impact that humans have had on Earth, such as deforestation, urbanization, desertification, erosion, air and water quality, changing the flow of water. 

Explore the scientific theory of evolution by relating how the survival of certain species and extinction of other species are different from societal laws. 

Explain the difference between theories and laws and give several examples of scientific theories and the evidence that supports them. 

Identify the benefits and limitations of the use of scientific models. 

Design and conduct a study using repeated trials and replication. 

Use phrases such as “results support” or “fail to support” in science, understanding that science does not offer conclusive “proof” of a knowledge claim. 

Analyze the methods used to develop a scientific explanation as seen in different fields of science. 

Understand that scientific investigations involve the collection of relevant empirical evidence, the use of logical reasoning, and the application of imagination in devising hypotheses, predictions, explanations, and models to make sense of the collected evidence. 

Distinguish between scientific and pseudoscientific ideas. 

Discuss what characterizes science and its methods. 

Select models useful in relating the results of their own investigations. 

Explain why theories may be modified but are rarely discarded. 

Explain that science is one of the processes that can be used to inform decision making at the community, state, national, and international levels. 

Explain how political, social, and economic concerns can affect science, and vice versa. 

Mathematicians who participate in effortful learning both individually and with others: 

- Analyze the problem in a way that makes sense given the task.
| MA.K12.MTR.1.1: | Ask questions that will help with solving the task.  
| | Build perseverance by modifying methods as needed while solving a challenging task.  
| | Stay engaged and maintain a positive mindset when working to solve tasks.  
| | Help and support each other when attempting a new method or approach.  
| Clarifications: Teachers who encourage students to participate actively in effortful learning both individually and with others:  
| | Cultivate a community of growth mindset learners.  
| | Foster perseverance in students by choosing tasks that are challenging.  
| | Develop students' ability to analyze and problem solve.  
| | Recognize students' effort when solving challenging problems.  
| MA.K12.MTR.2.1: | Demonstrate understanding by representing problems in multiple ways.  
| | Mathematicians who demonstrate understanding by representing problems in multiple ways:  
| | Build understanding through modeling and using manipulatives.  
| | Represent solutions to problems in multiple ways using objects, drawings, tables, graphs and equations.  
| | Progress from modeling problems with objects and drawings to using algorithms and equations.  
| | Express connections between concepts and representations.  
| | Choose a representation based on the given context or purpose.  
| Clarifications: Teachers who encourage students to demonstrate understanding by representing problems in multiple ways:  
| | Help students make connections between concepts and representations.  
| | Provide opportunities for students to use manipulatives when investigating concepts.  
| | Guide students from concrete to pictorial to abstract representations as understanding progresses.  
| | Show students that various representations can have different purposes and can be useful in different situations.  
| MA.K12.MTR.3.1: | Complete tasks with mathematical fluency.  
| | Mathematicians who complete tasks with mathematical fluency:  
| | Select efficient and appropriate methods for solving problems within the given context.  
| | Maintain flexibility and accuracy while performing procedures and mental calculations.  
| | Complete tasks accurately and with confidence.  
| | Adapt procedures to apply them to a new context.  
| | Use feedback to improve efficiency when performing calculations.  
| Clarifications: Teachers who encourage students to complete tasks with mathematical fluency:  
| | Provide students with the flexibility to solve problems by selecting a procedure that allows them to solve efficiently and accurately.  
| | Offer multiple opportunities for students to practice efficient and generalizable methods.  
| | Provide opportunities for students to reflect on the method they used and determine if a more efficient method could have been used.  
| MA.K12.MTR.4.1: | Engage in discussions that reflect on the mathematical thinking of self and others.  
| | Mathematicians who engage in discussions that reflect on the mathematical thinking of self and others:  
| | Communicate mathematical ideas, vocabulary and methods effectively.  
| | Analyze the mathematical thinking of others.  
| | Compare the efficiency of a method to those expressed by others.  
| | Recognize errors and suggest how to correctly solve the task.  
| | Justify results by explaining methods and processes.  
| | Construct possible arguments based on evidence.  
| Clarifications: Teachers who encourage students to engage in discussions that reflect on the mathematical thinking of self and others:  
| | Establish a culture in which students ask questions of the teacher and their peers, and error is an opportunity for learning.  
| | Create opportunities for students to discuss their thinking with peers.  
| | Select, sequence and present student work to advance and deepen understanding of correct and increasingly efficient methods.  
| | Develop students' ability to justify methods and compare their responses to the responses of their peers.  
| MA.K12.MTR.5.1: | Use patterns and structure to help understand and connect mathematical concepts.  
| | Mathematicians who use patterns and structure to help understand and connect mathematical concepts:  
| | Focus on relevant details within a problem.  
| | Create plans and procedures to logically order events, steps or ideas to solve problems.  
| | Decompose a complex problem into manageable parts.  
| | Relate previously learned concepts to new concepts.  
| | Look for similarities among problems.  
| | Connect solutions of problems to more complicated large-scale situations.  
| Clarifications: Teachers who encourage students to use patterns and structure to help understand and connect mathematical concepts:  
| | Help students recognize the patterns in the world around them and connect these patterns to mathematical concepts.  
| | Support students to develop generalizations based on the similarities found among problems.  
| | Provide opportunities for students to create plans and procedures to solve problems.  
| | Develop students' ability to construct relationships between their current understanding and more sophisticated ways of thinking.  
| | Mathematicians who assess the reasonableness of solutions:  
| Clarifications: Teachers who encourage students to assess the reasonableness of solutions:  
| | Help students to recognize the need to check and evaluate the reasonableness of solutions.  
| | Guide students to compare their solutions to those of others.  
| | Show students that different solutions can lead to the same or different results.  
| | Encourage students to question the reasonableness of their own and others' solutions.  
| | Develop students' ability to critique and improve upon their own solutions.  
| | Support students to recognize appropriate levels of rigor in their work and in that of others.  
| **Clarifications:** Teachers who encourage students to assess the reasonableness of solutions:
- Estimate to discover possible solutions.
- Use benchmark quantities to determine if a solution makes sense.
- Check calculations when solving problems.
- Verify possible solutions by explaining the methods used.
- Evaluate results based on the given context.

**MA.K12.MTR.6.1:**

Clarifications:
- Teachers who encourage students to assess the reasonableness of solutions:
  - Have students estimate or predict solutions prior to solving.
  - Prompt students to continually ask, “Does this solution make sense? How do you know?”
  - Reinforce that students check their work as they progress within and after a task.
  - Strengthen students’ ability to verify solutions through justifications.

Apply mathematics to real-world contexts.

Mathematicians who apply mathematics to real-world contexts:
- Connect mathematical concepts to everyday experiences.
- Use models and methods to understand, represent and solve problems.
- Perform investigations to gather data or determine if a method is appropriate. • Redesign models and methods to improve accuracy or efficiency.

**MA.K12.MTR.7.1:**

Clarifications:
- Teachers who encourage students to apply mathematics to real-world contexts:
  - Provide opportunities for students to create models, both concrete and abstract, and perform investigations.
  - Challenge students to question the accuracy of their models and methods.
  - Support students as they validate conclusions by comparing them to the given situation.
  - Indicate how various concepts can be applied to other disciplines.

Cite evidence to explain and justify reasoning.

**ELA.K12.EE.1.1:**

**K-1 Students include textual evidence in their oral communication with guidance and support from adults. The evidence can consist of details from the text without naming the text. During 1st grade, students learn how to incorporate the evidence in their writing.**

2-3 Students include relevant textual evidence in their written and oral communication. Students should name the text when they refer to it. In 3rd grade, students should use a combination of direct and indirect citations.

4-5 Students continue with previous skills and reference comments made by speakers and peers. Students cite texts that they've directly quoted, paraphrased, or used for information. When writing, students will use the form of citation dictated by the instructor or the style guide referenced by the instructor.

6-8 Students continue with previous skills and use a style guide to create a proper citation.

9-12 Students continue with previous skills and should be aware of existing style guides and the ways in which they differ.

**ELA.K12.EE.2.1:**

Read and comprehend grade-level complex texts proficiently.

**Clarifications:**
See Text Complexity for grade-level complexity bands and a text complexity rubric.

**ELA.K12.EE.3.1:**

Make inferences to support comprehension.

**Clarifications:**
- Students will make inferences before the words infer or inference are introduced.
- Kindergarten students will answer questions like “Why is the girl smiling?” or make predictions about what will happen based on the title page. Students will use the terms and apply them in 2nd grade and beyond.

**ELA.K12.EE.4.1:**

Use appropriate collaborative techniques and active listening skills when engaging in discussions in a variety of situations.

**Clarifications:**
- In kindergarten, students learn to listen to one another respectfully.
- In grades 1-2, students build upon these skills by justifying what they are thinking. For example: “I think _____ because _____.” The collaborative conversations are becoming academic conversations.
- In grades 3-12, students engage in academic conversations discussing claims and justifying their reasoning, refining and applying skills. Students build on ideas, propel the conversation, and support claims and counterclaims with evidence.

**ELA.K12.EE.5.1:**

Use the accepted rules governing a specific format to create quality work.

**Clarifications:**
- Students will incorporate skills learned into work products to produce quality work. For students to incorporate these skills appropriately, they must receive instruction. A 3rd grade student creating a poster board display must have instruction in how to effectively present information to do quality work.

**ELA.K12.EE.6.1:**

Use appropriate voice and tone when speaking or writing.

**Clarifications:**
- In kindergarten and 1st grade, students learn the difference between formal and informal language. For example, the way we talk to our friends differs from the way we speak to adults. In 2nd grade and beyond, students practice appropriate social and academic language to discuss texts.

**ELD.K12.ELL.5C.1:**

English language learners communicate information, ideas and concepts necessary for academic success in the content area of Science.

**HE.7.C.1.3:**

Analyze how environmental factors affect personal health.

**Clarifications:**
- Food refrigeration, appropriate home heating and cooling, air/water quality, and garbage/trash collection.
GENERAL NOTES

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Special Notes:

Instructional Practices

Teaching from a range of complex text is optimized when teachers in all subject areas implement the following strategies on a routine basis:

1. Ensuring wide reading from complex text that varies in length.
2. Making close reading and rereading of texts central to lessons.
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4. Emphasizing students supporting answers based upon evidence from the text.
5. Providing extensive research and writing opportunities (claims and evidence).


- Asking questions (for science) and defining problems (for engineering).
- Developing and using models.
- Planning and carrying out investigations.
- Analyzing and interpreting data.
- Using mathematics, information and computer technology, and computational thinking.
- Constructing explanations (for science) and designing solutions (for engineering).
- Engaging in argument from evidence.
- Obtaining, evaluating, and communicating information.

ISTE Standards (http://www.iste.org/docs/pdfs/20-14_ISTE_Standards-S.pdf) should be incorporated in many contexts throughout the course.

Course Standards

Use grade appropriate Nature of Science and mathematics content benchmarks (i.e. if this course is offered to seventh grade students, then the SC.7.N benchmarks should be integrated into the course content, and SC.6.N and SC.8.N benchmarks should be omitted from the seventh grade course).

Florida's Benchmarks for Excellent Student Thinking (B.E.S.T.) Standards

This course includes Florida’s B.E.S.T. ELA Expectations (EE) and Mathematical Thinking and Reasoning Standards (MTRs) for students. Florida educators should intentionally embed these standards within the content and their instruction as applicable. For guidance on the implementation of the EE and MTRs, please visit https://www.cpalms.org/Standards/BEST_Standards.aspx and select the appropriate B.E.S.T. Standards package.

English Language Development ELD Standards Special Notes Section:

Teachers are required to provide listening, speaking, reading and writing instruction that allows English language learners (ELL) to communicate information, ideas and concepts for academic success in the content area of Science. For the given level of English language proficiency and with visual, graphic, or interactive support, students will interact with grade level words, expressions, sentences and discourse to process or produce language necessary for academic success. The ELD standard should specify a relevant content area concept or topic of study chosen by curriculum developers and teachers which maximizes an ELL’s need for communication and social skills. To access an ELL supporting document which delineates performance definitions and descriptors, please click on the following link: https://cpalmsmediaprod.blob.core.windows.net/uploads/docs/standards/eld/sc.pdf.

GENERAL INFORMATION

Course Number: 2002200
Course Type: Core Academic Course
Course Status: State Board Approved
Grade Level(s): 6,7,8

Course Path: Section: Grades PreK to 12 Education
Courses > Grade Group: Grades 6 to 8 Education
Courses > Subject: Science > SubSubject: General Sciences
Abbreviated Title: M/J STEM ENV SCI
Course Length: Year (Y)
Course Attributes:
- Class Size Core Required
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Use grade appropriate Nature of Science benchmarks (i.e. if this course is offered to seventh grade students, then the SC.7.N benchmarks should be integrated into the course content, and SC.6.N and SC.8.N benchmarks should be omitted from the seventh grade course).

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<td>SC.6.N.1.1:</td>
<td>Define a problem from the sixth grade curriculum, use appropriate reference materials to support scientific understanding, plan and carry out scientific investigation of various types, such as systematic observations or experiments, identify variables, collect and organize data, interpret data in charts, tables, and graphics, analyze information, make predictions, and defend conclusions.</td>
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<td>SC.6.N.1.2:</td>
<td>Explain why scientific investigations should be replicable.</td>
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<td>SC.6.N.1.3:</td>
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<td>Discuss, compare, and negotiate methods used, results obtained, and explanations among groups of students conducting the same investigation.</td>
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<td>Recognize and explain that a scientific theory is a well-supported and widely accepted explanation of nature and is not simply a claim posed by an individual. Thus, the use of the term theory in science is very different than how it is used in everyday life.</td>
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<td>Recognize and explain that a scientific law is a description of a specific relationship under given conditions in the natural world. Thus, scientific laws are different from societal laws.</td>
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<td>SC.6.N.3.3:</td>
<td>Give several examples of scientific laws.</td>
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<td>SC.6.N.3.4:</td>
<td>Identify the role of models in the context of the sixth grade science benchmarks.</td>
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<td>SC.6.P.11.1:</td>
<td>Explore the Law of Conservation of Energy by differentiating between potential and kinetic energy. Identify situations where kinetic energy is transformed into potential energy and vice versa.</td>
</tr>
<tr>
<td>SC.6.P.12.1:</td>
<td>Measure and graph distance versus time for an object moving at a constant speed. Interpret this relationship.</td>
</tr>
<tr>
<td>SC.6.P.13.1:</td>
<td>Investigate and describe types of forces including contact forces and forces acting at a distance, such as electrical, magnetic, and gravitational.</td>
</tr>
<tr>
<td>SC.6.P.13.2:</td>
<td>Explore the Law of Gravity by recognizing that every object exerts gravitational force on every other object and that the force depends on how much mass the objects have and how far apart they are.</td>
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<tr>
<td>SC.6.P.13.3:</td>
<td>Investigate and describe that an unbalanced force acting on an object changes its speed, or direction of motion, or both.</td>
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<td>SC.7.N.1.1:</td>
<td>Define a problem from the seventh grade curriculum, use appropriate reference materials to support scientific understanding, plan and carry out scientific investigation of various types, such as systematic observations or experiments, identify variables, collect and organize data, interpret data in charts, tables, and graphics, analyze information, make predictions, and defend conclusions.</td>
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<td>SC.7.N.1.2:</td>
<td>Differentiate replication (by others) from repetition (multiple trials).</td>
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<td>SC.7.N.1.3:</td>
<td>Distinguish between an experiment (which must involve the identification and control of variables) and other forms of scientific investigation and explain that not all scientific knowledge is derived from experimentation.</td>
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<td>SC.7.N.1.4:</td>
<td>Identify test variables (independent variables) and outcome variables (dependent variables) in an experiment.</td>
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<tr>
<td>SC.7.N.1.5:</td>
<td>Describe the methods used in the pursuit of a scientific explanation as seen in different fields of science such as biology, geology, and physics.</td>
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<td>SC.7.N.1.6:</td>
<td>Explain that empirical evidence is the cumulative body of observations of a natural phenomenon on which scientific explanations are based.</td>
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<td>SC.7.N.1.7:</td>
<td>Explain that scientific knowledge is the result of a great deal of debate and confirmation within the science community.</td>
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<td>SC.7.N.2.1:</td>
<td>Identify an instance from the history of science in which scientific knowledge has changed when new evidence or new interpretations are encountered.</td>
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<td>SC.7.N.3.1:</td>
<td>Recognize and explain the difference between theories and laws and give several examples of scientific theories and the evidence that supports them.</td>
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<td>SC.7.N.3.2:</td>
<td>Identify the benefits and limitations of the use of scientific models.</td>
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<tr>
<td>SC.7.P.10.1:</td>
<td>Illustrate that the sun's energy arrives as radiation with a wide range of wavelengths, including infrared, visible, and ultraviolet, and that white light is made up of a spectrum of many different colors.</td>
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<tr>
<td>SC.7.P.10.2:</td>
<td>Observe and explain that light can be reflected, refracted, and/or absorbed.</td>
</tr>
<tr>
<td>SC.7.P.10.3:</td>
<td>Observe that light bounces, sound waves move, and other waves move at different speeds in different materials.</td>
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<tr>
<td>SC.7.P.11.1:</td>
<td>Recognize that adding heat to or removing heat from a system may result in a temperature change and possibly a change of state.</td>
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<tr>
<td>SC.7.P.11.2:</td>
<td>Investigate and describe the transformation of energy from one form to another.</td>
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<td>SC.7.P.11.3:</td>
<td>Cite evidence to explain that energy cannot be created nor destroyed, only changed from one form to another.</td>
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<td>SC.7.P.11.4:</td>
<td>Observe and describe that heat flows in predictable ways, moving from warmer objects to cooler ones until they reach the same temperature.</td>
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<td>SC.8.N.1.1:</td>
<td>Define a problem from the eighth grade curriculum using appropriate reference materials to support scientific understanding, plan and carry out scientific investigations of various types, such as systematic observations or experiments, identify variables, collect and organize data, interpret data in charts, tables, and graphics, analyze information, make predictions, and defend conclusions.</td>
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<td>SC.8.N.1.2:</td>
<td>Design and conduct a study using repeated trials and replication.</td>
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<td>SC.8.N.1.3:</td>
<td>Use phrases such as &quot;results support&quot; or &quot;fail to support&quot; in science, understanding that science does not offer conclusive 'proof' of a knowledge claim.</td>
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<td>SC.8.N.1.4:</td>
<td>Explain how hypotheses are valuable if they lead to further investigations, even if they turn out not to be supported by the data.</td>
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<td>Analyze the methods used to develop a scientific explanation as seen in different fields of science.</td>
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<td>SC.8.N.1.6:</td>
<td>Understand that scientific investigations involve the collection of relevant empirical evidence, the use of logical reasoning, and the application of imagination in devising hypotheses, predictions, explanations and models to make sense of the collected evidence.</td>
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<td>Distinguish between scientific and pseudoscientific ideas.</td>
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**M/J Physical Science (#2003010)**

**Course Standards**

Use grade appropriate Nature of Science benchmarks (i.e. if this course is offered to seventh grade students, then the SC.7.N benchmarks should be integrated into the course content, and SC.6.N and SC.8.N benchmarks should be omitted from the seventh grade course).
Discuss what characterizes science and its methods.

Analyze the author's purpose in providing an explanation, describing a procedure, or discussing an experiment in a text.

By the end of grade 8, read and comprehend science/technical texts in which they develop understanding of the natural world and its interaction with humans and technology by investigating and providing evidence for phenomena.

Explore and describe the densities of various materials through measurement of their masses and volumes.

Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.

Differentiate between physical changes and chemical changes.

Recognize that there are a finite number of elements and that their atoms combine in a multitude of ways to produce compounds that make up all of the living and nonliving things that we encounter.

Recognize that elements are grouped in the periodic table according to similarities of their properties.

Explore the scientific theory of atoms (also known as atomic theory) by recognizing that atoms are the smallest unit of an element and are composed of sub-atomic particles (electrons surrounding a nucleus containing protons and neutrons).

Identity basic examples of and compare and classify the properties of compounds, including acids, bases, and salts.

Distinguish among facts, reasoned judgment based on research findings, and speculation in a text.

Recognize that mass is conserved when substances undergo physical and chemical changes.

Differentiate between weight and mass recognizing that weight is the amount of gravitational pull on an object and is distinct from, though proportional to, mass.

Determine the amount of gravitational pull on an object by recognizing that it is independent of the object's location and is a function of the mass of the object and the amount of gravitational field at the location of the object.

Explore the Law of Conservation of Mass by demonstrating and concluding that mass is conserved when substances undergo physical and chemical changes.

Investigate and describe how temperature influences chemical changes.

Determine the central ideas or conclusions of a text; provide an accurate summary of the text distinct from prior knowledge or opinions.

Analyze the structure an author uses to organize a text, including how major sections contribute to the whole and to an understanding of the topic.

By the end of grade 8, read and comprehend science/technical texts in the grades 6–8 text complexity band independently and proficiently.

Write arguments focused on discipline-specific content.

a. Introduce claim(s) about a topic or issue, acknowledge and distinguish the claim(s) from alternate or opposing claims, and organize the reasons and evidence logically.

b. Support claim(s) with logical reasoning and relevant, accurate data and evidence that demonstrate an understanding of the topic or text, using credible sources.

c. Use words, phrases, and clauses to create cohesion and clarify the relationships among claim(s), counterclaims, reasons, and evidence.

d. Establish and maintain a formal style.

e. Provide a concluding statement or section that follows from and supports the argument presented.

Write informative/explanatory texts, including the narration of historical events, scientific procedures/experiments, or technical processes.

a. Introduce a topic clearly, previewing what is to follow; organize ideas, concepts, and information into broader categories as appropriate to achieving purpose; include formatting (e.g., headings), graphics (e.g., charts, tables), and multimedia when useful to aiding comprehension.

b. Develop the topic with relevant, well-chosen facts, definitions, concrete details, quotations, or other information and examples.

c. Use appropriate and varied transitions to create cohesion and clarify the relationships among ideas and concepts.

d. Use precise language and domain-specific vocabulary to inform or explain the topic.

e. Establish and maintain a formal style and objective tone.

f. Provide a concluding statement or section that follows from and supports the information or explanation presented.

Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.

With some guidance and support from peers and adults, develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on how well purpose and audience have been addressed.

Use technology, including the Internet, to produce and publish writing and present the relationships between information and ideas clearly and efficiently.

Conduct short research projects to answer a question (including a self-generated question), drawing on several sources and generating additional related, focused questions that allow for multiple avenues of exploration.

Gather relevant information from multiple print and digital sources, using search terms effectively; assess the credibility and accuracy of each source; and quote or paraphrase the data and conclusions of others while avoiding plagiarism and following a standard format for citation.

Draw evidence from informational texts to support analysis, reflection, and research.

Write routinely over extended time frames (time for reflection and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences.

Engage effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grade 8 topics, texts, and issues, building on others’ ideas and expressing their own clearly.

a. Come to discussions prepared, having read or researched material under study; explicitly draw on that preparation by referring to evidence on the topic, text, or issue to probe and reflect on ideas under discussion.
b. Follow rules for collegial discussions and decision-making, track progress toward specific goals and deadlines, and define individual roles as needed.
c. Pose questions that connect the ideas of several speakers and respond to others’ questions and comments with relevant evidence, observations, and ideas.
d. Acknowledge new information expressed by others, and, when warranted, qualify or justify their own views in light of the evidence presented.

Analyze the purpose of information presented in diverse media and formats (e.g., visually, quantitatively, orally) and evaluate the motives (e.g., social, commercial, political) behind its presentation.

Delineate a speaker’s argument and specific claims, evaluating the soundness of the reasoning and relevance and sufficiency of the evidence and identifying when irrelevant evidence is introduced.

Present claims and findings, emphasizing salient points in a focused, coherent manner with relevant evidence, sound valid reasoning, and well-chosen details; use appropriate eye contact, adequate volume, and clear pronunciation.

Integrate multimedia and visual displays into presentations to clarify information, strengthen claims and evidence, and add interest.

Summarize numerical data sets in relation to their context, such as by:

a. Reporting the number of observations.
b. Describing the nature of the attribute under investigation, including how it was measured and its units of measurement.
c. Giving quantitative measures of center (median and/or mean) and variability (interquartile range and/or mean absolute deviation), as well as describing any overall pattern and any striking deviations from the overall pattern with reference to the context in which the data were gathered.
d. Relating the choice of measures of center and variability to the shape of the data distribution and the context in which the data were gathered.

Use measures of center and measures of variability for numerical data from random samples to draw informal comparative inferences about two populations. For example, decide whether the words in a chapter of a seventh-grade science book are generally longer than the words in a chapter of a fourth-grade science book.

Understand that the probability of a chance event is a number between 0 and 1 that expresses the likelihood of the event occurring. Larger numbers indicate greater likelihood. A probability near 0 indicates an unlikely event, a probability around 1/2 indicates an event that is neither unlikely nor likely, and a probability near 1 indicates a likely event.

Describe qualitatively the functional relationship between two quantities by analyzing a graph (e.g., where the function is increasing or decreasing, linear or nonlinear). Sketch a graph that exhibits the qualitative features of a function that has been described verbally.

Know the formulas for the volumes of cones, cylinders, and spheres and use them to solve real-world and mathematical problems.

Clarifications:

Fluency Expectations or Examples of Culminating Standards

When students learn to solve problems involving volumes of cones, cylinders, and spheres — together with their previous grade 7 work in angle measure, area, surface area and volume (7.G.2.4–2.6) — they will have acquired a well-developed set of geometric measurement skills. These skills, along with proportional reasoning (7.RP) and multistep numerical problem solving (7.EE.2.3), can be combined and used in flexible ways as part of modeling during high school — not to mention after high school for college and careers.

Make sense of problems and persevere in solving them.

Mathematically proficient students start by explaining to themselves the meaning of a problem and looking for entry points to its solution. They analyze givers, constraints, relationships, and goals. They make conjectures about the form and meaning of the solution and plan a solution pathway rather than simply jumping into a solution attempt. They consider analogous problems, and try special cases and simpler forms of the original problem in order to gain insight into its solution. They monitor and evaluate their progress and change course if necessary. Older students might, depending on the context of the problem, transform algebraic expressions or change the viewing window on their graphing calculator to get the information they need. Mathematically proficient students can explain correspondences between equations, verbal descriptions, tables, and graphs or draw diagrams of important features and relationships, graph data, and search for regularity or trends. Younger students might rely on using concrete objects or pictures to help conceptualize and solve a problem. Mathematically proficient students check their answers to problems using a different method, and they continually ask themselves, “Does this make sense?” They can understand the approaches of others to solving complex problems and identify correspondences between different approaches.

Standard Relation to Course: Supporting

Reason abstractly and quantitatively.

Mathematically proficient students make sense of quantities and their relationships in problem situations. They bring two complementary abilities to bear on problems involving quantitative relationships: the ability to decontextualize—to abstract a given situation and represent it symbolically and manipulate the representing symbols as if they have a life of their own, without necessarily attending to their referents—and the ability to contextualize, to pause as needed during the manipulation process in order to probe into the referents for the symbols involved. Quantitative reasoning entails habits of creating a coherent representation of the problem at hand; considering the units involved; attending to the meaning of quantities, not just how to compute them; and knowing and flexibly using different properties of operations and objects.

Standard Relation to Course: Supporting

Construct viable arguments and critique the reasoning of others.

Mathematically proficient students understand and use stated assumptions, definitions, and previously established results in constructing arguments. They make conjectures and build a logical progression of statements to explore the truth of their conjectures. They are able to analyze situations by breaking them into cases, and can recognize and use counterexamples. They justify their conclusions, communicate them to others, and respond to the arguments of others. They reason inductively about data, making plausible arguments that take into account the context from which the data arose. Mathematically proficient students are also able to compare the effectiveness of two plausible arguments, distinguish correct logic or reasoning from that which is flawed, and—if there is a flaw in an argument—explain what it is. Elementary students can construct arguments using concrete referents such as objects, drawings, diagrams, and actions. Such arguments can make sense and be correct, even though they are not generalized or made formal until later grades. Later, students learn to determine domains to which an argument applies. Students at all grades can listen or read the arguments of others, decide whether they make sense, and ask useful questions to clarify or improve the arguments.

Standard Relation to Course: Supporting

Model with mathematics.

Mathematically proficient students can apply the mathematics they know to solve problems arising in everyday life, society, and the workplace. In early grades, this might be as simple as writing an addition equation to describe a situation. In middle grades, a student might apply proportional
MAFS.K12.MP.4.1:
reasoning to plan a school event or analyze a problem in the community. By high school, a student might use geometry to solve a design problem or use a function to describe how one quantity of interest depends on another. Mathematically proficient students who can apply what they know are comfortable making assumptions and approximations to simplify a complicated situation, realizing that these may need revision later. They are able to identify important quantities in a practical situation and map their relationships using such tools as diagrams, two-way tables, graphs, flowcharts and formulas. They can analyze those relationships mathematically to draw conclusions. They routinely interpret their mathematical results in the context of the situation and reflect on whether the results make sense, possibly improving the model if it has not served its purpose.

Standard Relation to Course: Supporting

Use appropriate tools strategically.

Mathematically proficient students consider the available tools when solving a mathematical problem. These tools might include pencil and paper, concrete models, a ruler, a protractor, a calculator, a spreadsheet, a computer algebra system, a statistical package, or dynamic geometry software. Proficient students are sufficiently familiar with tools appropriate for their grade or course to make sound decisions about when each of these tools might be helpful, recognizing both the insight to be gained and their limitations. For example, mathematically proficient high school students analyze graphs of functions and solutions generated using a graphing calculator. They detect possible errors by strategically using estimation and other mathematical knowledge. When making mathematical models, they know that technology can enable them to visualize the results of varying assumptions, explore consequences, and compare predictions with data. Mathematically proficient students at various grade levels are able to identify relevant external mathematical resources, such as digital content located on a website, and use them to pose or solve problems. They are able to use technological tools to explore and deepen their understanding of concepts.

Standard Relation to Course: Supporting

MAFS.K12.MP.5.1:
Attend to precision.

Mathematically proficient students try to communicate precisely to others. They try to use clear definitions in discussion with others and in their own reasoning. They state the meaning of the symbols they choose, including using the equal sign consistently and appropriately. They are careful about specifying units of measure, and labeling axes to clarify the correspondence with quantities in a problem. They calculate accurately and efficiently, express numerical answers with a degree of precision appropriate for the problem context. In the elementary grades, students give carefully formulated explanations to each other. By the time they reach high school they have learned to examine claims and make explicit use of definitions.

Standard Relation to Course: Supporting

MAFS.K12.MP.6.1:
Look for and make use of structure.

Mathematically proficient students look closely to discern a pattern or structure. Young students, for example, might notice that three and seven more is the same amount as seven and three more, or they may sort a collection of shapes according to how many sides the shapes have. Later, students will see 7 × 8 equals the well remembered 7 × 5 + 7 × 3, in preparation for learning about the distributive property. In the expression x² + 9x + 14, older students can see the 14 as 2 × 7 and the 9 as 2 × 7. They recognize the significance of an existing line in a geometric figure and can use the strategy of drawing an auxiliary line or other geometric construction to solve a problem. They also can step back for an overview and shift perspective. They can see complicated things, such as some algebraic expressions, as single objects or as being composed of several objects. For example, they can see 5 − 3(7 − y²) as 5 minus a positive number times a square and use that to realize that its value cannot be more than 5 for any real numbers x and y.

Standard Relation to Course: Supporting

MAFS.K12.MP.7.1:
Look for and express regularity in repeated reasoning.

Mathematically proficient students notice if calculations are repeated, and look both for general methods and for shortcuts. Upper elementary students might notice when dividing 25 by 11 that they are repeating the same calculations over and over again, and conclude they have a repeating decimal. By paying attention to the calculation of slope as they repeatedly check whether points are on the line through (1, 2) with slope 3, middle school students might abstract the equation (y − 2)/(x − 1) = 3. Noticing the regularity in the way terms cancel when expanding (x − 1)(x + 1), (x − 1)(x² + x + 1), and (x − 1)(x³ + x² + x + 1) might lead them to the general formula for the sum of a geometric series. As they work to solve a problem, mathematically proficient students maintain oversight of the process, while attending to the details. They continually evaluate the reasonableness of their intermediate results.

Standard Relation to Course: Supporting

MAFS.K12.MP.8.1:

General Course Information and Notes

GENERAL NOTES

Laboratory investigations that include the use of scientific inquiry, research, measurement, problem solving, laboratory apparatus and technologies, experimental procedures, and safety procedures are an integral part of this course. The National Science Teachers Association (NSTA) recommends that at the middle school level, all students should have multiple opportunities every week to explore science laboratory investigations (labs). School laboratory investigations are defined by the National Research Council (NRC) as an experience in the laboratory, classroom, or the field that provides students with opportunities to interact directly with natural phenomena or with data collected by others using tools, materials, data collection techniques, and models (NRC, 2006, p. 3). Laboratory investigations in the middle school classroom should help all students develop a growing understanding of the complexity and ambiguity of empirical work, as well as the skills to calibrate and troubleshoot equipment used to make observations. Learners should understand measurement error; and have the skills to aggregate, interpret, and present the resulting data (NRC 2006, p. 77; NSTA, 2007).

Special Notes:

Instructional Practices

Teaching from a range of complex text is optimized when teachers in all subject areas implement the following strategies on a routine basis:

1. Ensuring wide reading from complex text that varies in length.
2. Making close reading and rereading of texts central to lessons.
3. Emphasizing text-specific complex questions, and cognitively complex tasks, reinforce focus on the text and cultivate independence.
4. Emphasizing students supporting answers based upon evidence from the text.
5. Providing extensive research and writing opportunities (claims and evidence).

**Science and Engineering Practices** (NRC Framework for K-12 Science Education, 2010)

- Asking questions (for science) and defining problems (for engineering).
- Developing and using models.
- Planning and carrying out investigations.
- Analyzing and interpreting data.
- Using mathematics, information and computer technology, and computational thinking.
- Constructing explanations (for science) and designing solutions (for engineering).
- Engaging in argument from evidence.
- Obtaining, evaluating, and communicating information.

**Literacy Standards in Science**

Secondary science courses include reading standards for literacy in science and technical subjects 6-12 and writing standards for literacy in history/social studies, science, and technical subjects 6-12. The courses also include speaking and listening standards. For a complete list of standards required for this course click on the blue tile labeled course standards. You may also download the complete course including all required standards and notes sections using the export function located at the top of this page.

**English Language Development ELD Standards Special Notes Section:**

Teachers are required to provide listening, speaking, reading and writing instruction that allows English language learners (ELL) to communicate information, ideas and concepts for academic success in the content area of Science. For the given level of English language proficiency and with visual, graphic, or interactive support, students will interact with grade level words, expressions, sentences and discourse to process or produce language necessary for academic success. The ELD standard should specify a relevant content area concept or topic of study chosen by curriculum developers and teachers which maximizes an ELL's need for communication and social skills. To access an ELL supporting document which delineates performance definitions and descriptors, please click on the following link: https://cpalmsmediaprod.blob.core.windows.net/uploads/docs/standards/eld/sc.pdf

**Additional Instructional Resources:**

A.V.E. for Success Collection is provided by the Florida Association of School Administrators: http://www.fasa.net/4DCGI/cms/review.html?Action=CMS_Document&DocID=139. Please be aware that these resources have not been reviewed by CPALMS and there may be a charge for the use of some of them in this collection.

**GENERAL INFORMATION**

**Course Number:** 2003010
**Course Path:** Section: Grades PreK to 12 Education
Courses > Grade Group: Grades 6 to 8 Education
Courses > Subject: Science > SubSubject: Physical Sciences
**Abbreviated Title:** M/J PHY SCI
**Course Length:** Year (Y)
**Course Attributes:**
- Class Size Core Required
**Course Level:** 2
**Course Status:** Course Approved
**Grade Level(s):** 6,7,8

**Educator Certifications**

<table>
<thead>
<tr>
<th>Certification</th>
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<tr>
<td>Science (Secondary Grades 7-12)</td>
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</tr>
<tr>
<td>SC.6.N.3.4:</td>
<td>Identify the role of models in the context of the sixth grade science benchmarks.</td>
</tr>
<tr>
<td>SC.6.P.11.1:</td>
<td>Explore the Law of Conservation of Energy by differentiating between potential and kinetic energy. Identify situations where kinetic energy is transformed into potential energy and vice versa.</td>
</tr>
<tr>
<td>SC.6.P.12.1:</td>
<td>Measure and graph distance versus time for an object moving at a constant speed. Interpret this relationship.</td>
</tr>
<tr>
<td>SC.6.P.13.1:</td>
<td>Investigate and describe types of forces including contact forces and forces acting at a distance, such as electrical, magnetic, and gravitational.</td>
</tr>
<tr>
<td>SC.6.P.13.2:</td>
<td>Explore the Law of Gravity by recognizing that every object exerts gravitational force on every other object and that the force depends on how much mass the objects have and how far apart they are.</td>
</tr>
<tr>
<td>SC.6.P.13.3:</td>
<td>Investigate and describe that an unbalanced force acting on an object changes its speed, or direction of motion, or both.</td>
</tr>
<tr>
<td>SC.7.N.1.1:</td>
<td>Define a problem from the seventh grade curriculum, use appropriate reference materials to support scientific understanding, plan and carry out scientific investigation of various types, such as systematic observations or experiments, identify variables, collect and organize data, interpret data in charts, tables, and graphics, analyze information, make predictions, and defend conclusions.</td>
</tr>
<tr>
<td>SC.7.N.1.2:</td>
<td>Differentiate replication (by others) from repetition (multiple trials).</td>
</tr>
<tr>
<td>SC.7.N.1.3:</td>
<td>Distinguish between an experiment (which must involve the identification and control of variables) and other forms of scientific investigation and explain that not all scientific knowledge is derived from experimentation.</td>
</tr>
<tr>
<td>SC.7.N.1.4:</td>
<td>Identify test variables (independent variables) and outcome variables (dependent variables) in an experiment.</td>
</tr>
<tr>
<td>SC.7.N.1.5:</td>
<td>Describe the methods used in the pursuit of a scientific explanation as seen in different fields of science such as biology, geology, and physics.</td>
</tr>
<tr>
<td>SC.7.N.1.6:</td>
<td>Explain that empirical evidence is the cumulative body of observations of a natural phenomenon on which scientific explanations are based.</td>
</tr>
<tr>
<td>SC.7.N.1.7:</td>
<td>Explain that scientific knowledge is the result of a great deal of debate and confirmation within the science community.</td>
</tr>
<tr>
<td>SC.7.N.2.1:</td>
<td>Identify an instance from the history of science in which scientific knowledge has changed when new evidence or new interpretations are encountered.</td>
</tr>
<tr>
<td>SC.7.N.3.1:</td>
<td>Recognize and explain the difference between theories and laws and give several examples of scientific theories and the evidence that supports them.</td>
</tr>
<tr>
<td>SC.7.N.3.2:</td>
<td>Identify the benefits and limitations of the use of scientific models.</td>
</tr>
<tr>
<td>SC.7.P.10.1:</td>
<td>Illustrate that the sun's energy arrives as radiation with a wide range of wavelengths, including infrared, visible, and ultraviolet, and that white light is made up of a spectrum of many different colors.</td>
</tr>
<tr>
<td>SC.7.P.10.2:</td>
<td>Observe and explain that light can be reflected, refracted, and/or absorbed.</td>
</tr>
<tr>
<td>SC.7.P.10.3:</td>
<td>Recognize that light waves, sound waves, and other waves move at different speeds in different materials.</td>
</tr>
<tr>
<td>SC.7.P.11.1:</td>
<td>Recognize that adding heat to or removing heat from a system may result in a temperature change and possibly a change of state.</td>
</tr>
<tr>
<td>SC.7.P.11.2:</td>
<td>Investigate and describe the transformation of energy from one form to another.</td>
</tr>
<tr>
<td>SC.7.P.11.3:</td>
<td>Cite evidence to explain that energy cannot be created nor destroyed, only changed from one form to another.</td>
</tr>
<tr>
<td>SC.7.P.11.4:</td>
<td>Observe and describe that heat flows in predictable ways, moving from warmer objects to cooler ones until they reach the same temperature.</td>
</tr>
<tr>
<td>SC.8.N.1.1:</td>
<td>Define a problem from the eighth grade curriculum using appropriate reference materials to support scientific understanding, plan and carry out scientific investigations of various types, such as systematic observations or experiments, identify variables, collect and organize data, interpret data in charts, tables, and graphics, analyze information, make predictions, and defend conclusions.</td>
</tr>
<tr>
<td>SC.8.N.1.2:</td>
<td>Design and conduct a study using repeated trials and replication.</td>
</tr>
<tr>
<td>SC.8.N.1.3:</td>
<td>Use phrases such as &quot;results support&quot; or &quot;fail to support&quot; in science, understanding that science does not offer conclusive &quot;proof&quot; of a knowledge claim.</td>
</tr>
<tr>
<td>SC.8.N.1.4:</td>
<td>Explain how hypotheses are valuable if they lead to further investigations, even if they turn out not to be supported by the data.</td>
</tr>
<tr>
<td>SC.8.N.1.5:</td>
<td>Analyze the methods used to develop a scientific explanation as seen in different fields of science.</td>
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<td>SC.8.N.1.6:</td>
<td>Understand that scientific investigations involve the collection of relevant empirical evidence, the use of logical reasoning, and the application of imagination in devising hypotheses, predictions, explanations and models to make sense of the collected evidence.</td>
</tr>
<tr>
<td>SC.8.N.2.1:</td>
<td>Distinguish between scientific and pseudoscientific ideas.</td>
</tr>
</tbody>
</table>
Discuss what characterizes science and its methods.

Investigate and describe how temperature influences chemical changes.

Explore the scientific theory of atoms (also known as atomic theory) by using models to explain the motion of particles in solids, liquids, and gases.

Differentiate between weight and mass recognizing that weight is the amount of gravitational pull on an object and is distinct from, though proportional to, mass.

Explore and describe the densities of various materials through measurement of their masses and volumes.

Classify and compare substances on the basis of characteristic physical properties that can be demonstrated or measured; for example, density, thermal or electrical conductivity, solubility, magnetic properties, melting and boiling points, and know that these properties are independent of the amount of the sample.

Recognize that there are a finite number of elements and that their atoms combine in a multitude of ways to produce compounds that make up all of the living and nonliving things that we encounter.

Recognize that elements are grouped in the periodic table according to similarities of their properties.

Identify basic examples of and compare and classify the properties of compounds, including acids, bases, and salts.

Distinguish among mixtures (including solutions) and pure substances.

Determine the Law of Conservation of Mass by demonstrating and concluding that mass is conserved when substances undergo physical and chemical changes.

Identify basic examples of and compare and classify the properties of compounds, including acids, bases, and salts.

Select models useful in relating the results of their own investigations.

Explore the Law of Conservation of Mass by demonstrating and concluding that mass is conserved when substances undergo physical and chemical changes.

Demonstrate understanding by representing problems in multiple ways. Mathematicians who demonstrate understanding by representing problems in multiple ways:

- Build understanding through modeling and using manipulatives.
- Represent solutions to problems in multiple ways using objects, drawings, tables, graphs and equations.
- Progress from modeling problems with objects and drawings to using algorithms and equations.
- Express connections between concepts and representations.
- Choose a representation based on the given context or purpose.

Complete tasks with mathematical fluency. Mathematicians who complete tasks with mathematical fluency:

- Select efficient and appropriate methods for solving problems within the given context.
- Maintain flexibility and accuracy while performing procedures and mental calculations.
- Complete tasks accurately and with confidence.
- Adapt procedures to apply them to a new context.
- Use feedback to improve efficiency when performing calculations.

Engage in discussions that reflect on the mathematical thinking of self and others. Mathematicians who engage in discussions that reflect on the mathematical thinking of self and others:

- Communicate mathematical ideas, vocabulary and methods effectively.
- Analyze the mathematical thinking of others.
- Compare the efficiency of a method to those expressed by others.
- Recognize errors and suggest how to correctly solve the task.
- Justify results by explaining methods and processes.
- Construct possible arguments based on evidence.

Mathematicians who participate in effortful learning both individually and with others:

- Analyze the problem in a way that makes sense given the task.
- Ask questions that will help with solving the task.
- Build perseverance by modifying methods as needed while solving a challenging task.
- Stay engaged and maintain a positive mindset when working to solve tasks.
- Help and support each other when attempting a new method or approach.

Mathematicians who complete tasks with mathematical fluency:

- Select efficient and appropriate methods for solving problems within the given context.
- Maintain flexibility and accuracy while performing procedures and mental calculations.
- Complete tasks accurately and with confidence.
- Adapt procedures to apply them to a new context.
- Use feedback to improve efficiency when performing calculations.

Mathematicians who engage in discussions that reflect on the mathematical thinking of self and others:

- Communicate mathematical ideas, vocabulary and methods effectively.
- Analyze the mathematical thinking of others.
- Compare the efficiency of a method to those expressed by others.
- Recognize errors and suggest how to correctly solve the task.
- Justify results by explaining methods and processes.
- Construct possible arguments based on evidence.
Clarifications:
Teachers who encourage students to engage in discussions that reflect on the mathematical thinking of self and others:
- Establish a culture in which students ask questions of the teacher and their peers, and error is an opportunity for learning.
- Create opportunities for students to discuss their thinking with peers.
- Select, sequence and present student work to advance and deepen understanding of correct and increasingly efficient methods.
- Develop students’ ability to justify methods and compare their responses to the responses of their peers.

Use patterns and structure to help understand and connect mathematical concepts.
Mathematicians who use patterns and structure to help understand and connect mathematical concepts:
- Focus on relevant details within a problem.
- Create plans and procedures to logically order events, steps or ideas to solve problems.
- Decompose a complex problem into manageable parts.
- Relate previously learned concepts to new concepts.
- Look for similarities among problems.
- Connect solutions of problems to more complicated large-scale situations.

Clarifications:
Teachers who encourage students to use patterns and structure to help understand and connect mathematical concepts:
- Help students recognize the patterns in the world around them and connect these patterns to mathematical concepts.
- Support students to develop generalizations based on the similarities found among problems.
- Provide opportunities for students to create plans and procedures to solve problems.
- Develop students’ ability to construct relationships between their current understanding and more sophisticated ways of thinking.

Assess the reasonableness of solutions.
Mathematicians who assess the reasonableness of solutions:
- Estimate to discover possible solutions.
- Use benchmark quantities to determine if a solution makes sense.
- Check calculations when solving problems.
- Verify possible solutions by explaining the methods used.
- Evaluate results based on the given context.

Clarifications:
Teachers who encourage students to assess the reasonableness of solutions:
- Have students estimate or predict solutions prior to solving.
- Prompt students to continually ask, “Does this solution make sense? How do you know?”
- Reinforce that students check their work as they progress within and after a task.
- Strengthen students’ ability to verify solutions through justifications.

Apply mathematics to real-world contexts.
Mathematicians who apply mathematics to real-world contexts:
- Connect mathematical concepts to everyday experiences.
- Use models and methods to understand, represent and solve problems.
- Perform investigations to gather data or determine if a method is appropriate. • Redesign models and methods to improve accuracy or efficiency.

Clarifications:
Teachers who encourage students to apply mathematics to real-world contexts:
- Provide opportunities for students to create models, both concrete and abstract, and perform investigations.
- Challenge students to question the accuracy of their models and methods.
- Support students as they validate conclusions by comparing them to the given situation.
- Indicate how various concepts can be applied to other disciplines.

Cite evidence to explain and justify reasoning.

Clarifications:
K-1 Students include textual evidence in their oral communication with guidance and support from adults. The evidence can consist of details from the text without naming the text. During 1st grade, students learn how to incorporate the evidence in their writing. 2-3 Students include relevant textual evidence in their written and oral communication. Students should name the text when they refer to it. In 3rd grade, students should use a combination of direct and indirect citations.
4-5 Students continue with previous skills and reference comments made by speakers and peers. Students cite texts that they’ve directly quoted, paraphrased, or used for information. When writing, students will use the form of citation dictated by the instructor or the style guide referenced by the instructor.
6-8 Students continue with previous skills and use a style guide to create a proper citation.
9-12 Students continue with previous skills and should be aware of existing style guides and the ways in which they differ.

Read and comprehend grade-level complex texts proficiently.

Clarifications:
See Text Complexity for grade-level complexity bands and a text complexity rubric.

Make inferences to support comprehension.

Clarifications:
Students will make inferences before the words infer or inference are introduced. Kindergarten students will answer questions like “Why is the girl smiling?” or make predictions about what will happen based on the title page. Students will use the terms and apply them in 2nd grade and beyond.
Use appropriate collaborative techniques and active listening skills when engaging in discussions in a variety of situations.

**Clarifications:**
- In kindergarten, students learn to listen to one another respectfully.
- In grades 1-2, students build upon these skills by justifying what they are thinking. For example: “I think _____ because ____.” The collaborative conversations are becoming academic conversations.
- In grades 3-12, students engage in academic conversations discussing claims and justifying their reasoning, refining and applying skills. Students build on ideas, propel the conversation, and support claims and counterclaims with evidence.

Use the accepted rules governing a specific format to create quality work.

**Clarifications:**
- Students will incorporate skills learned into work products to produce quality work. For students to incorporate these skills appropriately, they must receive instruction. A 3rd grade student creating a poster board display must have instruction in how to effectively present information to do quality work.

Use appropriate voice and tone when speaking or writing.

**Clarifications:**
- In kindergarten and 1st grade, students learn the difference between formal and informal language. For example, the way we talk to our friends differs from the way we speak to adults. In 2nd grade and beyond, students practice appropriate social and academic language to discuss texts.

English language learners communicate information, ideas and concepts necessary for academic success in the content area of Science.

English language learners communicate for social and instructional purposes within the school setting.

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**GENERAL NOTES**

Laboratory investigations that include the use of scientific inquiry, research, measurement, problem solving, laboratory apparatus and technologies, experimental procedures, and safety procedures are an integral part of this course. The National Science Teachers Association (NSTA) recommends that at the middle school level, all students should have multiple opportunities every week to explore science laboratory investigations (labs). School laboratory investigations are defined by the National Research Council (NRC) as an experience in the laboratory, classroom, or the field that provides students with opportunities to interact directly with natural phenomena or with data collected by others using tools, materials, data collection techniques, and models (NRC, 2006, p. 3). Laboratory investigations in the middle school classroom should help all students develop a growing understanding of the complexity and ambiguity of empirical work, as well as the skills to calibrate and troubleshoot equipment used to make observations. Learners should understand measurement error; and have the skills to aggregate, interpret, and present the resulting data (NRC, 2006, p. 77; NSTA, 2007).

**Special Notes:**

**Instructional Practices**
Teaching from a range of complex text is optimized when teachers in all subject areas implement the following strategies on a routine basis:

1. Ensuring wide reading from complex text that varies in length.
2. Making close reading and rereading of texts central to lessons.
3. Emphasizing text-specific complex questions, and cognitively complex tasks, reinforce focus on the text and cultivate independence.
4. Emphasizing students supporting answers based upon evidence from the text.
5. Providing extensive research and writing opportunities (claims and evidence).

**Science and Engineering Practices** (NRC Framework for K-12 Science Education, 2010)
- Asking questions (for science) and defining problems (for engineering).
- Developing and using models.
- Planning and carrying out investigations.
- Analyzing and interpreting data.
- Using mathematics, information and computer technology, and computational thinking.
- Constructing explanations (for science) and designing solutions (for engineering).
- Engaging in argument from evidence.
- Obtaining, evaluating, and communicating information.

**Florida's Benchmarks for Excellent Student Thinking (B.E.S.T.) Standards**
This course includes Florida’s B.E.S.T. ELA Expectations (EE) and Mathematical Thinking and Reasoning Standards (MTRs) for students. Florida educators should intentionally embed these standards within the content and their instruction as applicable. For guidance on the implementation of the EEs and MTRs, please visit https://www.cpalms.org/Standards/BEST_Standards.aspx and select the appropriate B.E.S.T. Standards package.

**English Language Development ELD Standards Special Notes Section:**
Teachers are required to provide listening, speaking, reading and writing instruction that allows English language learners (ELL) to communicate information, ideas and concepts for academic success in the content area of Science. For the given level of English language proficiency and with visual, graphic, or interactive support, students will interact with grade level words, expressions, sentences and discourse to process or produce language necessary for academic success. The ELD standard should specify a relevant content area concept or topic of study chosen by curriculum developers and teachers which maximizes an ELL’s need for communication and social skills. To access an ELL supporting document which delineates performance definitions and descriptors, please click on the following link: https://cpalmsmediaprod.blob.core.windows.net/uploads/docs/standards/eld/sc.pdf

**Additional Instructional Resources:**
A.V.E. for Success Collection is provided by the Florida Association of School Administrators: http://www.fasa.net/4DCGI/cms/review.html?
Action=CMS_Document&DocID=139. Please be aware that these resources have not been reviewed by CPALMS and there may be a charge for the use of some of them in this collection.
GENERAL INFORMATION

Course Number: 2003010

Course Path: Section: Grades PreK to 12 Education
Courses > Grade Group: Grades 6 to 8 Education
Courses > Subject: Science > SubSubject: Physical Sciences
Abbreviated Title: M/J PHY SCI
Course Length: Year (Y)
Course Attributes:
- Class Size Core Required
Course Level: 2

Course Status: State Board Approved
Grade Level(s): 6,7,8

Educator Certifications

<table>
<thead>
<tr>
<th>Science (Secondary Grades 7-12)</th>
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<td>Middle Grades Integrated Curriculum (Middle Grades 5-9)</td>
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<tr>
<td>Physics (Grades 6-12)</td>
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<td>Middle Grades General Science (Middle Grades 5-9)</td>
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<td>Chemistry (Grades 6-12)</td>
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<td>Earth/Space Science (Grades 6-12)</td>
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</tbody>
</table>
Understand that scientific investigations involve the collection of data through experiments and observations.

Recognize that light waves, sound waves, and other waves move at different speeds in different materials.

Explain that scientific knowledge is the result of a great deal of debate and confirmation within the science community.

Explore the Law of Gravity by recognizing that every object exerts gravitational force on every other object and that the force depends on how much mass the objects have and how far apart they are.

Investigate and describe the transformation of energy from one form to another.

Explore and describe the densities of various materials through measurement of their masses and volumes.

Discuss what characterizes science and its methods.

Illustrate that the sun’s energy arrives as radiation with a wide range of energies, including visible light, infrared, and ultraviolet.

Observe and explain that light can be reflected, refracted, and/or absorbed.

Design and conduct a study using repeated trials and replication.

Explain that science is one of the processes that can be used to inform decision making at the community, state, national, and international levels.

Distinguish between scientific and pseudoscientific ideas.

Analyze the methods used to develop a scientific explanation as seen in different fields of science such as biology, geology, and physics.

Distinguish between weight and mass recognizing that weight is the amount of gravitational pull on an object and is distinct from, though proportional to, mass.

Explore and describe the densities of various materials through measurement of their masses and volumes.

Classify and compare substances on the basis of characteristic physical properties that can be demonstrated or measured; for example, density, thermal or electrical conductivity, solubility, magnetic properties, melting and boiling points, and know that these properties are independent of the amount of the sample.

Recognize that there are a finite number of elements and that their atoms combine in a multitude of ways to produce compounds that make up all of the living and nonliving things that we encounter.

Recognize that elements are grouped in the periodic table according to similarities of their properties.

Explore the scientific theory of atoms (also known as atomic theory) by recognizing that atoms are the smallest unit of an element and are composed of sub-atomic particles (electrons surrounding a nucleus containing protons and neutrons).
Identify basic examples of and compare and classify the properties of compounds, including acids, bases, and salts.

Distinguish among mixtures (including solutions) and pure substances.

Explore the Law of Conservation of Mass by demonstrating and concluding that mass is conserved when substances undergo physical and chemical changes.

Differentiate between physical changes and chemical changes.

Investigate and describe how temperature influences chemical changes.

Differentiate among the four states of matter.

Differentiate between physical and chemical properties and physical and chemical changes of matter.

Explore the scientific theory of atoms (also known as atomic theory) by describing the structure of atoms in terms of protons, neutrons and electrons, and differentiate among these particles in terms of their mass, electrical charges and locations within the atom.

Relate properties of atoms and their position in the periodic table to the arrangement of their electrons.

Interpret formula representations of molecules and compounds in terms of composition and structure.

Describe acidity and basicity to hydronium and hydroxyl ion concentration and pH.

Describe heat as the energy transferred by convection, conduction, and radiation, and explain the connection of heat to change in temperature or states of matter.

Relate temperature to the average molecular kinetic energy.

Cite specific textual evidence to support analysis of science and technical texts.

Determine the central ideas or conclusions of a text; provide an accurate summary of the text distinct from prior knowledge or opinions.

Follow precisely a multistep procedure when carrying out experiments, taking measurements, or performing technical tasks.

Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 6–8 texts and topics.

Analyze the structure an author uses to organize a text, including how the major sections contribute to the whole and to an understanding of the topic.

Analyze the author’s purpose in providing an explanation, describing a procedure, or discussing an experiment in a text.

Integrate quantitative or technical information expressed in words in a text with a version of that information expressed visually (e.g., in a flowchart, diagram, model, graph, or table).

Distinguish among facts, reasoned judgment based on research findings, and speculation in a text.

Compare and contrast the information gained from experiments, simulations, video, or multimedia sources with that gained from reading a text on the same topic.

By the end of grade 8, read and comprehend science/technical texts in the grades 6–8 text complexity band independently and proficiently.

Write arguments focused on discipline-specific content.

- Introduce claim(s) about a topic or issue, acknowledge and distinguish the claim(s) from alternate or opposing claims, and organize the reasons and evidence logically.
- Support claim(s) with logical reasoning and relevant, accurate data and evidence that demonstrate an understanding of the topic or text, using credible sources.
- Use words, phrases, and clauses to create cohesion and clarify the relationships among claim(s), counterclaims, reasons, and evidence.
- Establish and maintain a formal style.
- Provide a concluding statement or section that follows from and supports the argument presented.

Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes.

- Introduce a topic clearly, previewing what is to follow; organize ideas, concepts, and information into broader categories as appropriate to achieving purpose; include formatting (e.g., headings), graphics (e.g., charts, tables), and multimedia when useful to aiding comprehension.
- Develop the topic with relevant, well-chosen facts, definitions, concrete details, quotations, or other information and examples.
- Use appropriate and varied transitions to create cohesion and clarify the relationships among ideas and concepts.
- Use precise language and domain-specific vocabulary to inform about or explain the topic.
- Establish and maintain a formal style and objective tone.
- Provide a concluding statement or section that follows from and supports the information or explanation presented.

Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.

With some guidance and support from peers and adults, develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on how well purpose and audience have been addressed.

Use technology, including the Internet, to produce and publish writing and present the relationships between information and ideas clearly and efficiently.

Conduct short research projects to answer a question (including a self-generated question), drawing on several sources and generating additional related, focused questions that allow for multiple avenues of exploration.

Gather relevant information from multiple print and digital sources, using search terms effectively; assess the credibility and accuracy of each source; and quote or paraphrase the data and conclusions of others while avoiding plagiarism and following a standard format for citation.

Draw evidence from informational texts to support analysis reflection, and research.

Write routinely over extended time frames (time for reflection and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences.

Engage effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grade 8 topics, texts, and issues, building on others’ ideas and expressing their own clearly.

- Come to discussions prepared, having read or researched material under study; explicitly draw on that preparation by referring to evidence on the topic, text, or issue to probe and reflect on ideas under discussion.
- Follow rules for collegial discussions and decision-making, track progress toward specific goals and deadlines, and define individual roles as needed.
- Pose questions that connect the ideas of several speakers and respond to others’ questions and comments with relevant evidence, observations, and ideas.
- Acknowledge new information expressed by others, and, when warranted, qualify or justify their own views in light of the evidence presented.

Identify basic examples of and compare and classify the properties of compounds, including acids, bases, and salts.

Distinguish among mixtures (including solutions) and pure substances.

Explore the Law of Conservation of Mass by demonstrating and concluding that mass is conserved when substances undergo physical and chemical changes.

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Follow precisely a multistep procedure when carrying out experiments, taking measurements, or performing technical tasks.

Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 6–8 texts and topics.

Analyze the structure an author uses to organize a text, including how the major sections contribute to the whole and to an understanding of the topic.

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Integrate quantitative or technical information expressed in words in a text with a version of that information expressed visually (e.g., in a flowchart, diagram, model, graph, or table).

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Write arguments focused on discipline-specific content.

- Introduce claim(s) about a topic or issue, acknowledge and distinguish the claim(s) from alternate or opposing claims, and organize the reasons and evidence logically.
- Support claim(s) with logical reasoning and relevant, accurate data and evidence that demonstrate an understanding of the topic or text, using credible sources.
- Use words, phrases, and clauses to create cohesion and clarify the relationships among claim(s), counterclaims, reasons, and evidence.
- Establish and maintain a formal style.
- Provide a concluding statement or section that follows from and supports the argument presented.

Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes.

- Introduce a topic clearly, previewing what is to follow; organize ideas, concepts, and information into broader categories as appropriate to achieving purpose; include formatting (e.g., headings), graphics (e.g., charts, tables), and multimedia when useful to aiding comprehension.
- Develop the topic with relevant, well-chosen facts, definitions, concrete details, quotations, or other information and examples.
- Use appropriate and varied transitions to create cohesion and clarify the relationships among ideas and concepts.
- Use precise language and domain-specific vocabulary to inform about or explain the topic.
- Establish and maintain a formal style and objective tone.
- Provide a concluding statement or section that follows from and supports the information or explanation presented.

Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.

With some guidance and support from peers and adults, develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on how well purpose and audience have been addressed.

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Conduct short research projects to answer a question (including a self-generated question), drawing on several sources and generating additional related, focused questions that allow for multiple avenues of exploration.

Gather relevant information from multiple print and digital sources, using search terms effectively; assess the credibility and accuracy of each source; and quote or paraphrase the data and conclusions of others while avoiding plagiarism and following a standard format for citation.

Draw evidence from informational texts to support analysis reflection, and research.

Write routinely over extended time frames (time for reflection and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences.

Engage effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grade 8 topics, texts, and issues, building on others’ ideas and expressing their own clearly.

- Come to discussions prepared, having read or researched material under study; explicitly draw on that preparation by referring to evidence on the topic, text, or issue to probe and reflect on ideas under discussion.
- Follow rules for collegial discussions and decision-making, track progress toward specific goals and deadlines, and define individual roles as needed.
- Pose questions that connect the ideas of several speakers and respond to others’ questions and comments with relevant evidence, observations, and ideas.
- Acknowledge new information expressed by others, and, when warranted, qualify or justify their own views in light of the evidence presented.
LAFS.8.SL.1.2: Analyze the purpose of information presented in diverse media and formats (e.g., visually, quantitatively, orally) and evaluate the motives (e.g., social, commercial, political) behind its presentation.

LAFS.8.SL.1.3: Delineate a speaker's argument and specific claims, evaluating the soundness of the reasoning and relevance and sufficiency of the evidence and identifying when irrelevant evidence is introduced.

LAFS.8.SL.2.4: Present claims and findings, emphasizing salient points in a focused, coherent manner with relevant evidence, sound valid reasoning, and well-chosen details; use appropriate eye contact, adequate volume, and clear pronunciation.

LAFS.8.SL.2.5: Integrate multimedia and visual displays into presentations to clarify information, strengthen claims and evidence, and add interest.

MAFS.7.SP.2.4: Use measures of center and measures of variability for numerical data from random samples to draw informal comparative inferences about two populations. For example, decide whether the words in a chapter of a seventh-grade science book are generally longer than the words in a chapter of a fourth-grade science book.

MAFS.7.SP.3.5: Understand that the probability of a chance event is a number between 0 and 1 that expresses the likelihood of the event occurring. Larger numbers indicate greater likelihood. A probability near 0 indicates an unlikely event, a probability around 1/2 indicates an event that is neither unlikely nor likely, and a probability near 1 indicates a likely event.

MAFS.8.F.2.5: Describe qualitatively the functional relationship between two quantities by analyzing a graph (e.g., where the function is increasing or decreasing, linear or nonlinear). Sketch a graph that exhibits the qualitative features of a function that has been described verbally.

Clariﬁcations:

Fluency Expectations or Examples of Culminating Standards

MAFS.8.G.3.9: Know the formulas for the volumes of cones, cylinders, and spheres and use them to solve real-world and mathematical problems.

Clarifications:

Make sense of problems and persevere in solving them.

Mathematically proficient students start by explaining to themselves the meaning of a problem and looking for entry points to its solution. They analyze givens, constraints, relationships, and goals. They make conjectures about the form and meaning of the solution and plan a solution pathway rather than simply jumping into a solution attempt. They consider analogous problems, and try special cases and simpler forms of the original problem in order to gain insight into its solution. They monitor and evaluate their progress and change course if necessary. Older students might, depending on the context of the problem, transform algebraic expressions or change the viewing window on their graphing calculator to get the information they need. Mathematically proficient students can explain correspondences between equations, verbal descriptions, tables, and graphs or draw diagrams of important features and relationships, graph data, and search for regularity or trends. Younger students might rely on using concrete objects or pictures to help conceptualize and solve a problem. Mathematically proficient students check their answers to problems using a different method, and they continually ask themselves, “Does this make sense?” They can understand the approaches of others to solving complex problems and identify correspondences between different approaches.

Standard Relation to Course: Supporting

Reason abstractly and quantitatively.

Mathematically proficient students make sense of quantities and their relationships in problem situations. They bring two complementary abilities to bear on problems involving quantitative relationships: the ability to decontextualize—to abstract a given situation and represent it symbolically and manipulate the representing symbols as if they have a life of their own, without necessarily attending to their referents—and the ability to contextualize, to pause as needed during the manipulation process in order to probe into the referents for the symbols involved. Quantitative reasoning entails habits of creating a coherent representation of the problem at hand; considering the units involved; attending to the meaning of quantities, not just how to compute them; and knowing and flexibly using different properties of operations and objects.

Standard Relation to Course: Supporting

Construct viable arguments and critique the reasoning of others.

Mathematically proficient students understand and use stated assumptions, deﬁnitions, and previously established results in constructing arguments. They make conjectures and build a logical progression of statements to explore the truth of their conjectures. They are able to analyze situations by breaking them into cases, and can recognize and use counterexamples. They justify their conclusions, communicate them to others, and respond to the arguments of others. They reason inductively about data, making plausible arguments that take into account the context from which the data arose. Mathematically proficient students are also able to compare the effectiveness of two plausible arguments, distinguish correct logic or reasoning from that which is fallacious, and—if there is a flaw in an argument—explain what it is. Elementary students can construct arguments using concrete referents such as objects, drawings, diagrams, and actions. Such arguments can make sense and be correct, even though they are not generalized or made formal until later grades. Later, students learn to determine domains to which an argument applies. Students at all grades can listen or read the arguments of others, decide whether they make sense, and ask useful questions to clarify or improve the arguments.

Standard Relation to Course: Supporting

Model with mathematics.

Mathematically proficient students can apply the mathematics they know to solve problems arising in everyday life, society, and the workplace. In early grades, this might be as simple as writing an addition equation to describe a situation. In middle grades, a student might apply proportional reasoning to plan a school event or analyze a problem in the community. By high school, a student might use geometry to solve a design problem or use a function to describe how one quantity of interest depends on another. Mathematically proficient students who can apply what they know are comfortable making assumptions and approximations to simplify a complicated situation, realizing that these may need revision later. They are able to identify important quantities in a practical situation and map their relationships using such tools as diagrams, two-way tables, graphs, flowcharts and formulas. They can analyze those relationships mathematically to draw conclusions. They routinely interpret their mathematical results in the context of the situation and reflect on whether the results make sense, possibly improving the model if it has not served its purpose.

Standard Relation to Course: Supporting

Use appropriate tools strategically.

Mathematically proficient students consider the available tools when solving a mathematical problem. These tools might include pencil and paper, concrete models, a ruler, a protractor, a calculator, a spreadsheet, a computer algebra system, a statistical package, or dynamic geometry software. Proficient students are sufficiently familiar with tools appropriate for their grade or course to make sound decisions about when each of these tools
### GENERAL NOTES

Laboratory investigations that include the use of scientific inquiry, research, measurement, problem solving, laboratory apparatus and technologies, experimental procedures, and safety procedures are an integral part of this course. The National Science Teachers Association (NSTA) recommends that at the middle school level, all students should have multiple opportunities every week to explore science laboratory investigations (labs). School laboratory investigations are defined by the National Research Council (NRC) as an experience in the laboratory, classroom, or the field that provides students with opportunities to interact directly with natural phenomena or with data collected by others using tools, materials, data collection techniques, and models (NRC, 2006, p. 3). Laboratory investigations in the middle school classroom should help all students develop a growing understanding of the complexity and ambiguity of empirical work, as well as the skills to calibrate and troubleshoot equipment used to make observations. Learners should understand measurement error; and have the skills to aggregate, interpret, and present the resulting data (NRC 2006, p. 77; NSTA, 2007).

### Honors and Advanced Level Course Notes

Advanced courses require a greater demand on students through increased academic rigor. Academic rigor is obtained through the application, analysis, evaluation, and creation of complex ideas that are often abstract and multi-faceted. Students are challenged to think and collaborate critically on the content they are learning. Honors level rigor will be achieved by increasing text complexity through text selection, focus on high-level qualitative measures, and complexity of task. Instruction will be structured to give students a deeper understanding of conceptual themes and organization within and across disciplines. Academic rigor is more than simply assigning to students a greater quantity of work.

### Special Notes:

#### Instructional Practices

Teaching from a range of complex text is optimized when teachers in all subject areas implement the following strategies on a routine basis:

1. Ensuring wide reading from complex text that varies in length.
2. Making close reading and rereading of texts central to lessons.
3. Emphasizing text-specific complex questions, and cognitively complex tasks, reinforce focus on the text and cultivate independence.
4. Emphasizing students supporting answers based upon evidence from the text.
5. Providing extensive research and writing opportunities (claims and evidence).


- Asking questions (for science) and defining problems (for engineering).
- Developing and using models.
- Planning and carrying out investigations.
• Analyzing and interpreting data.
• Using mathematics, information and computer technology, and computational thinking.
• Constructing explanations (for science) and designing solutions (for engineering).
• Engaging in argument from evidence.
• Obtaining, evaluating, and communicating information.

**Literacy Standards in Science**

Secondary science courses include reading standards for literacy in science and technical subjects 6-12 and writing standards for literacy in history/social studies, science, and technical subjects 6-12. The courses also include speaking and listening standards. For a complete list of standards required for this course click on the blue tile labeled course standards. You may also download the complete course including all required standards and notes sections using the export function located at the top of this page.

**English Language Development ELD Standards Special Notes Section:**

Teachers are required to provide listening, speaking, reading and writing instruction that allows English language learners (ELL) to communicate information, ideas and concepts for academic success in the content area of Science. For the given level of English language proficiency and with visual, graphic, or interactive support, students will interact with grade level words, expressions, sentences and discourse to process or produce language necessary for academic success. The ELD standard should specify a relevant content area concept or topic of study chosen by curriculum developers and teachers which maximizes an ELL's need for communication and social skills. To access an ELL supporting document which delineates performance definitions and descriptors, please click on the following link: https://cpalmsmediaprod.blob.core.windows.net/uploads/docs/standards/eld/sc.pdf

**Additional Instructional Resources:**

A.V.E. for Success Collection is provided by the Florida Association of School Administrators: http://www.fasa.net/4DCGI/cms/review.html?Action=CMS_Document&DocID=139. Please be aware that these resources have not been reviewed by CPALMS and there may be a charge for the use of some of them in this collection.

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**GENERAL INFORMATION**

**Course Number:** 2003020

**Course Path:** Section: Grades PreK to 12 Education
Courses > Grade Group: Grades 6 to 8 Education
Courses > Subject: Science > SubSubject: Physical Sciences

**Abbreviated Title:** M/J PHY SCI ADV

**Course Length:** Year (Y)

**Course Attributes:**
- Class Size Core Required

**Course Level:** 3

**Course Status:** Course Approved

**Grade Level(s):** 6,7,8

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**Educator Certifications**

- Science (Secondary Grades 7-12)
- Middle Grades Integrated Curriculum (Middle Grades 5-9)
- Physics (Grades 6-12)
- Middle Grades General Science (Middle Grades 5-9)
- Chemistry (Grades 6-12)
- Earth/Space Science (Grades 6-12)
Use grade appropriate Nature of Science benchmarks (i.e., if this course is offered to seventh grade students, then the SC.7.N benchmarks should be integrated into the course content, and SC.6.N and SC.8.N benchmarks should be omitted from the seventh grade course).

<table>
<thead>
<tr>
<th>Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>SC.6.P.11.1</td>
<td>Explore the Law of Conservation of Energy by differentiating between potential and kinetic energy. Identify situations where kinetic energy is transformed into potential energy and vice versa.</td>
</tr>
<tr>
<td>SC.6.P.12.1</td>
<td>Measure and graph distance versus time for an object moving at a constant speed. Interpret this relationship.</td>
</tr>
<tr>
<td>SC.6.P.13.1</td>
<td>Investigate and describe types of forces including contact forces and forces acting at a distance, such as electrical, magnetic, and gravitational.</td>
</tr>
<tr>
<td>SC.6.P.13.2</td>
<td>Explore the Law of Gravity by recognizing that every object exerts gravitational force on every other object and that the force depends on how much mass the objects have and how far apart they are.</td>
</tr>
<tr>
<td>SC.6.P.13.3</td>
<td>Investigate and describe that an unbalanced force acting on an object changes its speed, or direction of motion, or both.</td>
</tr>
<tr>
<td>SC.7.N.1.1</td>
<td>Define a problem from the seventh grade curriculum, use appropriate reference materials to support scientific understanding, plan and carry out scientific investigation of various types, such as systematic observations or experiments, identify variables, collect and organize data, interpret data in charts, tables, and graphics, analyze information, make predictions, and defend conclusions.</td>
</tr>
<tr>
<td>SC.7.N.1.2</td>
<td>Differentiate replication (by others) from repetition (multiple trials).</td>
</tr>
<tr>
<td>SC.7.N.1.3</td>
<td>Distinguish between an experiment (which must involve the identification and control of variables) and other forms of scientific investigation and explain that not all scientific knowledge is derived from experimentation.</td>
</tr>
<tr>
<td>SC.7.N.1.4</td>
<td>Identify test variables (independent variables) and outcome variables (dependent variables) in an experiment.</td>
</tr>
<tr>
<td>SC.7.N.1.5</td>
<td>Describe the methods used in the pursuit of a scientific explanation as seen in different fields of science such as biology, geology, and physics.</td>
</tr>
<tr>
<td>SC.7.N.1.6</td>
<td>Explain that empirical evidence is the cumulative body of observations of a natural phenomenon on which scientific explanations are based.</td>
</tr>
<tr>
<td>SC.7.N.1.7</td>
<td>Explain that scientific knowledge is the result of a great deal of debate and confirmation within the science community.</td>
</tr>
<tr>
<td>SC.7.N.2.1</td>
<td>Identify an instance from the history of science in which scientific knowledge has changed when new evidence or new interpretations are encountered.</td>
</tr>
<tr>
<td>SC.7.N.3.1</td>
<td>Recognize and explain the difference between theories and laws and give several examples of scientific theories and the evidence that supports them.</td>
</tr>
<tr>
<td>SC.7.N.3.2</td>
<td>Identify the benefits and limitations of the use of scientific models.</td>
</tr>
<tr>
<td>SC.7.P.10.1</td>
<td>Illustrate that the sun's energy arrives as radiation with a wide range of wavelengths, including infrared, visible, and ultraviolet, and that white light is made up of a spectrum of many different colors.</td>
</tr>
<tr>
<td>SC.7.P.10.2</td>
<td>Observe and explain that light can be reflected, refracted, and/or absorbed.</td>
</tr>
<tr>
<td>SC.7.P.10.3</td>
<td>Recognize that light waves, sound waves, and other waves move at different speeds in different materials.</td>
</tr>
<tr>
<td>SC.7.P.11.1</td>
<td>Recognize that adding heat to or removing heat from a system may result in a temperature change and possibly a change of state.</td>
</tr>
<tr>
<td>SC.7.P.11.2</td>
<td>Investigate and describe the transformation of energy from one form to another.</td>
</tr>
<tr>
<td>SC.7.P.11.3</td>
<td>Cite evidence to explain that energy cannot be created nor destroyed, only changed from one form to another.</td>
</tr>
<tr>
<td>SC.7.P.11.4</td>
<td>Observe and describe that heat flows in predictable ways, moving from warmer objects to cooler ones until they reach the same temperature.</td>
</tr>
<tr>
<td>SC.BN.1.1</td>
<td>Define a problem from the eighth grade curriculum using appropriate reference materials to support scientific understanding, plan and carry out scientific investigations of various types, such as systematic observations or experiments, identify variables, collect and organize data, interpret data in charts, tables, and graphics, analyze information, make predictions, and defend conclusions.</td>
</tr>
<tr>
<td>SC.BN.1.2</td>
<td>Design and conduct a study using repeated trials and replication.</td>
</tr>
<tr>
<td>SC.BN.1.3</td>
<td>Use phrases such as “results support” or “fail to support” in science, understanding that science does not offer conclusive “proof” of a knowledge claim.</td>
</tr>
<tr>
<td>SC.BN.1.4</td>
<td>Explain how hypotheses are valuable if they lead to further investigations, even if they turn out not to be supported by the data.</td>
</tr>
<tr>
<td>SC.BN.1.5</td>
<td>Analyze the methods used to develop a scientific explanation as seen in different fields of science.</td>
</tr>
<tr>
<td>SC.BN.1.6</td>
<td>Understand that scientific investigations involve the collection of relevant empirical evidence, the use of logical reasoning, and the application of imagination in devising hypotheses, predictions, explanations and models to make sense of the collected evidence.</td>
</tr>
<tr>
<td>SC.BN.2.1</td>
<td>Distinguish between scientific and pseudoscientific ideas.</td>
</tr>
<tr>
<td>SC.BN.2.2</td>
<td>Discuss what characterizes science and its methods.</td>
</tr>
<tr>
<td>SC.BN.3.1</td>
<td>Select models useful in relating the results of their own investigations.</td>
</tr>
<tr>
<td>SC.BN.3.2</td>
<td>Explain why theories may be modified but are rarely discarded.</td>
</tr>
<tr>
<td>SC.BN.4.1</td>
<td>Explain that science is one of the processes that can be used to inform decision making at the community, state, national, and international levels.</td>
</tr>
<tr>
<td>SC.BN.4.2</td>
<td>Explain how political, social, and economic concerns can affect science, and vice versa.</td>
</tr>
<tr>
<td>SC.BP.8.1</td>
<td>Explore the scientific theory of atoms (also known as atomic theory) by using models to explain the motion of particles in solids, liquids, and gases.</td>
</tr>
<tr>
<td>SC.BP.8.2</td>
<td>Differentiate between weight and mass recognizing that weight is the amount of gravitational pull on an object and is distinct from, though proportional to, mass.</td>
</tr>
<tr>
<td>SC.BP.8.3</td>
<td>Explore and describe the densities of various materials through measurement of their masses and volumes.</td>
</tr>
<tr>
<td>SC.BP.8.4</td>
<td>Classify and compare substances on the basis of characteristic physical properties that can be demonstrated or measured; for example, density, thermal or electrical conductivity, solubility, magnetic properties, melting and boiling points, and know that these properties are independent of the amount of the sample.</td>
</tr>
<tr>
<td>SC.BP.8.5</td>
<td>Recognize that there are a finite number of elements and that their atoms combine in a multitude of ways to produce compounds that make up all of the living and nonliving things that we encounter.</td>
</tr>
<tr>
<td>SC.BP.8.6</td>
<td>Recognize that elements are grouped in the periodic table according to similarities of their properties.</td>
</tr>
<tr>
<td>SC.BP.8.7</td>
<td>Explore the scientific theory of atoms (also known as atomic theory) by recognizing that atoms are the smallest unit of an element and are composed of sub-atomic particles (electrons surrounding a nucleus containing protons and neutrons).</td>
</tr>
</tbody>
</table>
Identify basic examples of and compare and classify the properties of compounds, including acids, bases, and salts.

Distinguish among mixtures (including solutions) and pure substances.

Explore the Law of Conservation of Mass by demonstrating and concluding that mass is conserved when substances undergo physical and chemical changes.

Differentiate between physical changes and chemical changes.

Investigate and describe how temperature influences chemical changes.

Differentiate among the four states of matter.

Differentiate between physical and chemical properties and physical and chemical changes of matter.

Explore the scientific theory of atoms (also known as atomic theory) by describing the structure of atoms in terms of protons, neutrons and electrons, and differentiate among these particles in terms of their mass, electrical charges and locations within the atom.

Relate properties of atoms and their position in the periodic table to the arrangement of their electrons.

Interpret formula representations of molecules and compounds in terms of composition and structure.

Relate acidity and basicity to hydronium and hydroxyl ion concentration and pH.

Differentiate among the various forms of energy and recognize that they can be transformed from one form to others.

Describe heat as the energy transferred by convection, conduction, and radiation, and explain the connection of heat to change in temperature or states of matter.

Relate temperature to the average molecular kinetic energy.

### Mathematics:

#### MA.K12.MTR.1.1

Mathematicians who participate in effortful learning both individually and with others:
- Analyze the problem in a way that makes sense given the task.
- Ask questions that will help with solving the task.
- Build perseverance by modifying methods as needed while solving a challenging task.
- Stay engaged and maintain a positive mindset when working to solve tasks.
- Help and support each other when attempting a new method or approach.

#### Clarifications:

Teachers who encourage students to participate actively in effortful learning both individually and with others:
- Cultivate a community of growth mindset learners.
- Foster perseverance in students by choosing tasks that are challenging.
- Develop students' ability to analyze and problem solve.
- Recognize students' effort when solving challenging problems.

Demonstrate understanding by representing problems in multiple ways.

Mathematicians who demonstrate understanding by representing problems in multiple ways:
- Build understanding through modeling and using manipulatives.
- Represent solutions to problems in multiple ways using objects, drawings, tables, graphs and equations.
- Progress from modeling problems with objects and drawings to using algorithms and equations.
- Express connections between concepts and representations.
- Choose a representation based on the given context or purpose.

#### Clarifications:

Teachers who encourage students to demonstrate understanding by representing problems in multiple ways:
- Help students make connections between concepts and representations.
- Provide opportunities for students to use manipulatives when investigating concepts.
- Guide students from concrete to pictorial to abstract representations as understanding progresses.
- Show students that various representations can have different purposes and can be useful in different situations.

Complete tasks with mathematical fluency.

Mathematicians who complete tasks with mathematical fluency:
- Select efficient and appropriate methods for solving problems within the given context.
- Maintain flexibility and accuracy while performing procedures and mental calculations.
- Complete tasks accurately and with confidence.
- Adapt procedures to apply them to a new context.
- Use feedback to improve efficiency when performing calculations.

#### Clarifications:

Teachers who encourage students to complete tasks with mathematical fluency:
- Provide students with the flexibility to solve problems by selecting a procedure that allows them to solve efficiently and accurately.
- Offer multiple opportunities for students to practice efficient and generalizable methods.
- Provide opportunities for students to reflect on the method they used and determine if a more efficient method could have been used.

Engage in discussions that reflect on the mathematical thinking of self and others.

Mathematicians who engage in discussions that reflect on the mathematical thinking of self and others:
- Communicate mathematical ideas, vocabulary and methods effectively.
- Analyze the mathematical thinking of others.
- Compare the efficiency of a method to those expressed by others.
- Recognize errors and suggest how to correctly solve the task.
- Justify results by explaining methods and processes.
- Construct possible arguments based on evidence.

#### Clarifications:

Teachers who encourage students to engage in discussions that reflect on the mathematical thinking of self and others:
- Establish a culture in which students ask questions of the teacher and their peers, and error is an opportunity for learning.
- Create opportunities for students to discuss their thinking with peers.
- Select, sequence and present student work to advance and deepen understanding of correct and increasingly efficient methods.
Develop students' ability to justify methods and compare their responses to the responses of their peers.

Use patterns and structure to help understand and connect mathematical concepts.

Mathematicians who use patterns and structure to help understand and connect mathematical concepts:

- Focus on relevant details within a problem.
- Create plans and procedures to logically order events, steps or ideas to solve problems.
- Decompose a complex problem into manageable parts.
- Relate previously learned concepts to new concepts.
- Look for similarities among problems.
- Connect solutions of problems to more complicated large-scale situations.

Clarifications:
Teachers who encourage students to use patterns and structure to help understand and connect mathematical concepts:

- Help students recognize the patterns in the world around them and connect these patterns to mathematical concepts.
- Support students to develop generalizations based on the similarities found among problems.
- Provide opportunities for students to create plans and procedures to solve problems.
- Develop students' ability to construct relationships between their current understanding and more sophisticated ways of thinking.

Assess the reasonableness of solutions.

Mathematicians who assess the reasonableness of solutions:

- Estimate to discover possible solutions.
- Use benchmark quantities to determine if a solution makes sense.
- Check calculations when solving problems.
- Verify possible solutions by explaining the methods used.
- Evaluate results based on the given context.

Clarifications:
Teachers who encourage students to assess the reasonableness of solutions:

- Have students estimate or predict solutions prior to solving.
- Prompt students to continually ask, “Does this solution make sense? How do you know?”
- Reinforce that students check their work as they progress within and after a task.
- Strengthen students’ ability to verify solutions through justifications.

Apply mathematics to real-world contexts.

Mathematicians who apply mathematics to real-world contexts:

- Connect mathematical concepts to everyday experiences.
- Use models and methods to understand, represent and solve problems.
- Perform investigations to gather data or determine if a method is appropriate.
- Redesign models and methods to improve accuracy or efficiency.

Clarifications:
Teachers who encourage students to apply mathematics to real-world contexts:

- Provide opportunities for students to create models, both concrete and abstract, and perform investigations.
- Challenge students to question the accuracy of their models and methods.
- Support students as they validate conclusions by comparing them to the given situation.
- Indicate how various concepts can be applied to other disciplines.

Cite evidence to explain and justify reasoning.

Clarifications:
K-1 Students include textual evidence in their oral communication with guidance and support from adults. The evidence can consist of details from the text without naming the text. During 1st grade, students learn how to incorporate the evidence in their writing.

2-3 Students include relevant textual evidence in their written and oral communication. Students should name the text when they refer to it. In 3rd grade, students should use a combination of direct and indirect citations.

4-5 Students continue with previous skills and reference comments made by speakers and peers. Students cite texts that they’ve directly quoted, paraphrased, or used for information. When writing, students will use the form of citation dictated by the instructor or the style guide referenced by the instructor.

6-8 Students continue with previous skills and use a style guide to create a proper citation.

9-12 Students continue with previous skills and should be aware of existing style guides and the ways in which they differ.

Read and comprehend grade-level complex texts proficiently.

Clarifications:
See Text Complexity for grade-level complexity bands and a text complexity rubric.

Make inferences to support comprehension.

Clarifications:
Students will make inferences before the words infer or inference are introduced. Kindergarten students will answer questions like “Why is the girl smiling?” or make predictions about what will happen based on the title page. Students will use the terms and apply them in 2nd grade and beyond.

Use appropriate collaborative techniques and active listening skills when engaging in discussions in a variety of situations.

Clarifications:
In kindergarten, students learn to listen to one another respectfully. In grades 1-2, students build upon these skills by justifying what they are thinking. For example: “I think _____ because _____.” The collaborative conversations are becoming academic conversations.
In grades 3-12, students engage in academic conversations discussing claims and justifying their reasoning, refining and applying skills. Students build on ideas, propel the conversation, and support claims and counterclaims with evidence.

Use the accepted rules governing a specific format to create quality work.

**ELA.K12.EE.5.1:**

**Clarifications:**

Students will incorporate skills learned into work products to produce quality work. For students to incorporate these skills appropriately, they must receive instruction. A 3rd grade student creating a poster board display must have instruction in how to effectively present information to do quality work.

**ELA.K12.EE.6.1:**

Use appropriate voice and tone when speaking or writing.

**ELD.K12.ELL.SC.1:**

English language learners communicate information, ideas and concepts necessary for academic success in the content area of Science.

**ELD.K12.ELL.SI.1:**

English language learners communicate for social and instructional purposes within the school setting.

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**General Course Information and Notes**

**GENERAL NOTES**

Laboratory investigations that include the use of scientific inquiry, research, measurement, problem solving, laboratory apparatus and technologies, experimental procedures, and safety procedures are an integral part of this course. The National Science Teachers Association (NSTA) recommends that at the middle school level, all students should have multiple opportunities every week to explore science laboratory investigations (labs). School laboratory investigations are defined by the National Research Council (NRC) as an experience in the laboratory, classroom, or the field that provides students with opportunities to interact directly with natural phenomena or with data collected by others using tools, materials, data collection techniques, and models (NRC, 2006, p. 3). Laboratory investigations in the middle school classroom should help all students develop a growing understanding of the complexity and ambiguity of empirical work, as well as the skills to calibrate and troubleshoot equipment used to make observations. Learners should understand measurement error; and have the skills to aggregate, interpret, and present the resulting data (NRC 2006, p. 77; NSTA, 2007).

**Honors and Advanced Level Course Note:** Advanced courses require a greater demand on students through increased academic rigor. Academic rigor is obtained through the application, analysis, evaluation, and creation of complex ideas that are often abstract and multi-faceted. Students are challenged to think and collaborate critically on the content they are learning. Honors level rigor will be achieved by increasing text complexity through text selection, focus on high-level qualitative measures, and complexity of task. Instruction will be structured to give students a deeper understanding of conceptual themes and organization within and across disciplines. Academic rigor is more than simply assigning to students a greater quantity of work.

**Special Notes:**

**Instructional Practices**

Teaching from a range of complex text is optimized when teachers in all subject areas implement the following strategies on a routine basis:

1. Ensuring wide reading from complex text that varies in length.
2. Making close reading and rereading of texts central to lessons.
3. Emphasizing text-specific complex questions, and cognitively complex tasks, reinforce focus on the text and cultivate independence.
4. Emphasizing students supporting answers based upon evidence from the text.
5. Providing extensive research and writing opportunities (claims and evidence).

**Science and Engineering Practices (NRC Framework for K-12 Science Education, 2010)**

- Asking questions (for science) and defining problems (for engineering).
- Developing and using models.
- Planning and carrying out investigations.
- Analyzing and interpreting data.
- Using mathematics, information and computer technology, and computational thinking.
- Constructing explanations (for science) and designing solutions (for engineering).
- Engaging in argument from evidence.
- Obtaining, evaluating, and communicating information.

**Florida's Benchmarks for Excellent Student Thinking (B.E.S.T.) Standards**

This course includes Florida's B.E.S.T. ELA Expectations (EE) and Mathematical Thinking and Reasoning Standards (MTRs) for students. Florida educators should intentionally embed these standards within the content and their instruction as applicable. For guidance on the implementation of the EEs and MTRs, please visit https://www.cpalms.org/Standards/BEST_Standards.aspx and select the appropriate B.E.S.T. Standards package.

**English Language Development ELD Standards**

Teachers are required to provide listening, speaking, reading and writing instruction that allows English language learners (ELL) to communicate information, ideas and concepts for academic success in the content area of Science. For the given level of English language proficiency and with visual, graphic, or interactive support, students will interact with grade level words, expressions, sentences and discourse to process or produce language necessary for academic success. The ELD standard should specify a relevant content area concept or topic of study chosen by curriculum developers and teachers which maximizes an ELL's need for communication and social skills. To access an ELL supporting document which delineates performance definitions and descriptors, please click on the following link: https://cpalmsmediaprod.blob.core.windows.net/uploads/docs/standards/eld/sc.pdf

**Additional Instructional Resources:**

A.V.E. for Success Collection is provided by the Florida Association of School Administrators: http://www.fasa.net/4DCGI/cms/review.html?

Action=CM5_Document&DocID=139. Please be aware that these resources have not been reviewed by CPALMS and there may be a charge for the use of some of them in this collection.
GENERAL INFORMATION

Course Number: 2003020

Course Path: Section: Grades PreK to 12 Education
Courses > Grade Group: Grades 6 to 8 Education
Courses > Subject: Science > SubSubject: Physical Sciences

Abbreviated Title: M/J Phy SCI ADV

Course Length: Year (Y)

Course Attributes:
- Class Size Core Required

Course Level: 3

Course Status: State Board Approved

Grade Level(s): 6,7,8

Educator Certifications

<table>
<thead>
<tr>
<th>Science (Secondary Grades 7-12)</th>
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<tr>
<td>Middle Grades Integrated Curriculum (Middle Grades 5-9)</td>
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<td>Physics (Grades 6-12)</td>
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<td>Middle Grades General Science (Middle Grades 5-9)</td>
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<td>Chemistry (Grades 6-12)</td>
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<td>Earth/Space Science (Grades 6-12)</td>
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</table>
### Course Standards

<table>
<thead>
<tr>
<th>Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>SC.6.N.1.2</td>
<td>Explain why scientific investigations should be replicable.</td>
</tr>
<tr>
<td>SC.6.N.1.3</td>
<td>Explain the difference between an experiment and other types of scientific investigation, and explain the relative benefits and limitations of each.</td>
</tr>
<tr>
<td>SC.6.N.1.4</td>
<td>Discuss, compare, and negotiate methods used, results obtained, and explanations among groups of students conducting the same investigation.</td>
</tr>
<tr>
<td>SC.6.N.1.5</td>
<td>Recognize that science involves creativity, not just in designing experiments, but also in creating explanations that fit evidence.</td>
</tr>
<tr>
<td>SC.6.N.2.1</td>
<td>Distinguish science from other activities involving thought.</td>
</tr>
<tr>
<td>SC.6.N.2.2</td>
<td>Explain that scientific knowledge is durable because it is open to change as new evidence or interpretations are encountered.</td>
</tr>
<tr>
<td>SC.6.N.2.3</td>
<td>Recognize that scientists who make contributions to scientific knowledge come from all kinds of backgrounds and possess varied talents, interests, and goals.</td>
</tr>
<tr>
<td>SC.6.N.3.1</td>
<td>Recognize and explain that a scientific theory is a well-supported and widely accepted explanation of nature and is not simply a claim posed by an individual. Thus, the use of the term theory in science is very different than how it is used in everyday life.</td>
</tr>
<tr>
<td>SC.6.N.3.2</td>
<td>Recognize and explain that a scientific law is a description of a specific relationship under given conditions in the natural world. Thus, scientific laws are different from societal laws.</td>
</tr>
<tr>
<td>SC.6.N.3.3</td>
<td>Give several examples of scientific laws.</td>
</tr>
<tr>
<td>SC.6.N.3.4</td>
<td>Identify the role of models in the context of the sixth grade science benchmarks.</td>
</tr>
<tr>
<td>SC.6.P.11.1</td>
<td>Explore the Law of Conservation of Energy by differentiating between potential and kinetic energy. Identify situations where kinetic energy is transformed into potential energy and vice versa.</td>
</tr>
<tr>
<td>SC.6.P.12.1</td>
<td>Measure and graph distance versus time for an object moving at a constant speed. Interpret this relationship.</td>
</tr>
<tr>
<td>SC.6.P.13.1</td>
<td>Investigate and describe types of forces including contact forces and forces acting at a distance, such as electrical, magnetic, and gravitational.</td>
</tr>
<tr>
<td>SC.6.P.13.2</td>
<td>Explore the Law of Gravity by recognizing that every object exerts gravitational force on every other object and that the force depends on how much mass the objects have and how far apart they are.</td>
</tr>
<tr>
<td>SC.6.P.13.3</td>
<td>Investigate and describe that an unbalanced force acting on an object changes its speed, or direction of motion, or both.</td>
</tr>
<tr>
<td>SC.7.N.1.2</td>
<td>Differentiate replication (by others) from repetition (multiple trials).</td>
</tr>
<tr>
<td>SC.7.N.1.3</td>
<td>Distinguish between an experiment (which must involve the identification and control of variables) and other forms of scientific investigation and explain that not all scientific knowledge is derived from experimentation.</td>
</tr>
<tr>
<td>SC.7.N.1.4</td>
<td>Identify test variables (independent variables) and outcome variables (dependent variables) in an experiment.</td>
</tr>
<tr>
<td>SC.7.N.1.5</td>
<td>Describe the methods used in the pursuit of a scientific explanation as seen in different fields of science such as biology, geology, and physics.</td>
</tr>
<tr>
<td>SC.7.N.1.6</td>
<td>Explain that empirical evidence is the cumulative body of observations of a natural phenomenon on which scientific explanations are based.</td>
</tr>
<tr>
<td>SC.7.N.1.7</td>
<td>Explain that scientific knowledge is the result of a great deal of debate and confirmation within the science community.</td>
</tr>
<tr>
<td>SC.7.N.2.1</td>
<td>Identify an instance from the history of science in which scientific knowledge has changed when new evidence or new interpretations are encountered.</td>
</tr>
<tr>
<td>SC.7.N.3.1</td>
<td>Recognize and explain the difference between theories and laws and give several examples of scientific theories and the evidence that supports them.</td>
</tr>
<tr>
<td>SC.7.N.3.2</td>
<td>Identify the benefits and limitations of the use of scientific models.</td>
</tr>
<tr>
<td>SC.7.P.10.1</td>
<td>Illustrate that the sun's energy arrives as radiation with a wide range of wavelengths, including infrared, visible, and ultraviolet, and that white light is made up of a spectrum of many different colors.</td>
</tr>
<tr>
<td>SC.7.P.10.2</td>
<td>Observe and explain that light can be reflected, refracted, and/or absorbed.</td>
</tr>
<tr>
<td>SC.7.P.10.3</td>
<td>Recognize that light waves, sound waves, and other waves move at different speeds in different materials.</td>
</tr>
<tr>
<td>SC.7.P.11.1</td>
<td>Recognize that adding heat to or removing heat from a system may result in a temperature change and possibly a change of state.</td>
</tr>
<tr>
<td>SC.7.P.11.2</td>
<td>Investigate and describe the transformation of energy from one form to another.</td>
</tr>
<tr>
<td>SC.7.P.11.3</td>
<td>Cite evidence to explain that energy cannot be created nor destroyed only changed from one form to another.</td>
</tr>
<tr>
<td>SC.7.P.11.4</td>
<td>Observe and describe that heat flows in predictable ways, moving from warmer objects to cooler ones until they reach the same temperature.</td>
</tr>
<tr>
<td>SC.8.N.1.2</td>
<td>Design and conduct a study using repeated trials and replication.</td>
</tr>
<tr>
<td>SC.8.N.1.3</td>
<td>Use phrases such as &quot;results support&quot; or &quot;fail to support&quot; in science, understanding that science does not offer conclusive &quot;proof&quot; of a knowledge claim.</td>
</tr>
<tr>
<td>SC.8.N.1.4</td>
<td>Explain how hypotheses are valuable if they lead to further investigations, even if they turn out not to be supported by the data.</td>
</tr>
<tr>
<td>SC.8.N.1.5</td>
<td>Analyze the methods used to develop a scientific explanation as seen in different fields of science.</td>
</tr>
<tr>
<td>SC.8.N.1.6</td>
<td>Understand that scientific investigations involve the collection of relevant empirical evidence, the use of logical reasoning, and the application of imagination in devising hypotheses, predictions, explanations and models to make sense of the collected evidence.</td>
</tr>
<tr>
<td>SC.8.N.2.1</td>
<td>Distinguish between scientific and pseudoscientific ideas.</td>
</tr>
<tr>
<td>SC.8.N.2.2</td>
<td>Discuss what characterizes science and its methods.</td>
</tr>
<tr>
<td>SC.8.N.3.1</td>
<td>Select models useful in relating the results of their own investigations.</td>
</tr>
<tr>
<td>SC.8.N.3.2</td>
<td>Explain why theories may be modified but are rarely discarded.</td>
</tr>
<tr>
<td>SC.8.N.4.1</td>
<td>Explain that science is one of the processes that can be used to inform decision making at the community, state, national, and international levels.</td>
</tr>
<tr>
<td>SC.8.N.4.2</td>
<td>Explain how political, social, and economic concerns can affect science, and vice versa.</td>
</tr>
<tr>
<td>MAFS.6.SP.1.1</td>
<td>Recognize a statistical question as one that anticipates variability in the data related to the question and accounts for it in the answers. For example, &quot;How old am I?&quot; is not a statistical question, but &quot;How old are the students in my school?&quot; is a statistical question because one anticipates variability in students' ages.</td>
</tr>
<tr>
<td>MAFS.6.SP.1.2</td>
<td>Understand that a set of data collected to answer a statistical question has a distribution which can be described by its center, spread, and overall shape.</td>
</tr>
<tr>
<td>MAFS.6.SP.1.3</td>
<td>Recognize that a measure of center for a numerical data set summarizes all of its values with a single number, while a measure of variation describes how its values vary with a single number.</td>
</tr>
</tbody>
</table>
Display numerical data in plots on a number line, including dot plots, histograms, and box plots.

Summarize numerical data sets in relation to their context, such as by:

a. Reporting the number of observations.

b. Describing the nature of the attribute under investigation, including how it was measured and its units of measurement.

c. Giving quantitative measures of center (median and/or mean) and variability (interquartile range and/or mean absolute deviation), as well as describing any overall pattern and any striking deviations from the overall pattern with reference to the context in which the data were gathered.

d. Relating the choice of measures of center and variability to the shape of the data distribution and the context in which the data were gathered.

Understand that statistics can be used to gain information about a population by examining a sample of the population; generalizations about a population from a sample are valid only if the sample is representative of that population. Understand that random sampling tends to produce representative samples and support valid inferences.

Know that straight lines are widely used to model relationships between two quantitative variables. For scatter plots that suggest a linear association, informally fit a straight line, and informally assess the model fit by judging the closeness of the data points to the line.

Make sense of problems and persevere in solving them.

Mathematically proficient students start by explaining to themselves the meaning of a problem and looking for entry points to its solution. They analyze givens, constraints, relationships, and goals. They make conjectures about the form and meaning of the solution and plan a solution pathway rather than simply jumping into a solution attempt. They consider analogous problems, and try special cases and simpler forms of the original problem in order to gain insight into its solution. They monitor and evaluate their progress and change course if necessary. Older students might, depending on the context of the problem, transform algebraic expressions or change the viewing window on their graphing calculator to get the information they need. Mathematically proficient students can explain correspondences between equations, verbal descriptions, tables, and graphs or draw diagrams of important features and relationships, graph data, and search for regularity or trends. Younger students might rely on using concrete objects or pictures to help conceptualize and solve a problem. Mathematically proficient students check their answers to problems using a different method, and they continually ask themselves, “Does this make sense?” They can understand the approaches of others to solving complex problems and identify correspondences between different approaches.

Reason abstractly and quantitatively.

Mathematically proficient students make sense of quantities and their relationships in problem situations. They bring two complementary abilities to bear on problems involving quantitative relationships: the ability to decontextualize—to abstract a given situation and represent it symbolically and manipulate the representations as if they are a life of their own, without necessarily attending to their referents—and the ability to contextualize, to pause as needed during the manipulation process in order to probe into the referents for the symbols involved. Quantitative reasoning entails habits of creating a coherent representation of the problem at hand; considering the units involved; attending to the meaning of quantities, not just how to compute them; and knowing and flexibly using different properties of operations and objects.

Construct viable arguments and critique the reasoning of others.

Mathematically proficient students understand and use stated assumptions, definitions, and previously established results in constructing arguments. They make conjectures and build a logical progression of statements to explore the truth of their conjectures. They are able to analyze situations by breaking them into cases, and can recognize and use counterexamples. They justify their conclusions, communicate them to others, and respond to the arguments of others. They reason inductively about data, making plausible arguments that take into account the context from which the data arose. Mathematically proficient students are also able to compare the effectiveness of two plausible arguments, distinguish correct logic or reasoning from that which is flawed, and—if there is a flaw in an argument—explain what it is. Elementary students can construct arguments using concrete referents such as objects, drawings, diagrams, and actions. Such arguments can make sense and be correct, even though they are not generalized or made formal until later grades. Later, students learn to determine domains to which an argument applies. Students at all grades can listen or read the arguments of others, decide whether they make sense, and ask useful questions to clarify or improve the arguments.

Model with mathematics.

Mathematically proficient students can apply the mathematics they know to solve problems arising in everyday life, society, and the workplace. In early grades, this might be as simple as writing an addition equation to describe a situation. In middle grades, a student might apply proportional reasoning to plan a school event or analyze a problem in the community. By high school, a student might use geometry software.

Use appropriate tools strategically.

Mathematically proficient students consider the available tools when solving a mathematical problem. These tools might include pencil and paper, concrete models, a ruler, a protractor, a calculator, a spreadsheet, a computer algebra system, a statistical package, or dynamic geometry software.

Attend to precision.

Mathematically proficient students try to communicate precisely to others. They try to use clear definitions in discussion with others and in their own reasoning. They state the meaning of the symbols they choose, including using the equal sign consistently and appropriately. They are careful about specifying units of measure, and labeling axes to clarify the correspondence with quantities in a problem. They calculate accurately and efficiently, express numerical answers with a degree of precision appropriate for the problem context. In the elementary grades, students give carefully formulated explanations to each other. By the time they reach high school they have learned to examine claims and make explicit use of definitions.

Look for and make use of structure.
Look for and express regularity in repeated reasoning.

Mathematically proficient students notice if calculations are repeated, and look both for general methods and for shortcuts. Upper elementary students might notice when dividing 25 by 11 that they are repeating the same calculations over and over again, and conclude they have a repeating decimal. By paying attention to the calculation of slope as they repeatedly check whether points are on the line through $(1, 2)$ with slope 3, middle school students might abstract the equation $(y - 2)/(x - 1) = 3$. Noticing the regularity in the way terms cancel when expanding $(x – 1)(x + 1)$, $(x – 1)(x^2 + x + 1)$, and $(x – 1)x^2 + x + 1$ might lead them to the general formula for the sum of a geometric series. As they work to solve a problem, mathematically proficient students maintain oversight of the process, while attending to the details. They continually evaluate the reasonableness of their intermediate results.

Write arguments focused on discipline-specific content.

a. Introduce claim(s) about a topic or issue, acknowledge and distinguish the claim(s) from alternate or opposing claims, and organize the reasons and evidence logically.

b. Support claim(s) with logical reasoning and relevant, accurate data and evidence that demonstrate an understanding of the topic or text, using credible sources.

c. Use words, phrases, and clauses to create cohesion and clarify the relationships among claim(s), counterclaims, reasons, and evidence.

d. Establish and maintain a formal style.

e. Provide a concluding statement or section that follows from and supports the argument presented.

Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes.

a. Introduce a topic clearly, previewing what is to follow; organize ideas, concepts, and information into broader categories as appropriate to achieving purpose; include formatting (e.g., headings), graphics (e.g., charts, tables), and multimedia when useful to aiding comprehension.

b. Develop the topic with relevant, well-chosen facts, definitions, concrete details, quotations, or other information and examples.

c. Use appropriate and varied transitions to create cohesion and clarify the relationships among ideas and concepts.

d. Use precise language and domain-specific vocabulary to inform about or explain the topic.

e. Establish and maintain a formal style and objective tone.

f. Provide a concluding statement or section that follows from and supports the information or explanation presented.

Produce clear and coherent writing in which development, organization, and style are appropriate to task, purpose, and audience.

With some guidance and support from peers and adults, develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on how well purpose and audience have been addressed.

Use technology, including the Internet, to produce and publish writing and present the relationships between information and ideas clearly and efficiently.

Conduct short research projects to answer a question (including a self-generated question), drawing on several sources and generating additional related, focused questions that allow for multiple avenues of exploration.

Gather relevant information from multiple print and digital sources, using search engines effectively; assess the credibility and accuracy of each source; and quote or paraphrase the data and conclusions of others while avoiding plagiarism and following a standard format for citation.

Draw evidence from informational texts to support analysis reflection, and research.

English language learners communicate information, ideas and concepts necessary for academic success in the content area of Science.

General Course Information and Notes

GENERAL NOTES

If this course is to be used in a STEM sequence in place of either the comprehensive or subject specific course sequences, teachers should refer to the test item specifications for the 8th grade STA for information on tested standards which can be found at: https://www.fldoe.org/core/fileparse.php/5663/urlt/swsatisG8.pdf.

This course is an integrated Science, Technology, Engineering and Mathematics (STEM) course for middle school students. M/J STEM Physical Science includes an integration of standards from science, mathematics, and English/language arts (ELA) through the application to STEM problem solving using physical science knowledge and science and engineering practices. Physical sciences through applications such as aeronautics, robotics, rocketry, mechanical, electrical, and civil engineering, are emphasized in this course. Laboratory investigations that include the use of scientific inquiry, research, measurement, problem solving, laboratory apparatus and technologies, experimental procedures, and safety procedures are an integral part of this course. The National Science Teachers Association (NSTA) recommends that at the middle school level, all students should have multiple opportunities every week to explore science laboratory investigations (labs). School laboratory investigations are defined by the National Research Council (NRC) as an experience in the laboratory, classroom, or the field that provides students with opportunities to interact directly with natural phenomena or with data collected by other using tools, materials, data collection techniques, and models (NRC, 2006, p. 3). Laboratory investigations in the middle school classroom should help all students develop a growing understanding of the complexity and ambiguity of empirical work, as well as the skills to calibrate and troubleshoot equipment used to make observations. Learners should understand measurement error; and have the skills to aggregate, interpret, and present the resulting data (NRC, 2006, p. 77; NSTA, 2007).

Special Notes:
**Instructional Practices**
Teaching from a range of complex text is optimized when teachers in all subject areas implement the following strategies on a routine basis:

1. Ensuring wide reading from complex text that varies in length.
2. Making close reading and rereading of texts central to lessons.
3. Emphasizing text-specific complex questions, and cognitively complex tasks, reinforce focus on the text and cultivate independence.
4. Emphasizing students supporting answers based upon evidence from the text.
5. Providing extensive research and writing opportunities (claims and evidence).

**Science and Engineering Practices** (NRC Framework for K-12 Science Education, 2010)
- Asking questions (for science) and defining problems (for engineering).
- Developing and using models.
- Planning and carrying out investigations.
- Analyzing and interpreting data.
- Using mathematics, information and computer technology, and computational thinking.
- Constructing explanations (for science) and designing solutions (for engineering).
- Engaging in argument from evidence.
- Obtaining, evaluating, and communicating information.

ISTE Standards (http://www.iste.org/docs/pdfs/20-14_ISTE_Standards_S_PDF.pdf) should be incorporated in many contexts throughout the course.

**Course Standards**

**Use grade appropriate Nature of Science and Mathematics Content (MAFS) benchmarks** (i.e., if this course is offered to seventh grade students, then the SC.7.N benchmarks should be integrated into the course content, and SC.6.N and SC.8.N benchmarks should be omitted from the seventh grade course).

**Literacy Standards in Science**
Secondary science courses include reading standards for literacy in science and technical subjects 6-12 and writing standards for literacy in history/social studies, science, and technical subjects 6-12. The courses also include speaking and listening standards. For a complete list of standards required for this course click on the blue tile labeled course standards. You may also download the complete course including all required standards and notes sections using the export function located at the top of this page.

**English Language Development ELD Standards Special Notes Section:**
Teachers are required to provide listening, speaking, reading and writing instruction that allows English language learners (ELL) to communicate information, ideas and concepts for academic success in the content area of Science. For the given level of English language proficiency and with visual, graphic, or interactive support, students will interact with grade level words, expressions, sentences and discourse to process or produce language necessary for academic success The ELD standard should specify a relevant content area concept or topic of study chosen by curriculum developers and teachers which maximizes an ELL’s need for communication and social skills.

To access an ELL supporting document which delineates performance definitions and descriptors, please click on the following link: https://cpalmsmediaprod.blob.core.windows.net/uploads/docs/standards/eld/sc.pdf.

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**GENERAL INFORMATION**

- **Course Number:** 2003030
- **Course Path:** Section: Grades PreK to 12 Education
  - Courses: Grades 6 to 8 Education
  - Subject: Science
  - SubSubject: Physical Sciences
- **Abbreviated Title:** M/J STEM PHYSIC SCI
- **Course Length:** Year (Y)
- **Course Attributes:**
  - Class Size Core Required
- **Course Level:** 2

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**Educator Certifications**

- Middle Grades General Science (Middle Grades 5-9)
- Chemistry (Grades 6-12)
- Physics (Grades 6-12)
- Earth/Space Science (Grades 6-12)
- Middle Grades Integrated Curriculum (Middle Grades 5-9)
Investigate and describe the transformation of energy from one form to another.

Explore the Law of Gravity by recognizing that every object exerts gravitational force on every other object and that the force depends on how much mass the objects have and how far apart they are.

Identify an instance from the history of science in which scientific knowledge has changed when new evidence or new interpretations are encountered.

Distinguish between scientific and pseudoscientific ideas.

Explain that science is one of the processes that can be used to inform decision making at the community, state, national, and international levels.

Discuss what characterizes science and its methods.

Explain how hypotheses are valuable if they lead to further investigations, even if they turn out not to be supported by the data.

Understand that scientific investigations involve the collection of relevant empirical evidence, the use of logical reasoning, and the application of imagination in devising hypotheses, predictions, explanations and models to make sense of the collected evidence.

Mathematicians who participate in effortful learning both individually and with others:

- Analyze the problem in a way that makes sense given the task.
- Ask questions that will help with solving the task.
- Build perseverance by modifying methods as needed while solving a challenging task.
- Stay engaged and maintain a positive mindset when working to solve tasks.
- Help and support each other when attempting a new method or approach.
Teachers who encourage students to participate actively in effortful learning both individually and with others:
- Cultivate a community of growth mindset learners.
- Foster perseverance in students by choosing tasks that are challenging.
- Develop students' ability to analyze and problem solve.
- Recognize students' effort when solving challenging problems.

Demonstrate understanding by representing problems in multiple ways.
Mathematicians who demonstrate understanding by representing problems in multiple ways:
- Build understanding through modeling and using manipulatives.
- Represent solutions to problems in multiple ways using objects, drawings, tables, graphs and equations.
- Progress from modeling problems with objects and drawings to using algorithms and equations.
- Express connections between concepts and representations.
- Choose a representation based on the given context or purpose.

Clarifications:
Teachers who encourage students to demonstrate understanding by representing problems in multiple ways:
- Help students make connections between concepts and representations.
- Provide opportunities for students to use manipulatives when investigating concepts.
- Guide students from concrete to pictorial to abstract representations as understanding progresses.
- Show students that various representations can have different purposes and can be useful in different situations.

Complete tasks with mathematical fluency.
Mathematicians who complete tasks with mathematical fluency:
- Select efficient and appropriate methods for solving problems within the given context.
- Maintain flexibility and accuracy while performing procedures and mental calculations.
- Complete tasks accurately and with confidence.
- Adapt procedures to apply them to a new context.
- Use feedback to improve efficiency when performing calculations.

Clarifications:
Teachers who encourage students to complete tasks with mathematical fluency:
- Provide students with the flexibility to solve problems by selecting a procedure that allows them to solve efficiently and accurately.
- Offer multiple opportunities for students to practice efficient and generalizable methods.
- Provide opportunities for students to reflect on the method they used and determine if a more efficient method could have been used.

Engage in discussions that reflect on the mathematical thinking of self and others.
Mathematicians who engage in discussions that reflect on the mathematical thinking of self and others:
- Communicate mathematical ideas, vocabulary and methods effectively.
- Analyze the mathematical thinking of others.
- Compare the efficiency of a method to those expressed by others.
- Recognize errors and suggest how to correctly solve the task.
- Justify results by explaining methods and processes.
- Construct possible arguments based on evidence.

Clarifications:
Teachers who encourage students to engage in discussions that reflect on the mathematical thinking of self and others:
- Establish a culture in which students ask questions of the teacher and their peers, and error is an opportunity for learning.
- Create opportunities for students to discuss their thinking with peers.
- Select, sequence and present student work to advance and deepen understanding of correct and increasingly efficient methods.
- Develop students' ability to justify methods and compare their responses to the responses of their peers.

Use patterns and structure to help understand and connect mathematical concepts.
Mathematicians who use patterns and structure to help understand and connect mathematical concepts:
- Focus on relevant details within a problem.
- Create plans and procedures to logically order events, steps or ideas to solve problems.
- Decompose a complex problem into manageable parts.
- Relate previously learned concepts to new concepts.
- Look for similarities among problems.
- Connect solutions of problems to more complicated large-scale situations.

Clarifications:
Teachers who encourage students to use patterns and structure to help understand and connect mathematical concepts:
- Help students recognize the patterns in the world around them and connect these patterns to mathematical concepts.
- Support students to develop generalizations based on the similarities found among problems.
- Provide opportunities for students to create plans and procedures to solve problems.
- Develop students' ability to construct relationships between their current understanding and more sophisticated ways of thinking.

Assess the reasonableness of solutions.
Mathematicians who assess the reasonableness of solutions:
- Estimate to discover possible solutions.
- Use benchmark quantities to determine if a solution makes sense.
- Check calculations when solving problems.
- Verify possible solutions by explaining the methods used.
- Evaluate results based on the given context.
General Course Information and Notes

GENERAL NOTES

If this course is to be used in a STEM sequence in place of either the comprehensive or subject specific course sequences, teachers should refer to the test item specifications for the 8th grade SSA for information on tested standards which can be found at: https://www.fldoe.org/core/fileparse.php/5663/urlt/swsatissatG8.pdf.

This course is an integrated Science, Technology, Engineering and Mathematics (STEM) course for middle school students. M/J STEM Physical Science includes an
Course Level: Middle Grades General Science (Middle Grades 5-9), Chemistry (Grades 6-12), Physics (Grades 6-12)

**Course Type:** Core Academic Course  
**Course Level:** 2  
**Course Status:** State Board Approved  
**Grade Level(s):** 6, 7, 8

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**General Information**

- **Course Path:** Section: Grades PreK to 12 Education  
  Courses: Subject: Science > SubSubject: Physical Sciences  
- **Abbreviated Title:** M/J STEM PHYSIC SCI  
- **Course Length:** Year (Y)  
- **Course Attributes:**  
  - Class Size Core Required  
- **Course Level:** 2

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**Educator Certifications**

- Middle Grades General Science (Middle Grades 5-9)  
- Chemistry (Grades 6-12)  
- Physics (Grades 6-12)
## Course Standards

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<td>SC.912.L.15.10:</td>
<td>Identify basic trends in hominid evolution from early ancestors six million years ago to modern humans, including brain size, jaw size, language, and manufacture of tools.</td>
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<td>SC.912.L.15.13:</td>
<td>Describe the conditions required for natural selection, including: overproduction of offspring, inherited variation, and the struggle to survive, which result in differential reproductive success.</td>
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<td>SC.912.L.15.14:</td>
<td>Discuss mechanisms of evolutionary change other than natural selection such as genetic drift and gene flow.</td>
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<td>SC.912.L.15.15:</td>
<td>Describe how mutation and genetic recombination increase genetic variation.</td>
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<td>SC.912.L.16.2:</td>
<td>Discuss observed inheritance patterns caused by various modes of inheritance, including dominant, recessive, codominant, sex-linked, polygenic, and multiple alleles.</td>
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<td>Describe the basic process of DNA replication and how it relates to the transmission and conservation of the genetic information.</td>
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<td>Explain how mutations in the DNA sequence may or may not result in phenotypic change. Explain how mutations in gametes may result in phenotypic changes in offspring.</td>
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<td>Explain the basic processes of transcription and translation, and how they result in the expression of genes.</td>
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<td>Explain the relationship between mutation, cell cycle, and uncontrolled cell growth potentially resulting in cancer.</td>
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<td>Explain how and why the genetic code is universal and is common to almost all organisms.</td>
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<td>Evaluate the impact of biotechnology on the individual, society and the environment, including medical and ethical issues.</td>
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<td>Explain the general distribution of life in aquatic systems as a function of chemistry, geography, light, depth, salinity, and temperature.</td>
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<td>Describe changes in ecosystems resulting from seasonal variations, climate change and succession.</td>
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<td>Analyze how population size is determined by births, deaths, immigration, emigration, and limiting factors (biotic and abiotic) that determine carrying capacity.</td>
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<td>SC.912.L.17.8:</td>
<td>Recognize the consequences of the losses of biodiversity due to catastrophic events, climate changes, human activity, and the introduction of invasive, non-native species.</td>
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<td>SC.912.L.17.9:</td>
<td>Use a food web to identify and distinguish producers, consumers, and decomposers. Explain the pathway of energy transfer through trophic levels and the reduction of available energy at successive trophic levels.</td>
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<td>SC.912.L.17.11:</td>
<td>Evaluate the costs and benefits of renewable and nonrenewable resources, such as water, energy, fossil fuels, wildlife, and forests.</td>
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<td>SC.912.L.17.13:</td>
<td>Discuss the need for adequate monitoring of environmental parameters when making policy decisions.</td>
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<td>SC.912.L.17.20:</td>
<td>Predict the impact of individuals on environmental systems and examine how human lifestyles affect sustainability.</td>
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<td>SC.912.L.18.1:</td>
<td>Describe the basic molecular structures and primary functions of the four major categories of biological macromolecules.</td>
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<td>Identify the reactants, products, and basic functions of photosynthesis.</td>
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<td>SC.912.L.18.8:</td>
<td>Identify the reactants, products, and basic functions of aerobic and anaerobic cellular respiration.</td>
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<td>Explain the interrelated nature of photosynthesis and cellular respiration.</td>
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<td>SC.912.L.18.10:</td>
<td>Connect the role of adenosine triphosphate (ATP) to energy transfers within a cell.</td>
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<tr>
<td>SC.912.L.18.11:</td>
<td>Explain the role of enzymes as catalysts that lower the activation energy of biochemical reactions. Identify factors, such as pH and temperature, and their effect on enzyme activity.</td>
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Discuss the special properties of water that contribute to Earth's suitability as an environment for life: cohesive behavior, ability to moderate temperature, expansion upon freezing, and versatility as a solvent.

1. Pose questions about the natural world, (Articulate the purpose of the investigation and identify the relevant scientific concepts).
2. Conduct systematic observations, (Write procedures that are clear and replicable. Identify observables and examine relationships between test (independent) variable and outcome (dependent) variable. Employ appropriate methods for accurate and consistent observations; conduct and record measurements at appropriate levels of precision. Follow safety guidelines).
3. Examine books and other sources of information to see what is already known, Review what is known in light of empirical evidence, (Examine whether available empirical evidence can be interpreted in terms of existing knowledge and models, and if not, modify or develop new models).
4. Plan investigations, (Design and evaluate a scientific investigation).
5. Use tools to gather, analyze, and interpret data (this includes the use of measurement in metric and other systems, and also the generation and interpretation of graphical representations of data, including data tables and graphs), (Collect data or evidence in an organized way. Properly use instruments, equipment, and materials (e.g., scales, probeware, meter sticks, microscopes, computers) including set-up, calibration, technique, maintenance, and storage).
6. Pose answers, explanations, or descriptions of events, Generate explanations that explicate or describe natural phenomena (inferences), (Use appropriate evidence and reasoning to justify these explanations to others).
7. Communicate results of scientific investigations, and Evaluate a speaker's point of view, reasoning, and use of evidence and rhetoric, (Identify any fallacious reasoning or exaggerated or distorted evidence).

Recognize that theories do not become laws, nor do laws become principles. Integrate multiple sources of information presented in diverse media or formats (e.g., visually, quantitatively, orally) evaluating the credibility and accuracy of each source. Write arguments focused on discipline-specific content. a. Introduce precise claim(s), distinguish the claim(s) from alternate or opposing claims, and create an organization that establishes clear relationships among the claim(s), counterclaims, reasons, and evidence.
b. Develop claim(s) and counterclaims fairly, supplying data and evidence for each while pointing out the strengths and limitations of both claim(s) and counterclaims in a discipline-appropriate form and in a manner that anticipates the audience's knowledge level and concerns.

c. Use words, phrases, and clauses to link the major sections of the text, create cohesion, and clarify the relationships between claim(s) and reasons, between reasons and evidence, and between claim(s) and counterclaims.

d. Establish and maintain a formal style and objective tone while attending to the norms and conventions of the discipline in which they are writing.

e. Provide a concluding statement or section that follows from and supports the argument presented.

LAFS.910.WHST.1.2:

Write informative/explanatory texts, including the narration of historical events, scientific procedures/experiments, or technical processes.

a. Introduce a topic and organize ideas, concepts, and information to make important connections and distinctions; include formatting (e.g., headings), graphics (e.g., figures, tables), and multimedia when useful to aiding comprehension.

b. Develop the topic with well-chosen, relevant, and sufficient facts, extended definitions, concrete details, quotations, or other information and examples appropriate to the audience's knowledge of the topic.

c. Use varied transitions and sentence structures to link the major sections of the text, create cohesion, and clarify the relationships among ideas and concepts.

d. Use precise language and domain-specific vocabulary to manage the complexity of the topic and convey a style appropriate to the discipline and context as well as to the expertise of likely readers.

e. Establish and maintain a formal style and objective tone while attending to the norms and conventions of the discipline in which they are writing.

f. Provide a concluding statement or section that follows from and supports the information or explanation presented (e.g., articulating implications or the significance of the topic).

LAFS.910.WHST.2.4:

Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.

LAFS.910.WHST.2.5:

Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience.

LAFS.910.WHST.2.6:

Use technology, including the Internet, to produce, publish, and update individual or shared writing products, taking advantage of technology's capacity to link to other information and to display information flexibly and dynamically.

LAFS.910.WHST.3.7:

Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate: synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation.

LAFS.910.WHST.3.8:

Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the usefulness of each source in answering the research question; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and following a standard format for citation.

LAFS.910.WHST.3.9:

Draw evidence from informational texts to support analysis, reflection, and research.

LAFS.910.WHST.4.10:

Write routinely over extended time frames (time for reflection and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences.

MAFS.912.N-Q.1.1:

Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays.

MAFS.912.N-Q.1.3:

Choose a level of accuracy appropriate to limitations on measurement when reporting quantities.

Mathematically proficient students start by explaining to themselves the meaning of a problem and looking for entry points to its solution. They analyze givens, constraints, relationships, and goals. They make conjectures about the form and meaning of the solution and plan a solution pathway rather than simply jumping into a solution attempt. They consider analogous problems, and try special cases and simpler forms of the original problem in order to gain insight into its solution. They monitor and evaluate their progress and change course if necessary. Older students might, depending on the context of the problem, transform algebraic expressions or change the viewing window on their graphing calculator to get the information they need. Mathematically proficient students can explain correspondences between equations, verbal descriptions, tables, and graphs or draw diagrams of important features and relationships, graph data, and search for regularity or trends. Younger students might rely on using concrete objects or pictures to help conceptualize and solve a problem. Mathematically proficient students check their answers to problems using a different method, and they continually ask themselves, “Does this make sense?” They can understand the approaches of others to solving complex problems and identify correspondences between different approaches.

MAFS.K12.MP.2.1:

Construct viable arguments and critique the reasoning of others.

Mathematically proficient students understand and use stated assumptions, definitions, and previously established results in constructing arguments. They make conjectures and build a logical progression of statements to explore the truth of their conjectures. They are able to analyze situations by breaking them into cases, and can recognize and use counterexamples. They justify their conclusions, communicate them to others, and respond to the arguments of others. They reason inductively about data, making plausible arguments that take into account the context from which the data arose. Mathematically proficient students are also able to compare the effectiveness of two plausible arguments, distinguish correct logic or reasoning from that which is flawed, and—if there is a flaw in an argument—explain what it is. Elementary students can construct arguments using concrete referents such as objects, drawings, diagrams, and actions. Such arguments can make sense and be correct, even though they are not generalized or made formal until later grades. Later, students learn to determine domains to which an argument applies. Students at all grades can listen or read the arguments of others, decide whether they make sense, and ask useful questions to clarify or improve the arguments.

MAFS.K12.MP.3.1:

Model with mathematics.

Mathematically proficient students can apply the mathematics they know to solve problems arising in everyday life, society, and the workplace. In early grades, this might be as simple as writing an addition equation to describe a situation. In middle grades, a student might apply proportional
reasoning to plan a school event or analyze a problem in the community. By high school, a student might use geometry to solve a design problem or use a function to describe how one quantity of interest depends on another. Mathematically proficient students who can apply what they know are comfortable making assumptions and approximations to simplify a complicated situation, realizing that these may need revision later. They are able to identify important quantities in a practical situation and map their relationships using such tools as diagrams, two-way tables, graphs, flowcharts and formulas. They can analyze those relationships mathematically to draw conclusions. They routinely interpret their mathematical results in the context of the situation and reflect on whether the results make sense, possibly improving the model if it has not served its purpose.

**Standard Relation to Course: Supporting**

**Use appropriate tools strategically.**

Mathematically proficient students consider the available tools when solving a mathematical problem. These tools might include pencil and paper, concrete models, a ruler, a protractor, a calculator, a spreadsheet, a computer algebra system, a statistical package, or dynamic geometry software. Proficient students are sufficiently familiar with tools appropriate for their grade or course to make sound decisions about when each of these tools might be helpful, recognizing both the insight to be gained and their limitations. For example, mathematically proficient high school students analyze graphs of functions and solutions generated using a graphing calculator. They detect possible errors by strategizing estimation and other mathematical knowledge. When making mathematical models, they know that technology can enable them to visualize the results of varying assumptions, explore consequences, and compare predictions with data. Mathematically proficient students at various grade levels are able to identify relevant external mathematical resources, such as digital content located on a website, and use them to pose or solve problems. They are able to use technological tools to explore and deepen their understanding of concepts.

**Standard Relation to Course: Supporting**

**Attend to precision.**

Mathematically proficient students try to communicate precisely to others. They try to use clear definitions in discussion with others and in their own reasoning. They state the meaning of the symbols they choose, including using the equal sign consistently and appropriately. They are careful about specifying units of measure, and labeling axes to clarify the correspondence with quantities in a problem. They calculate accurately and efficiently, express numerical answers with a degree of precision appropriate for the problem context. In the elementary grades, students give carefully formulated explanations to each other. By the time they reach high school they have learned to examine claims and make explicit use of definitions.

**Standard Relation to Course: Supporting**

**Look for and make use of structure.**

Mathematically proficient students look closely to discern a pattern or structure. Young students, for example, might notice that three and seven more is the same amount as seven and three more, or they may sort a collection of shapes according to how many sides the shapes have. Later, students will see 7 × 8 equals the well remembered 7 × 5 + 7 × 3, in preparation for learning about the distributive property. In the expression $x^2 + 9x + 14$, older students can see the $14$ as $2 \times 7$ and $9$ as $2 + 7$. They recognize the significance of an existing line in a geometric figure and can use the strategy of drawing an auxiliary line for solving problems. They also can step back for an overview and shift perspective. They can see complicated things, such as some algebraic expressions, as single objects or as being composed of several objects. For example, they can see $5 - (x - y)^2$ as $5$ minus a positive number times a square and use that to realize that its value cannot be more than $5$ for any real numbers $x$ and $y$.

**Standard Relation to Course: Supporting**

**Look for and express regularity in repeated reasoning.**

Mathematically proficient students notice if calculations are repeated, and look both for general methods and for shortcuts. Upper elementary students might notice when dividing $25$ by $11$ that they are repeating the same calculations over and over again, and conclude they have a repeating decimal. By paying attention to the calculation of slope as they repeatedly check whether points are on the line through (1, 2) with slope 3, middle school students might abstract the equation $(y - 2)/(x - 1) = 3$. Noticing the regularity in the way terms cancel when expanding $(x - 1)(x + 1)$, $(x - 1)(x^2 + x + 1)$, and $(x - 1)(x^3 + x^2 + x + 1)$ might lead them to the general formula for the sum of a geometric series. As they work to solve a problem, mathematically proficient students maintain oversight of the process, while attending to the details. They continually evaluate the reasonableness of their intermediate results.

**Standard Relation to Course: Supporting**

**Evaluate how environment and personal health are interrelated.**

**Clarifications:**
Food options within a community; prenatal-care services; availability of recreational facilities; air quality; weather-safety awareness; and weather, air, and water conditions.

**Analyze strategies for prevention, detection, and treatment of communicable and chronic diseases.**

**Clarifications:**
Health prevention, detection, and treatment of: breast and testicular cancer, suicide, obesity, and industrial-related chronic disease.

**Analyze how heredity and family history can impact personal health.**

**Clarifications:**
Drug use, family obesity, heart disease, mental health, and non-communicable illness or disease.

**English language learners communicate information, ideas and concepts necessary for academic success in the content area of Science.**

**English language learners communicate for social and instructional purposes within the school setting.**

**General Course Information and Notes**

**GENERAL NOTES**

Laboratory investigations that include the use of scientific inquiry, research, measurement, problem solving, laboratory apparatus and technologies, experimental procedures, and safety procedures are an integral part of this course. The National Science Teachers Association (NSTA) recommends that at the high school level, all students should be in the science lab or field, collecting data every week. School laboratory investigations (labs) are defined by the National Research Council (NRC) as an experience in the laboratory, classroom, or the field that provides students with opportunities to interact directly with natural phenomena or with data collected by others using tools, materials, data collection techniques, and models (NRC, 2006, p. 3). Laboratory investigations in the high school classroom should help all students develop a...
growing understanding of the complexity and ambiguity of empirical work, as well as the skills to calibrate and troubleshoot equipment used to make observations. Learners should understand measurement error; and have the skills to aggregate, interpret, and present the resulting data (National Research Council, 2006, p.77; NSTA, 2007).

Special Notes:

Instructional Practices
Teaching from a range of complex text is optimized when teachers in all subject areas implement the following strategies on a routine basis:

1. Ensuring wide reading from complex text that varies in length.
2. Making close reading and rereading of texts central to lessons.
3. Emphasizing text-specific complex questions, and cognitively complex tasks, reinforce focus on the text and cultivate independence.
4. Emphasizing students supporting answers based upon evidence from the text.
5. Providing extensive research and writing opportunities (claims and evidence).


- Asking questions (for science) and defining problems (for engineering).
- Developing and using models.
- Planning and carrying out investigations.
- Analyzing and interpreting data.
- Using mathematics, information and computer technology, and computational thinking.
- Constructing explanations (for science) and designing solutions (for engineering).
- Engaging in argument from evidence.
- Obtaining, evaluating, and communicating information.

English Language Development ELD Standards Special Notes Section:

Teachers are required to provide listening, speaking, reading and writing instruction that allows English language learners (ELL) to communicate information, ideas and concepts for academic success in the content area of Science. For the given level of English language proficiency and with visual, graphic, or interactive support, students will interact with grade level words, expressions, sentences and discourse to process or produce language necessary for academic success. The ELD standard should specify a relevant content area concept or topic of study chosen by curriculum developers and teachers which maximizes an ELL's need for communication and social skills. To access an ELL supporting document which delineates performance definitions and descriptors, please click on the following link: https://cpalmsmediaprod.blob.core.windows.net/uploads/docs/standards/eld/sc.pdf

Additional Instructional Resources:

A.V.E. for Success Collection is provided by the Florida Association of School Administrators: http://www.fasa.net/4DCGI/cms/review.html?
Action=CM5_Document&DocID=139. Please be aware that these resources have not been reviewed by CPALMS and there may be a charge for the use of some of them in this collection.

GENERAL INFORMATION

Course Number: 2000310
Course Path: Section: Courses > Grade Group: Education Courses > Subject: Science > SubSubject: Biological Sciences >
Abbreviated Title: BIO 1
Number of Credits: One (1) credit
Course Type: Core Academic Course
Course Level: 2
Course Status: Course Approved
Grade Level(s): 9,10,11,12
Graduation Requirement: Biology

Educator Certifications

Science (Secondary Grades 7-12)
Biology (Grades 6-12)
Middle Grades General Science (Middle Grades 5-9)

Equivalent Courses

2000320-Biology 1 Honors
2000430-Biology Technology
2000322-Cambridge Pre-AICE Biology IGCSE Level
2000800-Florida's Preinternational Baccalaureate Biology 1
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9. Use appropriate evidence and reasoning to justify these explanations to others,
10. Communicate results of scientific investigations, and
11. Evaluate the merits of the explanations produced by others.

Recognize that the strength or usefulness of a scientific claim is evaluated through scientific argumentation, which depends on critical and logical thinking, and the active consideration of alternative scientific explanations to explain the data presented.

Identify sources of information and assess their reliability according to the strict standards of scientific investigation.

Describe how scientific inferences are drawn from scientific observations and provide examples from the content being studied.

Identify what is science, what clearly is not science, and what superficially resembles science (but fails to meet the criteria for science).

Identify which questions can be answered through science and which questions are outside the boundaries of scientific investigation, such as questions addressed by other ways of knowing, such as art, philosophy, and religion.

Explain that a scientific theory is the culmination of many scientific investigations drawing together all the current evidence concerning a substantial range of phenomena. Thus, a scientific theory represents the most powerful explanation scientists have to offer.

Recognize that theories do not become laws, nor do laws become theories; theories are well-supported explanations and laws are well-supported descriptions.

Mathematicians who participate in effortful learning both individually and with others:
- Analyze the problem in a way that makes sense given the task.
- Ask questions that will help with solving the task.
- Build perseverance by modifying methods as needed while solving a challenging task.
- Stay engaged and maintain a positive mindset when working to solve tasks.
- Help and support each other when attempting a new method or approach.

Teachers who encourage students to participate actively in effortful learning both individually and with others:
- Cultivate a community of growth mindset learners.
- Foster perseverance in students by choosing tasks that are challenging.
- Develop students' ability to analyze and problem solve.
- Recognize students' effort when solving challenging problems.

Demonstrate understanding by representing problems in multiple ways.

Mathematicians who demonstrate understanding by representing problems in multiple ways:
- Build understanding through modeling and using manipulatives.
- Represent solutions to problems in multiple ways using objects, drawings, tables, graphs and equations.
- Progress from modeling problems with objects and drawings to using algorithms and equations.
- Express connections between concepts and representations.
- Choose a representation based on the given context or purpose.

Teachers who encourage students to demonstrate understanding by representing problems in multiple ways:
- Help students make connections between concepts and representations.
- Provide opportunities for students to use manipulatives when investigating concepts.
- Guide students from concrete to pictorial to abstract representations as understanding progresses.
- Show students that various representations can have different purposes and can be useful in different situations.

Complete tasks with mathematical fluency.

Mathematicians who complete tasks with mathematical fluency:
- Select efficient and appropriate methods for solving problems within the given context.
- Maintain flexibility and accuracy while performing procedures and mental calculations.
- Complete tasks accurately and with confidence.
- Adapt procedures to apply them to a new context.
- Use feedback to improve efficiency when performing calculations.

Teachers who encourage students to complete tasks with mathematical fluency:
- Provide students with the flexibility to solve problems by selecting a procedure that allows them to solve efficiently and accurately.
- Offer multiple opportunities for students to practice efficient and generalizable methods.
- Provide opportunities for students to reflect on the method they used and determine if a more efficient method could have been used.
Engage in discussions that reflect on the mathematical thinking of self and others. Mathematicians who engage in discussions that reflect on the mathematical thinking of self and others:

- Communicate mathematical ideas, vocabulary and methods effectively.
- Analyze the mathematical thinking of others.
- Compare the efficiency of a method to those expressed by others.
- Recognize errors and suggest how to correctly solve the task.
- Justify results by explaining methods and processes.
- Construct possible arguments based on evidence.

**Clarifications:**
Teachers who encourage students to engage in discussions that reflect on the mathematical thinking of self and others:

- Establish a culture in which students ask questions of the teacher and their peers, and error is an opportunity for learning.
- Create opportunities for students to discuss their thinking with peers.
- Select, sequence and present student work to advance and deepen understanding of correct and increasingly efficient methods.
- Develop students' ability to justify methods and compare their responses to the responses of their peers.

Use patterns and structure to help understand and connect mathematical concepts. Mathematicians who use patterns and structure to help understand and connect mathematical concepts:

- Focus on relevant details within a problem.
- Create plans and procedures to logically order events, steps or ideas to solve problems.
- Decompose a complex problem into manageable parts.
- Relate previously learned concepts to new concepts.
- Look for similarities among problems.
- Connect solutions of problems to more complicated large-scale situations.

**Clarifications:**
Teachers who encourage students to use patterns and structure to help understand and connect mathematical concepts:

- Help students recognize the patterns in the world around them and connect these patterns to mathematical concepts.
- Support students to develop generalizations based on the similarities found among problems.
- Provide opportunities for students to create plans and procedures to solve problems.
- Develop students' ability to construct relationships between their current understanding and more sophisticated ways of thinking.

Assess the reasonableness of solutions. Mathematicians who assess the reasonableness of solutions:

- Estimate to discover possible solutions.
- Use benchmark quantities to determine if a solution makes sense.
- Check calculations when solving problems.
- Verify possible solutions by explaining the methods used.
- Evaluate results based on the given context.

**Clarifications:**
Teachers who encourage students to assess the reasonableness of solutions:

- Have students estimate or predict solutions prior to solving.
- Prompt students to continually ask, “Does this solution make sense? How do you know?”
- Reinforce that students check their work as they progress within and after a task.
- Strengthen students' ability to verify solutions through justifications.

Apply mathematics to real-world contexts. Mathematicians who apply mathematics to real-world contexts:

- Connect mathematical concepts to everyday experiences.
- Use models and methods to understand, represent and solve problems.
- Perform investigations to gather data or determine if a method is appropriate. • Redesign models and methods to improve accuracy or efficiency.

**Clarifications:**
Teachers who encourage students to apply mathematics to real-world contexts:

- Provide opportunities for students to create models, both concrete and abstract, and perform investigations.
- Challenge students to question the accuracy of their models and methods.
- Support students as they validate conclusions by comparing them to the given situation.
- Indicate how various concepts can be applied to other disciplines.

Cite evidence to explain and justify reasoning.

**Clarifications:**
K-1 Students include textual evidence in their oral communication with guidance and support from adults. The evidence can consist of details from the text without naming the text. During 1st grade, students learn how to incorporate the evidence in their writing.

2-3 Students include relevant textual evidence in their written and oral communication. Students should name the text when they refer to it. In 3rd grade, students should use a combination of direct and indirect citations.

4-5 Students continue with previous skills and reference comments made by speakers and peers. Students cite texts that they've directly quoted, paraphrased, or used for information. When writing, students will use the form of citation dictated by the instructor or the style guide referenced by the instructor.

6-8 Students continue with previous skills and use a style guide to create a proper citation.

9-12 Students continue with previous skills and should be aware of existing style guides and the ways in which they differ.
### General Course Information and Notes

#### General Notes

Laboratory investigations that include the use of scientific inquiry, research, measurement, problem solving, laboratory apparatus and technologies, experimental procedures, and safety procedures are an integral part of this course. The National Science Teachers Association (NSTA) recommends that at the high school level, all students should be in the science lab or field, collecting data every week. School laboratory investigations (labs) are defined by the National Research Council (NRC) as an experience in the laboratory, classroom, or the field that provides students with opportunities to interact directly with natural phenomena or with data collected by others using tools, materials, data collection techniques, and models (NRC, 2006, p. 3). Laboratory investigations in the high school classroom should help all students develop a growing understanding of the complexity and ambiguity of empirical work, as well as the skills to calibrate and troubleshoot equipment used to make observations. Learners should understand measurement error; and have the skills to aggregate, interpret, and present the resulting data (National Research Council, 2006, p. 77; NSTA, 2007).

#### Special Notes:

**Instructional Practices**

Teaching from a range of complex text is optimized when teachers in all subject areas implement the following strategies on a routine basis:

1. Ensuring wide reading from complex text that varies in length.
2. Making close reading and rereading of texts central to lessons.
3. Emphasizing text-specific complex questions, and cognitively complex tasks, reinforce focus on the text and cultivate independence.
4. Emphasizing students supporting answers based upon evidence from the text.
5. Providing extensive research and writing opportunities (claims and evidence).

**Science and Engineering Practices** (NRC Framework for K-12 Science Education, 2010)

- Asking questions (for science) and defining problems (for engineering).
- Developing and using models.
- Planning and carrying out investigations.
- Analyzing and interpreting data.
• Using mathematics, information and computer technology, and computational thinking.
• Constructing explanations (for science) and designing solutions (for engineering).
• Engaging in argument from evidence.
• Obtaining, evaluating, and communicating information.

**Florida's Benchmarks for Excellent Student Thinking (B.E.S.T.) Standards**

This course includes Florida’s B.E.S.T. ELA Expectations (EE) and Mathematical Thinking and Reasoning Standards (MTRs) for students. Florida educators should intentionally embed these standards within the content and their instruction as applicable. For guidance on the implementation of the EEs and MTRs, please visit https://www.cpalms.org/Standards/BEST_Standards.aspx and select the appropriate B.E.S.T. Standards package.

**English Language Development ELD Standards Special Notes Section:**

Teachers are required to provide listening, speaking, reading and writing instruction that allows English language learners (ELL) to communicate information, ideas and concepts for academic success in the content area of Science. For the given level of English language proficiency and with visual, graphic, or interactive support, students will interact with grade level words, expressions, sentences and discourse to process or produce language necessary for academic success. The ELD standard should specify a relevant content area concept or topic of study chosen by curriculum developers and teachers which maximizes an ELL’s need for communication and social skills. To access an ELL supporting document which delineates performance definitions and descriptors, please click on the following link: https://cpalmsmediaprod.blob.core.windows.net/uploads/docs/standards/eld/sc.pdf

**Additional Instructional Resources:**

A.V.E. for Success Collection is provided by the Florida Association of School Administrators: http://www.fasa.net/4DCGI/cms/review.html?Action=CMS_Document&DocID=139. Please be aware that these resources have not been reviewed by CPALMS and there may be a charge for the use of some of them in this collection.

**GENERAL INFORMATION**

**Course Path:** Section: Grades PreK to 12 Education Courses > Grade Group: Grades 9 to 12 and Adult Education Courses > Subject: Science > SubSubject: Biological Sciences >

**Abbreviated Title:** BIO 1

**Course Level:** 2

**Course Attributes:**
- Class Size Core Required

**Course Length:** Year (Y)

**Number of Credits:** One (1) credit

**Course Type:** Core Academic Course

**Course Status:** State Board Approved

**Grade Level(s):** 9,10,11,12

**Graduation Requirement:** Biology

**Educator Certifications**

Science (Secondary Grades 7-12)
Biology (Grades 6-12)
Middle Grades General Science (Middle Grades 5-9)

**Equivalent Courses**

2000320-Biology 1 Honors
2000430-Biology Technology
2000322-Cambridge Pre-AICE Biology IGCSE Level
2000800-Florida's Preinternational Baccalaureate Biology 1
Course Standards

<table>
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| LAFS.910.WHST.1.1: | b. Develop claim(s) and counterclaims fairly, supplying data and evidence for each while pointing out the strengths and limitations of both claim(s) and counterclaims in a discipline-appropriate form and in a manner that anticipates the audience’s knowledge level and concerns.  
| | c. Use words, phrases, and clauses to link the major sections of the text, create cohesion, and clarify the relationships between claim(s) and reasons, between reasons and evidence, and between claim(s) and counterclaims.  
| | d. Establish and maintain a formal style and objective tone while attending to the norms and conventions of the discipline in which they are writing.  
| | e. Provide a concluding statement or section that follows from or supports the argument presented.  
| LAFS.910.WHST.1.2: | Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes.  
| a. Introduce a topic and organize ideas, concepts, and information to make important connections and distinctions; include formatting (e.g., headings), graphics (e.g., figures, tables), and multimedia when useful to aiding comprehension.  
| b. Develop the topic with well-chosen, relevant, and sufficient facts, extended definitions, concrete details, quotations, or other information and examples appropriate to the audience’s knowledge of the topic.  
| c. Use varied transitions and sentence structures to link the major sections of the text, create cohesion, and clarify the relationships among ideas and concepts.  
| d. Use precise language and domain-specific vocabulary to manage the complexity of the topic and convey a style appropriate to the discipline and context as well as to the expertise of likely readers.  
| e. Establish and maintain a formal style and objective tone while attending to the norms and conventions of the discipline in which they are writing.  
| f. Provide a concluding statement or section that follows from and supports the information or explanation presented (e.g., articulating implications or the significance of the topic).  
| LAFS.910.WHST.2.4: | Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.  
| LAFS.910.WHST.2.5: | Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience.  
| LAFS.910.WHST.2.6: | Use technology, including the Internet, to produce, publish, and update individual or shared writing products, taking advantage of technology’s capacity to link to other information and to display information flexibly and dynamically.  
| LAFS.910.WHST.3.7: | Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation.  
| LAFS.910.WHST.3.8: | Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the usefulness of each source in answering the research question; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and following a standard format for citation.  
| LAFS.910.WHST.3.9: | Draw evidence from informational texts to support analysis, reflection, and research.  
| LAFS.910.WHST.4.10: | Write routinely over extended time frames (time for reflection and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences.  
| MAFS.912.N-Q.1.1: | Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays. ★  
| MAFS.912.N-Q.1.3: | Choose a level of accuracy appropriate to limitations on measurement when reporting quantities. ★  
| MAFS.K12.MP.1.1: | Make sense of problems and persevere in solving them.  
| | Mathematically proficient students start by explaining to themselves the meaning of a problem and looking for entry points to its solution. They analyze given, constraints, relationships, and goals. They make conjectures about the form and meaning of the solution and plan a solution pathway rather than simply jumping into a solution attempt. They consider analogous problems, and try simple cases and simpler forms of the original problem in order to gain insight into its solution. They monitor and evaluate their progress and change course if necessary. Older students might, depending on the context of the problem, transform algebraic expressions or change the viewing window on their graphing calculator to get the information they need. Mathematically proficient students can explain correspondences between equations, verbal descriptions, tables, and graphs or draw diagrams of important features and relationships, graph data, and search for regularity or trends. Younger students might rely on using concrete objects or pictures to help conceptualize and solve a problem. Mathematically proficient students check their answers to problems using a different method, and if they continually ask themselves, “Does this make sense?” They can understand the approaches of others to solving complex problems and identify correspondences between different approaches.  
| Standard Relation to Course: Supporting  
| Reason abstractly and quantitatively.  
| | Mathematically proficient students make sense of quantities and their relationships in problem situations. They bring two complementary abilities to bear on problems involving quantitative relationships: the ability to decontextualize—to abstract a given situation and represent it symbolically and manipulate the representing symbols as if they have a life of their own, without necessarily attending to their referents—and the ability to contextualize, to pause as needed during the manipulation process in order to probe into the referents for the symbols involved. Quantitative reasoning entails habits of creating a coherent representation of the problem at hand; considering the units involved; attending to the meaning of quantities, not just how to compute them; and knowing and flexibly using different properties of operations and objects.  
| Standard Relation to Course: Supporting  
| Construct viable arguments and critique the reasoning of others.  
| | Mathematically proficient students understand and use stated assumptions, definitions, and previously established results in constructing arguments. They make conjectures and build a logical progression of statements to explore the truth of their conjectures. They are able to analyze situations by breaking them into cases, and can recognize and use counterexamples. They justify their conclusions, communicate them to others, and respond to the arguments of others. They reason inductively about data, making plausible arguments that take into account the context from which the data arose. Mathematically proficient students are also able to compare the effectiveness of two plausible arguments, distinguish correct logic or reasoning from that which is flawed, and—if there is a flaw in an argument—explain what it is. Elementary students can construct arguments using concrete referents such as objects, drawings, diagrams, and actions. Such arguments can make sense and be correct, even though they are not generalized or made formal until later grades. Later, students learn to determine domains to which an argument applies. Students at all grades can listen or read arguments using concrete referents and give reasons, between reasons and evidence, and between claim(s) and counterclaims in a discipline-appropriate form and in a manner that anticipates the audience’s knowledge level and concerns.  
| Standard Relation to Course: Supporting  
| Model with mathematics.  
| | Mathematically proficient students can apply the mathematics they know to solve problems arising in everyday life, society, and the workplace. In early grades, this might be as simple as writing an addition equation to describe a situation. In middle grades, a student might apply proportional
### General Course Information and Notes

**GENERAL NOTES**

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contains student performance standards, since the students have previously attempted successful completion of the corresponding course. Additionally, Credit Recovery courses should ONLY be used for credit recovery, grade forgiveness, or remediation for students needing to prepare for an End-of-Course assessment retake.

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- Asking questions (for science) and defining problems (for engineering).
- Developing and using models.
- Planning and carrying out investigations.
- Analyzing and interpreting data.
- Using mathematics, information and computer technology, and computational thinking.
- Constructing explanations (for science) and designing solutions (for engineering).
- Engaging in argument from evidence.
- Obtaining, evaluating, and communicating information.

English Language Development ELD Standards Special Notes Section:

Teachers are required to provide listening, speaking, reading and writing instruction that allows English language learners (ELL) to communicate information, ideas and concepts for academic success in the content area of Science. For the given level of English language proficiency and with visual, graphic, or interactive support, students will interact with grade level words, expressions, sentences and discourse to process or produce language necessary for academic success. The ELD standard should specify a relevant content area concept or topic of study chosen by curriculum developers and teachers which maximizes an ELL’s need for communication and social skills. To access an ELL supporting document which delineates performance definitions and descriptors, please click on the following link:
https://cpalmsmediaprod.blob.core.windows.net/uploads/docs/standards/eld/sc.pdf

GENERAL INFORMATION

Course Number: 2000315
Course Path: Section: Grades PreK to 12 Education Courses > Grade Group: Grades 9 to 12 and Adult Education Courses > Subject: Science > SubSubject: Biological Sciences
Abbreviated Title: BIO 1 CR
Number of Credits: One (1) credit
Course Type: Elective Course
Course Status: Course Approved
Course Length: Credit Recovery (R)
Course Level: 2
Grade Level(s): 9,10,11,12

Educator Certifications

<table>
<thead>
<tr>
<th>Science (Secondary Grades 7-12)</th>
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<tr>
<td>Biology (Grades 6-12)</td>
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<td>Middle Grades General Science (Middle Grades 5-9)</td>
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## Course Standards

<table>
<thead>
<tr>
<th>Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>SC.912.E.7.1:</td>
<td>Analyze the movement of matter and energy through the different biogeochemical cycles, including water and carbon.</td>
</tr>
<tr>
<td>SC.912.L.14.1:</td>
<td>Describe the scientific theory of cells (cell theory) and relate the history of its discovery to the process of science.</td>
</tr>
<tr>
<td>SC.912.L.14.2:</td>
<td>Relate structure to function for the components of plant and animal cells. Explain the role of cell membranes as a highly selective barrier (passive and active transport).</td>
</tr>
<tr>
<td>SC.912.L.14.3:</td>
<td>Compare and contrast the general structures of plant and animal cells. Compare and contrast the general structures of prokaryotic and eukaryotic cells.</td>
</tr>
<tr>
<td>SC.912.L.14.4:</td>
<td>Compare and contrast structure and function of various types of microscopes.</td>
</tr>
<tr>
<td>SC.912.L.14.6:</td>
<td>Explain the significance of genetic factors, environmental factors, and pathogenic agents to health from the perspectives of both individual and public health.</td>
</tr>
<tr>
<td>SC.912.L.14.7:</td>
<td>Relate the structure of each of the major plant organs and tissues to physiological processes.</td>
</tr>
<tr>
<td>SC.912.L.14.26:</td>
<td>Identify the major parts of the brain on diagrams or models.</td>
</tr>
<tr>
<td>SC.912.L.14.36:</td>
<td>Describe the factors affecting blood flow through the cardiovascular system.</td>
</tr>
<tr>
<td>SC.912.L.14.52:</td>
<td>Explain the basic functions of the human immune system, including specific and nonspecific immune response, vaccines, and antibiotics.</td>
</tr>
<tr>
<td>SC.912.L.15.1:</td>
<td>Explain how the scientific theory of evolution is supported by the fossil record, comparative anatomy, comparative embryology, biogeography, molecular biology, and observed evolutionary change.</td>
</tr>
<tr>
<td>SC.912.L.15.4:</td>
<td>Describe how and why organisms are hierarchically classified and based on evolutionary relationships.</td>
</tr>
<tr>
<td>SC.912.L.15.5:</td>
<td>Explain the reasons for changes in how organisms are classified.</td>
</tr>
<tr>
<td>SC.912.L.15.6:</td>
<td>Discuss distinguishing characteristics of the domains and kingdoms of living organisms.</td>
</tr>
<tr>
<td>SC.912.L.15.8:</td>
<td>Describe the scientific explanations of the origin of life on Earth.</td>
</tr>
<tr>
<td>SC.912.L.15.10:</td>
<td>Identify basic trends in hominid evolution from early ancestors six million years ago to modern humans, including brain size, jaw size, language, and manufacture of tools.</td>
</tr>
<tr>
<td>SC.912.L.15.13:</td>
<td>Describe the conditions required for natural selection, including: overproduction of offspring, inherited variation, and the struggle to survive, which result in differential reproductive success.</td>
</tr>
<tr>
<td>SC.912.L.15.14:</td>
<td>Discuss mechanisms of evolutionary change other than natural selection such as genetic drift and gene flow.</td>
</tr>
<tr>
<td>SC.912.L.15.15:</td>
<td>Describe how mutation and genetic recombination increase genetic variation.</td>
</tr>
<tr>
<td>SC.912.L.16.2:</td>
<td>Discuss observed inheritance patterns caused by various modes of inheritance, including dominant, recessive, codominant, sex-linked, polygenic, and multiple alleles.</td>
</tr>
<tr>
<td>SC.912.L.16.3:</td>
<td>Describe the basic process of DNA replication and how it relates to the transmission and conservation of the genetic information.</td>
</tr>
<tr>
<td>SC.912.L.16.4:</td>
<td>Explain how mutations in the DNA sequence may or may not result in phenotypic change. Explain how mutations in gametes may result in phenotypic changes in offspring.</td>
</tr>
<tr>
<td>SC.912.L.16.5:</td>
<td>Explain the basic processes of transcription and translation, and how they result in the expression of genes.</td>
</tr>
<tr>
<td>SC.912.L.16.8:</td>
<td>Explain the relationship between mutation, cell cycle, and uncontrolled cell growth potentially resulting in cancer.</td>
</tr>
<tr>
<td>SC.912.L.16.9:</td>
<td>Explain how and why the genetic code is universal and is common to almost all organisms.</td>
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<tr>
<td>SC.912.L.16.10:</td>
<td>Evaluate the impact of biotechnology on the individual, society and the environment, including medical and ethical issues.</td>
</tr>
<tr>
<td>SC.912.L.16.13:</td>
<td>Describe the basic anatomy and physiology of the human reproductive system. Describe the process of human development from fertilization to birth and major changes that occur in each trimester of pregnancy.</td>
</tr>
<tr>
<td>SC.912.L.16.14:</td>
<td>Describe the cell cycle, including the process of mitosis. Explain the role of mitosis in the formation of new cells and its importance in maintaining chromosome number during asexual reproduction.</td>
</tr>
<tr>
<td>SC.912.L.16.16:</td>
<td>Describe the process of meiosis, including independent assortment and crossing over. Explain how reduction division results in the formation of haploid gametes or spores.</td>
</tr>
<tr>
<td>SC.912.L.16.17:</td>
<td>Compare and contrast mitosis and meiosis and relate to the processes of sexual and asexual reproduction and their consequences for genetic variation.</td>
</tr>
<tr>
<td>SC.912.L.17.2:</td>
<td>Explain the general distribution of life in aquatic systems as a function of chemistry, geography, light, depth, salinity, and temperature.</td>
</tr>
<tr>
<td>SC.912.L.17.4:</td>
<td>Describe changes in ecosystems resulting from seasonal variations, climate change and succession.</td>
</tr>
<tr>
<td>SC.912.L.17.5:</td>
<td>Analyze how population size is determined by births, deaths, immigration, emigration, and limiting factors (biotic and abiotic) that determine carrying capacity.</td>
</tr>
<tr>
<td>SC.912.L.17.8:</td>
<td>Recognize the consequences of the losses of biodiversity due to catastrophic events, climate changes, human activity, and the introduction of invasive, non-native species.</td>
</tr>
<tr>
<td>SC.912.L.17.9:</td>
<td>Use a food web to identify and distinguish producers, consumers, and decomposers. Explain the pathway of energy transfer through trophic levels and the reduction of available energy at successive trophic levels.</td>
</tr>
<tr>
<td>SC.912.L.17.11:</td>
<td>Evaluate the costs and benefits of renewable and nonrenewable resources, such as water, energy, fossil fuels, wildlife, and forests.</td>
</tr>
<tr>
<td>SC.912.L.17.13:</td>
<td>Discuss the need for adequate monitoring of environmental parameters when making policy decisions.</td>
</tr>
<tr>
<td>SC.912.L.17.20:</td>
<td>Predict the impact of individuals on environmental systems and examine how human lifestyles affect sustainability.</td>
</tr>
<tr>
<td>SC.912.L.18.1:</td>
<td>Describe the basic molecular structures and primary functions of the four major categories of biological macromolecules.</td>
</tr>
<tr>
<td>SC.912.L.18.7:</td>
<td>Identify the reactants, products, and basic functions of photosynthesis.</td>
</tr>
<tr>
<td>SC.912.L.18.8:</td>
<td>Identify the reactants, products, and basic functions of aerobic and anaerobic cellular respiration.</td>
</tr>
<tr>
<td>SC.912.L.18.9:</td>
<td>Explain the interrelated nature of photosynthesis and cellular respiration.</td>
</tr>
<tr>
<td>SC.912.L.18.10:</td>
<td>Connect the role of adenosine triphosphate (ATP) to energy transfers within a cell.</td>
</tr>
<tr>
<td>SC.912.L.18.11:</td>
<td>Explain the role of enzymes as catalysts that lower the activation energy of biochemical reactions. Identify factors, such as pH and temperature, and their effect on enzyme activity.</td>
</tr>
</tbody>
</table>
Discuss the special properties of water that contribute to Earth's suitability as an environment for life: cohesive behavior, ability to moderate temperature, expansion upon freezing, and versatility as a solvent.

1. **Pose questions about the natural world.** (Articulate the purpose of the investigation and identify the relevant scientific concepts).
2. **Conduct systematic observations.** (Write procedures that are clear and replicable. Identify observables and examine relationships between test (independent) variable and outcome (dependent) variable. Employ appropriate methods for accurate and consistent observations; conduct and record measurements at appropriate levels of precision. Follow safety guidelines).
3. **Examine books and other sources of information to see what is already known.**
4. **Review what is known in light of empirical evidence.** (Examine whether available empirical evidence can be interpreted in terms of existing knowledge and models, and if not, modify or develop new models).
5. **Plan investigations.** (Design and evaluate a scientific investigation).
6. **Use tools to gather, analyze, and interpret data** (this includes the use of measurement in metric and other systems, and also the generation and interpretation of graphical representations of data, including data tables and graphs). (Collect data or evidence in an organized way. Properly use instruments, equipment, and materials (e.g., scales, probeware, meter sticks, microscopes, computers) including setup, calibration, technique, maintenance, and storage).
7. **Pose answers, explanations, or descriptions of events.**
8. **Generate explanations that explicate or describe natural phenomena (inferences).**
9. **Use appropriate evidence and reasoning to justify these explanations to others,**
10. **Communicate results of scientific investigations, and**
11. **Evaluate the merits of the explanations produced by others.**

**Mathematicians who complete tasks with mathematical fluency:**
- Complete tasks with mathematical fluency.
- Select efficient and appropriate methods for solving problems within the given context.
- Maintain flexibility and accuracy while performing procedures and mental calculations.
- Complete tasks accurately and with confidence.
- Adapt procedures to apply them to a new context.
- Use feedback to improve efficiency when performing calculations.

**Mathematicians who demonstrate understanding by representing problems in multiple ways:**
- Build understanding through modeling and using manipulatives.
- Represent solutions to problems in multiple ways using objects, drawings, tables, graphs and equations.
- Progress from modeling problems with objects and drawings to using algorithms and equations.
- Express connections between concepts and representations.
- Choose a representation based on the given context or purpose.

**Mathematicians who participate in effortful learning both individually and with others:**
- Analyze the problem in a way that makes sense given the task.
- Ask questions that will help with solving the task.
- Build perseverance by modifying methods as needed while solving a challenging task.
- Stay engaged and maintain a positive mindset when working to solve tasks.
- Help and support each other when attempting a new method or approach.

**Mathematicians who participate in effortful learning both individually and with others:**
- Cultivate a community of growth mindset learners.
- Foster perseverance in students by choosing tasks that are challenging.
- Develop students' ability to analyze and problem solve.
- Recognize students' effort when solving challenging problems.

**Teachers who encourage students to participate actively in effortful learning both individually and with others:**
- Demonstrate understanding by representing problems in multiple ways.
- Help students make connections between concepts and representations.
- Provide opportunities for students to use manipulatives when investigating concepts.
- Guide students from concrete to pictorial to abstract representations as understanding progresses.
- Show students that various representations can have different purposes and can be useful in different situations.

**Teachers who encourage students to reflect on the method they used and determine if a more efficient method could have been used:**
- Offer multiple opportunities for students to practice efficient and generalizable methods.
- Provide opportunities for students to reflect on the method they used and determine if a more efficient method could have been used.
Engage in discussions that reflect on the mathematical thinking of self and others. Mathematicians who engage in discussions that reflect on the mathematical thinking of self and others:

- Communicate mathematical ideas, vocabulary and methods effectively.
- Analyze the mathematical thinking of others.
- Compare the efficiency of a method to those expressed by others.
- Recognize errors and suggest how to correctly solve the task.
- Justify results by explaining methods and processes.
- Construct possible arguments based on evidence.

**Clarifications:**

Teachers who encourage students to engage in discussions that reflect on the mathematical thinking of self and others:

- Establish a culture in which students ask questions of the teacher and their peers, and error is an opportunity for learning.
- Create opportunities for students to discuss their thinking with peers.
- Select, sequence and present student work to advance and deepen understanding of correct and increasingly efficient methods.
- Develop students’ ability to justify methods and compare their responses to the responses of their peers.

Use patterns and structure to help understand and connect mathematical concepts. Mathematicians who use patterns and structure to help understand and connect mathematical concepts:

- Focus on relevant details within a problem.
- Create plans and procedures to logically order events, steps or ideas to solve problems.
- Decompose a complex problem into manageable parts.
- Relate previously learned concepts to new concepts.
- Look for similarities among problems.
- Connect solutions of problems to more complicated large-scale situations.

**Clarifications:**

Teachers who encourage students to use patterns and structure to help understand and connect mathematical concepts:

- Help students recognize the patterns in the world around them and connect these patterns to mathematical concepts.
- Support students to develop generalizations based on the similarities found among problems.
- Provide opportunities for students to create plans and procedures to solve problems.
- Develop students’ ability to construct relationships between their current understanding and more sophisticated ways of thinking.

Assess the reasonableness of solutions. Mathematicians who assess the reasonableness of solutions:

- Estimate to discover possible solutions.
- Use benchmark quantities to determine if a solution makes sense.
- Check calculations when solving problems.
- Verify possible solutions by explaining the methods used.
- Evaluate results based on the given context.

**Clarifications:**

Teachers who encourage students to assess the reasonableness of solutions:

- Have students estimate or predict solutions prior to solving.
- Prompt students to continually ask, “Does this solution make sense? How do you know?”
- Reinforce that students check their work as they progress within and after a task.
- Strengthen students’ ability to verify solutions through justifications.

Apply mathematics to real-world contexts. Mathematicians who apply mathematics to real-world contexts:

- Connect mathematical concepts to everyday experiences.
- Use models and methods to understand, represent and solve problems.
- Perform investigations to gather data or determine if a method is appropriate.
- Redesign models and methods to improve accuracy or efficiency.

**Clarifications:**

Teachers who encourage students to apply mathematics to real-world contexts:

- Provide opportunities for students to create models, both concrete and abstract, and perform investigations.
- Challenge students to question the accuracy of their models and methods.
- Support students as they validate conclusions by comparing them to the given situation.
- Indicate how various concepts can be applied to other disciplines.

Cite evidence to explain and justify reasoning.

**Clarifications:**

K-1 Students include textual evidence in their oral communication with guidance and support from adults. The evidence can consist of details from the text without naming the text. During 1st grade, students learn how to incorporate the evidence in their writing.

2-3 Students include relevant textual evidence in their written and oral communication. Students should name the text when they refer to it. In 3rd grade, students should use a combination of direct and indirect citations.

4-5 Students continue with previous skills and reference comments made by speakers and peers. Students cite texts that they’ve directly quoted, paraphrased, or used for information. When writing, students will use the form of citation dictated by the instructor or the style guide referenced by the instructor.

6-8 Students continue with previous skills and use a style guide to create a proper citation.

9-12 Students continue with previous skills and should be aware of existing style guides and the ways in which they differ.
Read and comprehend grade-level complex texts proficiently.

Clarifications:
See Text Complexity for grade-level complexity bands and a text complexity rubric.

Make inferences to support comprehension.

Clarifications:
Students will make inferences before the words infer or inference are introduced. Kindergarten students will answer questions like “Why is the girl smiling?” or make predictions about what will happen based on the title page. Students will use the terms and apply them in 2nd grade and beyond.

Use collaborative techniques and active listening skills when engaging in discussions in a variety of situations.

Clarifications:
In kindergarten, students learn to listen to one another respectfully. In grades 1-2, students build upon these skills by justifying what they are thinking. For example: “I think ______ because ______.” The collaborative conversations are becoming academic conversations.

In grades 3-12, students engage in academic conversations discussing claims and justifying their reasoning, refining and applying skills. Students build on ideas, propel the conversation, and support claims and counterclaims with evidence.

Use the accepted rules governing a specific format to create quality work.

Clarifications:
Students will incorporate skills learned into work products to produce quality work. For students to incorporate these skills appropriately, they must receive instruction. A 3rd grade student creating a poster board display must have instruction in how to effectively present information to do quality work.

Use appropriate voice and tone when speaking or writing.

Clarifications:
In kindergarten and 1st grade, students learn the difference between formal and informal language. For example, the way we talk to our friends differs from the way we speak to adults. In 2nd grade and beyond, students practice appropriate social and academic language to discuss texts.

Evaluate how environment and personal health are interrelated.

Clarifications:
Food options within a community; prenatal-care services; availability of recreational facilities; air quality; weather-safety awareness; and weather, air, and water conditions.

Analyze strategies for prevention, detection, and treatment of communicable and chronic diseases.

Clarifications:
Health prevention, detection, and treatment of: breast and testicular cancer, suicide, obesity, and industrial-related chronic disease.

Analyze how heredity and family history can impact personal health.

Clarifications:
Drug use, family obesity, heart disease, mental health, and non-communicable illness or disease.

English language learners communicate information, ideas and concepts necessary for academic success in the content area of Science.

Clarifications:
Emphasizing students supporting answers based upon evidence from the text.

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• Obtaining, evaluating, and communicating information.

Florida's Benchmarks for Excellent Student Thinking (B.E.S.T.) Standards
This course includes Florida’s B.E.S.T. ELA Expectations (EE) and Mathematical Thinking and Reasoning Standards (MTRs) for students. Florida educators should intentionally embed these standards within the content and their instruction as applicable. For guidance on the implementation of the EEs and MTRs, please visit https://www.cpalms.org/Standards/BEST_Standards.aspx and select the appropriate B.E.S.T. Standards package.

English Language Development ELD Standards Special Notes Section:
Teachers are required to provide listening, speaking, reading and writing instruction that allows English language learners (ELL) to communicate information, ideas and concepts for academic success in the content area of Science. For the given level of English language proficiency and with visual, graphic, or interactive support, students will interact with grade level words, expressions, sentences and discourse to process or produce language necessary for academic success. The ELD standard should specify a relevant content area concept or topic of study chosen by curriculum developers and teachers which maximizes an ELL’s need for communication and social skills. To access an ELL supporting document which delineates performance definitions and descriptors, please click on the following link: https://cpalmsmediaprod.blob.core.windows.net/uploads/docs/standards/eld/sc.pdf

GENERAL INFORMATION

Course Number: 2000315
Course Path: Courses > Grade Group: Grades 9 to 12 and Adult Education Courses > Subject: Science > SubSubject: Biological Sciences
Abbreviated Title: BIO 1 CR
Course Length: Credit Recovery (R)
Course Level: 2

Number of Credits: One (1) credit
Course Type: Elective Course
Course Status: State Board Approved
Grade Level(s): 9,10,11,12

Educator Certifications
Science (Secondary Grades 7-12)
Biology (Grades 6-12)
Middle Grades General Science (Middle Grades 5-9)
### Course Standards

<table>
<thead>
<tr>
<th>Name</th>
<th>Description</th>
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<tbody>
<tr>
<td>SC.912.E.7.1:</td>
<td>Analyze the movement of matter and energy through the different biogeochemical cycles, including water and carbon.</td>
</tr>
<tr>
<td>SC.912.L.14.1:</td>
<td>Describe the scientific theory of cells (cell theory) and relate the history of its discovery to the process of science.</td>
</tr>
<tr>
<td>SC.912.L.14.2:</td>
<td>Relate structure to function for the components of plant and animal cells. Explain the role of cell membranes as a highly selective barrier (passive and active transport).</td>
</tr>
<tr>
<td>SC.912.L.14.3:</td>
<td>Compare and contrast the general structures of plant and animal cells. Compare and contrast the general structures of prokaryotic and eukaryotic cells.</td>
</tr>
<tr>
<td>SC.912.L.14.4:</td>
<td>Compare and contrast structure and function of various types of microscopes.</td>
</tr>
<tr>
<td>SC.912.L.14.5:</td>
<td>Explain the evidence supporting the scientific theory of the origin of eukaryotic cells (endosymbiosis).</td>
</tr>
<tr>
<td>SC.912.L.14.6:</td>
<td>Explain the significance of genetic factors, environmental factors, and pathogenic agents to health from the perspectives of both individual and public health.</td>
</tr>
<tr>
<td>SC.912.L.14.7:</td>
<td>Relate the structure of each of the major plant organs and tissues to physiological processes.</td>
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<tr>
<td>SC.912.L.14.26:</td>
<td>Identify the major parts of the brain on diagrams or models.</td>
</tr>
<tr>
<td>SC.912.L.14.27:</td>
<td>Identify the functions of the major parts of the brain, including the meninges, medulla, pons, midbrain, hypothalamus, thalamus, cerebellum, and cerebrum.</td>
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<tr>
<td>SC.912.L.14.36:</td>
<td>Describe the factors affecting blood flow through the cardiovascular system.</td>
</tr>
<tr>
<td>SC.912.L.14.52:</td>
<td>Explain the basic functions of the human immune system, including specific and nonspecific immune response, vaccines, and antibiotics.</td>
</tr>
<tr>
<td>SC.912.L.15.1:</td>
<td>Explain how the scientific theory of evolution is supported by the fossil record, comparative anatomy, comparative embryology, biogeography, molecular biology, and observed evolutionary change.</td>
</tr>
<tr>
<td>SC.912.L.15.2:</td>
<td>Discuss the use of molecular clocks to estimate how long ago various groups of organisms diverged evolutionarily from one another.</td>
</tr>
<tr>
<td>SC.912.L.15.3:</td>
<td>Describe how biological diversity is increased by the origin of new species and how it is decreased by the natural process of extinction.</td>
</tr>
<tr>
<td>SC.912.L.15.4:</td>
<td>Describe how and why organisms are hierarchically classified and based on evolutionary relationships.</td>
</tr>
<tr>
<td>SC.912.L.15.5:</td>
<td>Explain the reasons for changes in how organisms are classified.</td>
</tr>
<tr>
<td>SC.912.L.15.6:</td>
<td>Discuss distinguishing characteristics of the domains and kingdoms of living organisms.</td>
</tr>
<tr>
<td>SC.912.L.15.8:</td>
<td>Describe the scientific explanations of the origin of life on Earth.</td>
</tr>
<tr>
<td>SC.912.L.15.10:</td>
<td>Identify basic trends in hominid evolution from early ancestors six million years ago to modern humans, including brain size, jaw size, language, and manufacture of tools.</td>
</tr>
<tr>
<td>SC.912.L.15.13:</td>
<td>Describe the conditions required for natural selection, including: overproduction of offspring, inherited variation, and the struggle to survive, which result in differential reproductive success.</td>
</tr>
<tr>
<td>SC.912.L.15.14:</td>
<td>Discuss mechanisms of evolutionary change other than natural selection such as genetic drift and gene flow.</td>
</tr>
<tr>
<td>SC.912.L.15.15:</td>
<td>Describe how mutation and genetic recombination increase genetic variation.</td>
</tr>
<tr>
<td>SC.912.L.16.2:</td>
<td>Discuss observed inheritance patterns caused by various modes of inheritance, including dominant, recessive, codominant, sex-linked, polygenic, and multiple alleles.</td>
</tr>
<tr>
<td>SC.912.L.16.3:</td>
<td>Describe the basic process of DNA replication and how it relates to the transmission and conservation of the genetic information.</td>
</tr>
<tr>
<td>SC.912.L.16.4:</td>
<td>Explain how mutations in the DNA sequence may or may not result in phenotypic change. Explain how mutations in gametes may result in phenotypic changes in offspring.</td>
</tr>
<tr>
<td>SC.912.L.16.5:</td>
<td>Explain the basic processes of transcription and translation, and how they result in the expression of genes.</td>
</tr>
<tr>
<td>SC.912.L.16.8:</td>
<td>Explain the relationship between mutation, cell cycle, and uncontrolled cell growth potentially resulting in cancer.</td>
</tr>
<tr>
<td>SC.912.L.16.9:</td>
<td>Explain how and why the genetic code is universal and is common to almost all organisms.</td>
</tr>
<tr>
<td>SC.912.L.16.10:</td>
<td>Evaluate the impact of biotechnology on the individual, society, and the environment, including medical and ethical issues.</td>
</tr>
<tr>
<td>SC.912.L.16.12:</td>
<td>Describe how basic DNA technology (restriction digestion by endonucleases, gel electrophoresis, polymerase chain reaction, ligation, and transformation) is used to construct recombinant DNA molecules (DNA cloning).</td>
</tr>
<tr>
<td>SC.912.L.16.13:</td>
<td>Describe the basic anatomy and physiology of the human reproductive system. Describe the process of human development from fertilization to birth and major changes that occur in each trimester of pregnancy.</td>
</tr>
<tr>
<td>SC.912.L.16.14:</td>
<td>Describe the cell cycle, including the process of mitosis. Explain the role of mitosis in the formation of new cells and its importance in maintaining chromosome number during asexual reproduction.</td>
</tr>
<tr>
<td>SC.912.L.16.15:</td>
<td>Compare and contrast binary fission and mitotic cell division.</td>
</tr>
<tr>
<td>SC.912.L.16.16:</td>
<td>Describe the process of meiosis, including independent assortment and crossing over. Explain how reduction division results in the formation of haploid gametes or spores.</td>
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<tr>
<td>SC.912.L.16.17:</td>
<td>Compare and contrast mitosis and meiosis and relate to the processes of sexual and asexual reproduction and their consequences for genetic variation.</td>
</tr>
<tr>
<td>SC.912.L.17.2:</td>
<td>Explain the general distribution of life in aquatic systems as a function of chemistry, geography, light, depth, salinity, and temperature.</td>
</tr>
<tr>
<td>SC.912.L.17.4:</td>
<td>Describe changes in ecosystems resulting from seasonal variations, climate change and succession.</td>
</tr>
<tr>
<td>SC.912.L.17.5:</td>
<td>Analyze how population size is determined by births, deaths, immigration, emigration, and limiting factors (biotic and abiotic) that determine carrying capacity.</td>
</tr>
<tr>
<td>SC.912.L.17.8:</td>
<td>Recognize the consequences of the losses of biodiversity due to catastrophic events, climate changes, human activity, and the introduction of invasive, non-native species.</td>
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<tr>
<td>SC.912.L.17.9:</td>
<td>Use a food web to identify and distinguish producers, consumers, and decomposers. Explain the pathway of energy transfer through trophic levels and the reduction of available energy at successive trophic levels.</td>
</tr>
<tr>
<td>SC.912.L.17.11:</td>
<td>Evaluate the costs and benefits of renewable and nonrenewable resources, such as water, energy, fossil fuels, wildlife, and forests.</td>
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</table>
Discuss the large-scale environmental impacts resulting from human activity, including waste spills, oil spills, runoff, greenhouse gases, ozone depletion, and surface and groundwater pollution.

**SC.912.L.17.16:**

Predict the impact of individuals on environmental systems and examine how human lifestyles affect sustainability.

**SC.912.L.17.20:**

Describe the basic molecular structures and primary functions of the four major categories of biological macromolecules.

**SC.912.L.18.1:**

Describe the important structural characteristics of monosaccharides, disaccharides, and polysaccharides and explain the functions of carbohydrates in living things.

**SC.912.L.18.2:**

Describe the structures of fatty acids, triglycerides, phospholipids, and steroids. Explain the functions of lipids in living organisms. Identify some reactions that fatty acids undergo. Relate the structure and function of cell membranes.

**SC.912.L.18.3:**

Describe the structures of proteins and amino acids. Explain the functions of proteins in living organisms. Identify some reactions that amino acids undergo. Relate the structure and function of enzymes.

**SC.912.L.18.4:**

Identify the reactants, products, and basic functions of photosynthesis.

**SC.912.L.18.7:**

Identify the reactants, products, and basic functions of aerobic and anaerobic cellular respiration.

**SC.912.L.18.8:**

Describe the structures of proteins and amino acids. Explain the functions of lipids in living organisms. Identify some reactions that amino acids undergo. Relate the structure and function of enzymes.

**SC.912.L.18.9:**

Explain the interrelated nature of photosynthesis and cellular respiration.

**SC.912.L.18.10:**

Connect the role of adenosine triphosphate (ATP) to energy transfers within a cell.

**SC.912.L.18.11:**

Discuss the special properties of water that contribute to Earth's suitability as an environment for life: cohesive behavior, ability to moderate temperature, expansion upon freezing, and versatility as a solvent.

**SC.912.L.18.12:**

Define a problem based on a specific body of knowledge, for example: biology, chemistry, physics, and earth/space science, and do the following:

1. **SC.912.N.1.1:**
   - Pose questions about the natural world. (Articulate the purpose of the investigation and identify the relevant scientific concepts.)
2. **SC.912.N.1.2:**
   - Conduct systematic observations. (Write procedures that are clear and replicable. Identify observables and examine relationships between test variables and outcomes.)
3. **SC.912.N.1.3:**
   - Examine books and other sources of information to see what is already known.
4. **SC.912.N.1.4:**
   - Review what is known in light of empirical evidence. (Examine whether available empirical evidence can be interpreted in terms of existing knowledge and models, and if not, modify or develop new models.)
5. **SC.912.N.1.5:**
   - Plan investigations. (Design and evaluate a scientific investigation.)
6. **SC.912.N.1.6:**
   - Use tools to gather, analyze, and interpret data (this includes the use of measurement in metric and other systems, and also the generation and interpretation of graphical representations of data, including data tables and graphs). (Collect data or evidence in an organized way. Properly use instruments, equipment, and materials (e.g., scales, probeware, meter sticks, microscopes, computers) including set-up, calibration, technique, maintenance, and storage.)
7. **SC.912.N.1.7:**
   - Pose answers, explanations, or descriptions of events.
8. **SC.912.N.1.8:**
   - Generate explanations that explicate or describe natural phenomena (inferences).
9. **SC.912.N.1.9:**
   - Use appropriate evidence and reasoning to justify these explanations to others.
10. **SC.912.N.1.10:**
    - Communicate results of scientific investigations, and
11. **SC.912.N.1.11:**
    - Evaluate the merits of the explanations produced by others.

**SC.912.N.1.13:**

Recognize that the strength or usefulness of a scientific claim is evaluated through scientific argumentation, which depends on critical and logical thinking, and the active consideration of alternative scientific explanations to explain the data presented.

**SC.912.N.1.14:**

Identify sources of information and assess their reliability according to the strict standards of scientific investigation.

**SC.912.N.1.16:**

Describe how scientific inferences are drawn from scientific observations and provide examples from the content being studied.

**SC.912.N.2.1:**

Identify what is science, what clearly is not science, and what superficially resembles science (but fails to meet the criteria for science).

**SC.912.N.2.2:**

Identify which questions can be answered through science and which questions are outside the boundaries of scientific investigation, such as questions addressed by other ways of knowing, such as art, philosophy, and religion.

**SC.912.N.2.4:**

Explain that scientific knowledge is both durable and robust and open to change. Scientific knowledge can change because it is often examined and re-examined by new investigations and scientific argumentation. Because of these frequent examinations, scientific knowledge becomes stronger, leading to its durability.

**SC.912.N.3.1:**

Explain that a scientific theory is the culmination of many scientific investigations drawing together all the current evidence concerning a substantial range of phenomena; thus, a scientific theory represents the most powerful explanation scientists have to offer.

**SC.912.N.3.4:**

Recognize that theories do not become laws, nor do laws become theories; theories are well supported explanations and laws are well supported descriptions.

**SC.912.P.8.7:**

Interpret formula representations of molecules and compounds in terms of composition and structure.

**SC.912.P.10.1:**

Differentiate among the various forms of energy and recognize that they can be transformed from one form to another.

**LAFS.910.RST.1.1:**

Cite specific textual evidence to support analysis of science and technical texts, attending to the precise details of explanations or descriptions.

**LAFS.910.RST.1.2:**

Determine the central ideas or conclusions of a text; trace the text's explanation or depiction of a complex process, phenomenon, or concept; provide an accurate summary of the text.

**LAFS.910.RST.1.3:**

Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks, attending to special cases or exceptions defined in the text.

**LAFS.910.RST.2.4:**

Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 9–10 texts and topics.

**LAFS.910.RST.2.5:**

Analyze the structure of the relationships among concepts in a text, including relationships among key terms (e.g., force, friction, reaction force, energy).

**LAFS.910.RST.2.6:**

Analyze the author's purpose in providing an explanation, describing a procedure, or discussing an experiment in a text, defining the question the author seeks to address.

**LAFS.910.RST.3.7:**

Translate quantitative or technical information expressed in words in a text into visual form (e.g., a table or chart) and translate information expressed visually or mathematically (e.g., in an equation) into words.

**LAFS.910.RST.3.8:**

Assess the extent to which the reasoning and evidence in a text support the author's claim or a recommendation for solving a scientific or technical problem.

**LAFS.910.RST.3.9:**

Compare and contrast findings presented in a text to those from other sources (including their own experiments), noting when the findings support or contradict previous explanations or accounts.

**LAFS.910.RST.4.10:**

By the end of grade 10, read and comprehend science/technical texts in the grades 9–10 text complexity band independently and proficiently.

Initiate and participate effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grades 9–10 texts and topics, attending to such elements as purpose, audience, margin of error, points of agreement and disagreement, and implications for the claims being advanced.

**LAFS.910.RST.4.1:**

Hold others accountable for their ideas, reasoning, and evidence.

**LAFS.910.RST.4.2:**

Draw evidence from a text to support answers to questions about what a text says explicitly or implicitly; make logical inferences about what the text makes explicit;

**LAFS.910.RST.4.3:**

Determine the meaning of general academic and domain-specific words or phrases in context.

**LAFS.910.RST.4.4:**

Determine the meaning of general academic and domain-specific words or phrases in context.
Integrate multiple sources of information presented in diverse media or formats (e.g., visually, quantitatively, orally) evaluating the credibility and accuracy of each source.

Evaluate a speaker's point of view, reasoning, and use of evidence and rhetoric, identifying any fallacious reasoning or exaggerated or distorted evidence.

Present information, findings, and supporting evidence clearly, concisely, and logically such that listeners can follow the line of reasoning and the organization, development, substance, and style are appropriate to purpose, audience, and task.

Make strategic use of digital media (e.g., textual, graphical, audio, visual, and interactive elements) in presentations to enhance understanding of findings, reasoning, and evidence and to add interest.

Write arguments focused on discipline-specific content:
- Introduce precise claim(s), distinguish the claim(s) from alternate or opposing claims, and create an organization that establishes clear relationships among the claim(s), counterclaims, reasons, and evidence.
- Develop claim(s) and counterclaim(s) fairly, supplying data and evidence for each while pointing out the strengths and limitations of both claim(s) and counterclaim(s) in a discipline-appropriate form and in a manner that anticipates the audience's knowledge level and concerns.
- Use words, phrases, and clauses to link the major sections of the text, create cohesion, and clarify the relationships between claim(s) and reasons, between reasons and evidence, and between claim(s) and counterclaim(s).
- Establish and maintain a formal style and objective tone while attending to the norms and conventions of the discipline in which they are writing.
- Provide a concluding statement or section that follows from or supports the argument presented.

Write informative/explanatory texts, including the narration of historical events, scientific procedures/experiments, or technical processes:
- Introduce a topic and organize ideas, concepts, and information to make important connections and distinctions; include formatting (e.g., headings), graphics (e.g., figures, tables), and multimedia when useful to aiding comprehension.
- Develop the topic with well-chosen, relevant, and sufficient facts, extended definitions, concrete details, quotations, or other information and examples appropriate to the audience's knowledge of the topic.
- Use varied transitions and sentence structures to link the major sections of the text, create cohesion, and clarify the relationships among ideas and concepts.
- Use precise language and domain-specific vocabulary to manage the complexity of the topic and convey a style appropriate to the discipline and context as well as to the expertise of likely readers.
- Establish and maintain a formal style and objective tone while attending to the norms and conventions of the discipline in which they are writing.
- Provide a concluding statement or section that follows from and supports the information or explanation presented (e.g., articulating implications or the significance of the topic).

Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.

Use technology, including the Internet, to produce, publish, and update individual or shared writing products, taking advantage of technology's capacity to link to other information and to display information flexibly and dynamically.

Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation.

Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the usefulness of each source in answering the research question; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and following a standard format for citation.

Draw evidence from informational texts to support analysis, reflection, and research.

Write routinely over extended time frames (time for reflection and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences.

For a function that models a relationship between two quantities, interpret key features of graphs and tables in terms of the quantities, and sketch graphs showing key features given a verbal description of the relationship. Key features include intercepts; intervals where the function is increasing, decreasing, positive, or negative; relative maximums and minimums; symmetries; end behavior; and periodicity.

- Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases.

- Graph linear and quadratic functions and show intercepts, maxima, and minima.
- Graph square root, cube root, and piecewise-defined functions, including step functions and absolute value functions.
- Graph polynomial functions, identifying zeros when suitable factorizations are available, and showing end behavior.
- Graph rational functions, identifying zeros and asymptotes when suitable factorizations are available, and showing end behavior.
- Graph exponential and logarithmic functions, showing intercepts and end behavior, and trigonometric functions, showing period, midline, and amplitude, and using phase shift.

Apply concepts of density based on area and volume in modeling situations (e.g., persons per square mile, BTUs per cubic foot).

Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays.

Choose a level of accuracy appropriate to limitations on measurement when reporting quantities.

Evaluate reports based on data.

Represent data with plots on the real number line (dot plots, histograms, and box plots).
**MAFS.912.S-ID.1.1:** Clarifications: In grades 6–8, students describe center and spread in a data distribution. Here they choose a summary statistic appropriate to the characteristics of the data distribution, such as the shape of the distribution or the existence of extreme data points.

Use statistics appropriate to the shape of the data distribution to compare center (median, mean) and spread (interquartile range, standard deviation) of two or more different data sets. ★

**MAFS.912.S-ID.1.2:** Clarifications: In grades 6–8, students describe center and spread in a data distribution. Here they choose a summary statistic appropriate to the characteristics of the data distribution, such as the shape of the distribution or the existence of extreme data points.

Interpret differences in shape, center, and spread in the context of the data sets, accounting for possible effects of extreme data points (outliers). ★

**MAFS.912.S-ID.1.3:** Clarifications: In grades 6–8, students describe center and spread in a data distribution. Here they choose a summary statistic appropriate to the characteristics of the data distribution, such as the shape of the distribution or the existence of extreme data points.

Use the mean and standard deviation of a data set to fit it to a normal distribution and to estimate population percentages. Recognize that there are data sets for which such a procedure is not appropriate. Use calculators, spreadsheets, and tables to estimate areas under the normal curve. ★

**MAFS.912.S-ID.1.4:** Use categorical data for two categories in two-way frequency tables. Interpret relative frequencies in the context of the data (including joint, marginal, and conditional relative frequencies). Recognize possible associations and trends in the data. ★

**MAFS.912.S-ID.1.5:** Make sense of problems and persevere in solving them.

Mathematically proficient students start by explaining to themselves the meaning of a problem and looking for entry points to its solution. They analyze givens, constraints, relationships, and goals. They make conjectures about the form and meaning of the solution and plan a solution pathway rather than simply jumping into a solution attempt. They consider analogous problems, and try special cases and simpler forms of the original problem in order to gain insight into its solution. They monitor and evaluate their progress and change course if necessary. Older students might, depending on the context of the problem, transform algebraic expressions or change the viewing window on their graphing calculator to get the information they need. Mathematically proficient students can explain correspondences between equations, verbal descriptions, tables, and graphs or draw diagrams of important features and relationships, graph data, and search for regularity or trends. Younger students might rely on using concrete objects or pictures to help conceptualize and solve a problem. Mathematically proficient students check their answers to problems using a different method, and they continually ask themselves, "Does this make sense?" They can understand the approaches of others to solving complex problems and identify correspondences between different approaches.

**Standard Relation to Course: Supporting**

**MAFS.K12.MP.1.1:** Reason abstractly and quantitatively.

Mathematically proficient students make sense of quantities and their relationships in problem situations. They bring two complementary abilities to bear on problems involving quantitative relationships: the ability to decontextualize—to abstract a given situation and represent it symbolically and manipulate the representations as if they have a life of their own, without necessarily attending to their referents—and the ability to contextualize, to pause as needed during the manipulation process in order to probe into the referents for the symbols involved. Quantitative reasoning entail habits of creating a coherent representation of the problem at hand; considering the units involved; attending to the meaning of quantities, not just how to compute them; and knowing and flexibly using different properties of operations and objects.

**Standard Relation to Course: Supporting**

**MAFS.K12.MP.2.1:** Construct viable arguments and critique the reasoning of others.

Mathematically proficient students understand and use stated assumptions, definitions, and previously established results in constructing arguments. They make conjectures and build a logical progression of statements to explore the truth of their conjectures. They are able to analyze situations by breaking them into cases, and can recognize and use counterexamples. They justify their conclusions, communicate them to others, and respond to the arguments of others. They reason inductively about data, making plausible arguments that take into account the context from which the data arose. Mathematically proficient students are also able to compare the effectiveness of two plausible arguments, distinguish correct logic or reasoning from that which is flawed, and—if there is a flaw in an argument—explain what it is. Elementary students can construct arguments using concrete referents such as objects, drawings, diagrams, and actions. Such arguments can make sense and be correct, even though they are not generalized or made formal until later grades. Later, students learn to determine domains to which an argument applies. Students at all grades can listen or read the arguments of others, decide whether they make sense, and ask useful questions to clarify or improve the arguments.

**Standard Relation to Course: Supporting**

**MAFS.K12.MP.3.1:** Model with mathematics.

Mathematically proficient students can apply the mathematics they know to solve problems arising in everyday life, society, and the workplace. In early grades, this might be as simple as writing an addition equation to describe a situation. In middle grades, a student might apply proportional reasoning to plan a school event or analyze a problem in the community. By high school, a student might use geometry software. Older students might use function to describe how one quantity changes in relationship to another. Mathematically proficient students who can apply what they know are comfortable making assumptions and approximations to simplify a complicated situation, realizing that these may need revision later. They are able to identify important quantities in a practical situation and map their relationships using such tools as diagrams, two-way tables, graphs, flowcharts and formulas. They can analyze those relationships mathematically to draw conclusions. They routinely interpret their mathematical results in the context of the situation and reflect on whether the results make sense, possibly improving the model if it has not served its purpose.

**Standard Relation to Course: Supporting**

**MAFS.K12.MP.4.1:** Use appropriate tools strategically.

Mathematically proficient students consider the available tools when solving a mathematical problem. These tools might include pencil and paper, concrete models, a ruler, a protractor, a calculator, a spreadsheet, a computer algebra system, a statistical package, or dynamic geometry software. Proficient students are sufficiently familiar with tools appropriate for their grade or course to make sound decisions about when each of these tools might be helpful, recognizing both the insight to be gained and their limitations. For example, mathematically proficient high school students analyze graphs of functions and solutions generated using a graphing calculator. They detect possible errors by strategically using estimation and other mathematical knowledge. When making mathematical models, they know that technology can enable them to visualize the results of varying assumptions, explore consequences, and compare predictions with data. Mathematically proficient students at various grade levels are able to identify relevant external mathematical resources, such as digital content located on a website, and use them to pose or solve problems. They are able to use technological tools to explore and deepen their understanding of concepts.

**Standard Relation to Course: Supporting**
Mathematically proficient students try to communicate precisely to others. They try to use clear definitions in discussion with others and in their own reasoning. They state the meaning of the symbols they choose, including using the equal sign consistently and appropriately. They are careful about specifying units of measure, and labeling axes to clarify the correspondence with quantities in a problem. They calculate accurately and efficiently, express numerical answers with a degree of precision appropriate for the problem context. In the elementary grades, students give carefully formulated explanations to each other. By the time they reach high school they have learned to examine claims and make explicit use of definitions.

**Standard Relation to Course: Supporting**

Look for and make use of structure.

Mathematically proficient students look closely to discern a pattern or structure. Young students, for example, might notice that three and seven more is the same amount as seven and three more, or they may sort a collection of shapes according to how many sides the shapes have. Later, students might see 7 x 8 equals the well remembered 7 x 5 + 7 x 3, in preparation for learning about the distributive property. In the expression x² + 9x + 14, older students can see the 14 as 2 x 7 and the 9 as 2 + 7. They recognize the significance of an existing line in a geometric figure and can use the strategy of drawing an auxiliary line for solving problems. They also can step back for an overview and shift perspective. They see complicated things, such as some algebraic expressions, as single objects or as being composed of several objects. For example, they can see 5 – 3(x – y)² as 5 minus a positive number times a square and use that to realize that its value cannot be more than 5 for any real numbers x and y.

**Standard Relation to Course: Supporting**

Look for and express regularity in repeated reasoning.

Mathematically proficient students notice if calculations are repeated, and look both for general methods and for shortcuts. Upper elementary students might notice when dividing 25 by 11 that they are repeating the same calculations over and over again, and conclude they have a repeating decimal. By paying attention to the calculation of slope as they repeatedly check whether points are on the line through (1, 2) with slope 3, middle school students might abstract the equation (y – 2) = 3(x – 1). Noticing the regularity in the way terms cancel when expanding (x – 1)(x + 1), (x – 1)² + 1, and (x – 1)³ + 1, and (x – 1)(x² + x + 1) might lead them to the general formula for the sum of a geometric series. As they work to solve a problem, mathematically proficient students maintain oversight of the process while attending to the details. They continually evaluate the reasonableness of their intermediate results.

**Standard Relation to Course: Supporting**

Evaluate how environment and personal health are interrelated.

**Clarifications:** Food options within a community; prenatal-care services; availability of recreational facilities; air quality; weather-safety awareness; and weather, air, and water conditions.

**Clarifications:** Health prevention, detection, and treatment of: breast and testicular cancer, suicide, obesity, and industrial-related chronic disease.

**Clarifications:** Drug use, family obesity, heart disease, mental health, and non-communicable illness or disease.

**Clarifications:** Risks associated with alcohol abuse, including poison, date rape, and death; cancer and chronic lung disease related to tobacco use; overdose from drug use; child abuse or neglect; and dating violence.

**English language learners communicate information, ideas and concepts necessary for academic success in the content area of Science.**

**English language learners communicate for social and instructional purposes within the school setting.**

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**General Course Information and Notes**

**GENERAL NOTES**

While the content focus of this course is consistent with the Biology I course, students will explore these concepts in greater depth. In general, the academic pace and rigor will be greatly increased for honors level course work. Laboratory investigations, that include the use of scientific inquiry, research, measurement, problem solving, laboratory apparatus and technologies, experimental procedures, and safety procedures are an integral part of this course. The National Science Teachers Association (NSTA) recommends that at the high school level, all students be in the science lab or field, collecting data every week. School laboratory investigations (labs) are defined by the National Research Council (NRC) as an experience in the laboratory, classroom, or the field that provides students with opportunities to interact directly with natural phenomena or with data collected by others using tools, materials, data collection techniques, and models (NRC, 2006, p. 3). Laboratory investigations in the high school classroom should help all students develop a growing understanding of the complexity and ambiguity of empirical work, as well as the skills to calibrate and troubleshoot equipment used to make observations. Learners should understand measurement error; and have the skills to aggregate, interpret, and present the resulting data (National Research Council, 2006, p.77; NSTA, 2007).

**Honors and Advanced Level Course Note:** Advanced courses require a greater demand on students through increased academic rigor. Academic rigor is obtained through the analysis, application, evaluation, and creation of complex ideas that are often abstract and multi-faceted. Students are challenged to think and collaborate critically on the content they are learning. Honors level rigor will be achieved by increasing text complexity through text selection, focus on high-level qualitative measures, and complexity of task. Instruction will be structured to give students a deeper understanding of conceptual themes and organization within and across disciplines. Academic rigor is more than simply assigning to students a greater quantity of work.

**Special Notes:**

**Instructional Practices**

Teaching from a range of complex text is optimized when teachers in all subject areas implement the following strategies on a routine basis:
1. Ensuring wide reading from complex text that varies in length.
2. Making close reading and rereading of texts central to lessons.
3. Emphasizing text-specific complex questions, and cognitively complex tasks, reinforce focus on the text and cultivate independence.
4. Emphasizing students supporting answers based upon evidence from the text.
5. Providing extensive research and writing opportunities (claims and evidence).

- Asking questions (for science) and defining problems (for engineering).
- Developing and using models.
- Planning and carrying out investigations.
- Analyzing and interpreting data.
- Using mathematics, information and computer technology, and computational thinking.
- Constructing explanations (for science) and designing solutions (for engineering).
- Engaging in argument from evidence.
- Obtaining, evaluating, and communicating information.

Literacy Standards in Science
Secondary science courses include reading standards for literacy in science and technical subjects 6-12 and writing standards for literacy in history/social studies, science, and technical subjects 6-12. The courses also include speaking and listening standards. For a complete list of standards required for this course click on the blue tile labeled course standards. You may also download the complete course including all required standards and notes sections using the export function located at the top of this page.

English Language Development ELD Standards
Teachers are required to provide listening, speaking, reading and writing instruction that allows English language learners (ELL) to communicate information, ideas and concepts for academic success in the content area of Science. For the given level of English language proficiency and with visual, graphic, or interactive support, students will interact with grade level words, expressions, sentences and discourse to process or produce language necessary for academic success. The ELD standard should specify a relevant content area concept or topic of study chosen by curriculum developers and teachers which maximizes an ELL's need for communication and social skills. To access an ELL supporting document which delineates performance definitions and descriptors, please click on the following link: https://cpalmsmediaprod.blob.core.windows.net/uploads/docs/standards/eld/sc.pdf

Additional Instructional Resources:
A.V.E. for Success Collection is provided by the Florida Association of School Administrators: http://www.fasa.net/4DCGI/cms/review.html?Action=CMS_Document&DocID=139. Please be aware that these resources have not been reviewed by CPALMS and there may be a charge for the use of some of them in this collection.

GENERAL INFORMATION

Course Number: 2000320
Course Path: Section: Grades PreK to 12 Education Courses > Grade Group: Grades 9 to 12 and Adult Education Courses > Subject: Science > SubSubject: Biological Sciences
Abbreviated Title: BIO 1 HON
Number of Credits: One (1) credit
Course Length: Year (Y)
Course Attributes:
- Honors
- Class Size Core Required
Course Level: 3

Course Status: Course Approved
Grade Level(s): 9,10,11,12
Graduation Requirement: Biology

Educator Certifications
Science (Secondary Grades 7-12)
Biology (Grades 6-12)
Middle Grades General Science (Middle Grades 5-9)

Equivalent Courses
2000310-Biology 1
## Course Standards

<table>
<thead>
<tr>
<th>Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>SC.912.E.7.1:</td>
<td>Analyze the movement of matter and energy through the different biogeochemical cycles, including water and carbon.</td>
</tr>
<tr>
<td>SC.912.L.14.1:</td>
<td>Describe the scientific theory of cells (cell theory) and relate the history of its discovery to the process of science.</td>
</tr>
<tr>
<td>SC.912.L.14.2:</td>
<td>Relate structure to function for the components of plant and animal cells. Explain the role of cell membranes as a highly selective barrier (passive and active transport).</td>
</tr>
<tr>
<td>SC.912.L.14.3:</td>
<td>Compare and contrast the general structures of plant and animal cells. Compare and contrast the general structures of prokaryotic and eukaryotic cells.</td>
</tr>
<tr>
<td>SC.912.L.14.4:</td>
<td>Compare and contrast structure and function of various types of microscopes.</td>
</tr>
<tr>
<td>SC.912.L.14.5:</td>
<td>Explain the evidence supporting the scientific theory of the origin of eukaryotic cells (endosymbiosis).</td>
</tr>
<tr>
<td>SC.912.L.14.6:</td>
<td>Explain the significance of genetic factors, environmental factors, and pathogenic agents to health from the perspectives of both individual and public health.</td>
</tr>
<tr>
<td>SC.912.L.14.7:</td>
<td>Relate the structure of each of the major plant organs and tissues to physiological processes.</td>
</tr>
<tr>
<td>SC.912.L.14.26:</td>
<td>Identify the major parts of the brain on diagrams or models.</td>
</tr>
<tr>
<td>SC.912.L.14.27:</td>
<td>Identify the functions of the major parts of the brain, including the meninges, medulla, pons, midbrain, hypothalamus, thalamus, cerebellum and cerebrum.</td>
</tr>
<tr>
<td>SC.912.L.14.36:</td>
<td>Describe the factors affecting blood flow through the cardiovascular system.</td>
</tr>
<tr>
<td>SC.912.L.14.52:</td>
<td>Explain the basic functions of the human immune system, including specific and nonspecific immune response, vaccines, and antibiotics.</td>
</tr>
<tr>
<td>SC.912.L.15.1:</td>
<td>Discuss the use of molecular clocks to estimate how long ago various groups of organisms diverged evolutionarily from one another.</td>
</tr>
<tr>
<td>SC.912.L.15.2:</td>
<td>Describe how biological diversity is increased by the origin of new species and how it is decreased by the natural process of extinction.</td>
</tr>
<tr>
<td>SC.912.L.15.4:</td>
<td>Describe how and why organisms are hierarchically classified and based on evolutionary relationships.</td>
</tr>
<tr>
<td>SC.912.L.15.5:</td>
<td>Explain the reasons for changes in how organisms are classified.</td>
</tr>
<tr>
<td>SC.912.L.15.6:</td>
<td>Discuss distinguishing characteristics of the domains and kingdoms of living organisms.</td>
</tr>
<tr>
<td>SC.912.L.15.8:</td>
<td>Describe the scientific explanations of the origin of life on Earth.</td>
</tr>
<tr>
<td>SC.912.L.15.10:</td>
<td>Identify basic trends in hominid evolution from early ancestors six million years ago to modern humans, including brain size, jaw size, language, and manufacture of tools.</td>
</tr>
<tr>
<td>SC.912.L.15.13:</td>
<td>Describe the conditions required for natural selection, including: overproduction of offspring, inherited variation, and the struggle to survive, which result in differential reproductive success.</td>
</tr>
<tr>
<td>SC.912.L.15.14:</td>
<td>Discuss mechanisms of evolutionary change other than natural selection such as genetic drift and gene flow.</td>
</tr>
<tr>
<td>SC.912.L.15.15:</td>
<td>Describe how mutation and genetic recombination increase genetic variation.</td>
</tr>
<tr>
<td>SC.912.L.16.2:</td>
<td>Discuss observed inheritance patterns caused by various modes of inheritance, including dominant, recessive, codominant, sex-linked, polygenic, and multiple alleles.</td>
</tr>
<tr>
<td>SC.912.L.16.3:</td>
<td>Describe the basic process of DNA replication and how it relates to the transmission and conservation of the genetic information.</td>
</tr>
<tr>
<td>SC.912.L.16.4:</td>
<td>Explain how mutations in the DNA sequence may or may not result in phenotypic change. Explain how mutations in gametes may result in phenotypic changes in offspring.</td>
</tr>
<tr>
<td>SC.912.L.16.5:</td>
<td>Explain the basic processes of transcription and translation, and how they result in the expression of genes.</td>
</tr>
<tr>
<td>SC.912.L.16.8:</td>
<td>Explain the relationship between mutation, cell cycle, and uncontrolled cell growth potentially resulting in cancer.</td>
</tr>
<tr>
<td>SC.912.L.16.9:</td>
<td>Explain how and why the genetic code is universal and is common to almost all organisms.</td>
</tr>
<tr>
<td>SC.912.L.16.10:</td>
<td>Evaluate the impact of biotechnology on the individual, society and the environment, including medical and ethical issues.</td>
</tr>
<tr>
<td>SC.912.L.16.12:</td>
<td>Describe how basic DNA technology (restriction digestion by endonucleases, gel electrophoresis, polymerase chain reaction, ligation, and transformation) is used to construct recombinant DNA molecules (DNA cloning).</td>
</tr>
<tr>
<td>SC.912.L.16.13:</td>
<td>Describe the basic anatomy and physiology of the human reproductive system. Describe the process of human development from fertilization to birth and major changes that occur in each trimester of pregnancy.</td>
</tr>
<tr>
<td>SC.912.L.16.14:</td>
<td>Describe the cell cycle, including the process of mitosis. Explain the role of mitosis in the formation of new cells and its importance in maintaining chromosome number during asexual reproduction.</td>
</tr>
<tr>
<td>SC.912.L.16.15:</td>
<td>Compare and contrast binary fission and mitotic cell division.</td>
</tr>
<tr>
<td>SC.912.L.16.16:</td>
<td>Describe the process of meiosis, including independent assortment and crossing over. Explain how reduction division results in the formation of haploid gametes or spores.</td>
</tr>
<tr>
<td>SC.912.L.16.17:</td>
<td>Compare and contrast mitosis and meiosis and relate to the processes of sexual and asexual reproduction and their consequences for genetic variation.</td>
</tr>
<tr>
<td>SC.912.L.17.2:</td>
<td>Explain the general distribution of life in aquatic systems as a function of chemistry, geography, light, depth, salinity, and temperature.</td>
</tr>
<tr>
<td>SC.912.L.17.4:</td>
<td>Describe changes in ecosystems resulting from seasonal variations, climate change and succession.</td>
</tr>
<tr>
<td>SC.912.L.17.5:</td>
<td>Analyze how population size is determined by births, deaths, immigration, emigration, and limiting factors (biotic and abiotic) that determine carrying capacity.</td>
</tr>
<tr>
<td>SC.912.L.17.8:</td>
<td>Recognize the consequences of the losses of biodiversity due to catastrophic events, climate changes, human activity, and the introduction of invasive, non-native species.</td>
</tr>
<tr>
<td>SC.912.L.17.9:</td>
<td>Use a food web to identify and distinguish producers, consumers, and decomposers. Explain the pathway of energy transfer through trophic levels and the reduction of available energy at successive trophic levels.</td>
</tr>
<tr>
<td>SC.912.L.17.11:</td>
<td>Evaluate the costs and benefits of renewable and nonrenewable resources, such as water, energy, fossil fuels, wildlife, and forests.</td>
</tr>
</tbody>
</table>
Discuss the large-scale environmental impacts resulting from human activity, including waste spills, oil spills, runoff, greenhouse gases, ozone depletion, and surface and groundwater pollution.

Predict the impact of individuals on environmental systems and examine how human lifestyles affect sustainability.

Describe the basic molecular structures and primary functions of the four major categories of biological macromolecules.

Describe the important structural characteristics of monosaccharides, disaccharides, and polysaccharides and explain the functions of carbohydrates in living things.

Describe the structures of fatty acids, triglycerides, phospholipids, and steroids. Explain the functions of lipids in living organisms. Identify some reactions that fatty acids undergo. Relate the structure and function of cell membranes.

Describe the structures of proteins and amino acids. Explain the functions of proteins in living organisms. Identify some reactions that amino acids undergo. Relate the structure and function of enzymes.

Identify the reactants, products, and basic functions of photosynthesis.

Identify the reactants, products, and basic functions of aerobic and anaerobic cellular respiration.

Identify the special properties of water that contribute to Earth's suitability as an environment for life: cohesive behavior, ability to moderate temperature, expansion upon freezing, and versatility as a solvent.

Identify sources of information and assess their reliability according to the strict standards of scientific investigation.

Explain the interrelated nature of photosynthesis and cellular respiration.

Connect the role of adenosine triphosphate (ATP) to energy transfers within a cell.

Identify the role of enzymes as catalysts that lower the activation energy of biochemical reactions. Identify factors, such as pH and temperature, and their effect on enzyme activity.

Define a problem based on a specific body of knowledge, for example: biology, chemistry, physics, and earth/space science, and do the following:

1. Pose questions about the natural world. (Articulate the purpose of the investigation and identify the relevant scientific concepts).
2. Conduct systematic observations. (Write procedures that are clear and replicable. Identify observables and examine relationships between test (independent) variable and outcome (dependent) variable. Employ appropriate methods for accurate and consistent observations; conduct and record measurements at appropriate levels of precision. Follow safety guidelines).
3. Examine books and other sources of information to see what is already known.
4. Review what is known in light of empirical evidence. (Examine whether available empirical evidence can be interpreted in terms of existing knowledge and models, and if not, modify or develop new models).
5. Plan investigations. (Design and evaluate a scientific investigation).
6. Use tools to gather, analyze, and interpret data (this includes the use of measurement in metric and other systems, and also the generation and interpretation of graphical representations of data, including data tables and graphs). (Collect data or evidence in an organized way. Properly use instruments, equipment, and materials (e.g., scales, probeware, meter sticks, microscopes, computers) including set-up, calibration, technique, maintenance, and storage).
7. Pose answers, explanations, or descriptions of events.
8. Generate explanations that explicate or describe natural phenomena (inferences).
9. Use appropriate evidence and reasoning to justify these explanations to others.
10. Communicate results of scientific investigations, and
11. Evaluate the merits of the explanations produced by others.

Recognize that the strength or usefulness of a scientific claim is evaluated through scientific argumentation, which depends on critical and logical thinking, and the active consideration of alternative scientific explanations to explain the data presented.

Identify sources of information and assess their reliability according to the strict standards of scientific investigation.

Describe how scientific inferences are drawn from scientific observations and provide examples from the content being studied.

Identify what is science, what clearly is not science, and what superficially resembles science (but fails to meet the criteria for science).

Identify which questions can be answered through science and which questions are outside the boundaries of scientific investigation, such as questions addressed by other ways of knowing, such as art, philosophy, and religion.

Explain that scientific knowledge is both durable and robust and open to change. Scientific knowledge can change because it is often examined and re-examined by new investigations and scientific argumentation. Because of these frequent examinations, scientific knowledge becomes stronger, leading to its durability.

Explain that a scientific theory is the culmination of many scientific investigations drawing together all the current evidence concerning a substantial range of phenomena; thus, a scientific theory represents the most powerful explanation scientists have to offer.

Recognize that theories do not become laws, nor do laws become theories; theories are well supported explanations and laws are well supported descriptions.

Interpret formula representations of molecules and compounds in terms of composition and structure.

Differentiate among the various forms of energy and recognize that they can be transformed from one form to others.

Mathematicians who participate in effortful learning both individually and with others:
- Analyze the problem in a way that makes sense given the task.
- Ask questions that will help with solving the task.
- Build perseverance by modifying methods as needed while solving a challenging task.
- Stay engaged and maintain a positive mindset when working to solve tasks.
- Help and support each other when attempting a new method or approach.

Clarifications:
- Teachers who encourage students to participate actively in effortful learning both individually and with others:
  - Cultivate a community of growth mindset learners.
  - Foster perseverance in students by choosing tasks that are challenging.
  - Develop students' ability to analyze and problem solve.
  - Recognize students' effort when solving challenging problems.

Demonstrate understanding by representing problems in multiple ways.
Mathematicians who demonstrate understanding by representing problems in multiple ways:
- Build understanding through modeling and using manipulatives.
- Represent solutions to problems in multiple ways using objects, drawings, tables, graphs and equations.
- Progress from modeling problems with objects and drawings to using algorithms and equations.
### MA.K12.MTR.2.1:
Express connections between concepts and representations.
Choose a representation based on the given context or purpose.

**Clarifications:**
- Teachers who encourage students to demonstrate understanding by representing problems in multiple ways:
  - Help students make connections between concepts and representations.
  - Provide opportunities for students to use manipulatives when investigating concepts.
  - Guide students from concrete to pictorial to abstract representations as understanding progresses.
  - Show students that various representations can have different purposes and can be useful in different situations.

### MA.K12.MTR.3.1:
Complete tasks with mathematical fluency.
Mathematicians who complete tasks with mathematical fluency:

- Select efficient and appropriate methods for solving problems within the given context.
- Maintain flexibility and accuracy while performing procedures and mental calculations.
- Complete tasks accurately and with confidence.
- Adapt procedures to apply them to a new context.
- Use feedback to improve efficiency when performing calculations.

**Clarifications:**
- Teachers who encourage students to complete tasks with mathematical fluency:
  - Provide students with the flexibility to solve problems by selecting a procedure that allows them to solve efficiently and accurately.
  - Offer multiple opportunities for students to practice efficient and generalizable methods.
  - Provide opportunities for students to reflect on the method they used and determine if a more efficient method could have been used.

### MA.K12.MTR.4.1:
Engage in discussions that reflect on the mathematical thinking of self and others.
Mathematicians who engage in discussions that reflect on the mathematical thinking of self and others:

- Communicate mathematical ideas, vocabulary and methods effectively.
- Analyze the mathematical thinking of others.
- Compare the efficiency of a method to those expressed by others.
- Recognize errors and suggest how to correctly solve the task.
- Justify results by explaining methods and processes.
- Construct possible arguments based on evidence.

**Clarifications:**
- Teachers who encourage students to engage in discussions that reflect on the mathematical thinking of self and others:
  - Establish a culture in which students ask questions of the teacher and their peers, and error is an opportunity for learning.
  - Create opportunities for students to discuss their thinking with peers.
  - Select, sequence and present student work to advance and deepen understanding of correct and increasingly efficient methods.
  - Develop students’ ability to justify methods and compare their responses to the responses of their peers.

### MA.K12.MTR.5.1:
Use patterns and structure to help understand and connect mathematical concepts.
Mathematicians who use patterns and structure to help understand and connect mathematical concepts:

- Focus on relevant details within a problem.
- Create plans and procedures to logically order events, steps or ideas to solve problems.
- Decompose a complex problem into manageable parts.
- Look for similarities among problems.
- Connect solutions of problems to more complicated large-scale situations.

**Clarifications:**
- Teachers who encourage students to use patterns and structure to help understand and connect mathematical concepts:
  - Help students recognize the patterns in the world around them and connect these patterns to mathematical concepts.
  - Support students to develop generalizations based on the similarities found among problems.
  - Provide opportunities for students to create plans and procedures to solve problems.
  - Develop students’ ability to construct relationships between their current understanding and more sophisticated ways of thinking.

### MA.K12.MTR.6.1:
Assess the reasonableness of solutions.
Mathematicians who assess the reasonableness of solutions:

- Estimate to discover possible solutions.
- Use benchmark quantities to determine if a solution makes sense.
- Check calculations when solving problems.
- Verify possible solutions by explaining the methods used.
- Evaluate results based on the given context.

**Clarifications:**
- Teachers who encourage students to assess the reasonableness of solutions:
  - Have students estimate or predict solutions prior to solving.
  - Prompt students to continually ask, “Does this solution make sense? How do you know?”
  - Reinforce that students check their work as they progress within and after a task.
  - Strengthen students’ ability to verify solutions through justifications.

### MA.K12.MTR.7.1:
Apply mathematics to real-world contexts.
Mathematicians who apply mathematics to real-world contexts:

- Connect mathematical concepts to everyday experiences.
- Use models and methods to understand, represent and solve problems.
Perform investigations to gather data or determine if a method is appropriate. • Redesign models and methods to improve accuracy or efficiency.

Clarifications:
Teachers who encourage students to apply mathematics to real-world contexts:
- Provide opportunities for students to create models, both concrete and abstract, and perform investigations.
- Challenge students to question the accuracy of their models and methods.
- Support students as they validate conclusions by comparing them to the given situation.
- Indicate how various concepts can be applied to other disciplines.

Cite evidence to explain and justify reasoning.

Clarifications:
K-1 Students include textual evidence in their oral communication with guidance and support from adults. The evidence can consist of details from the text without naming the text. During 1st grade, students learn how to incorporate the evidence in their writing. 2-3 Students include relevant textual evidence in their written and oral communication. Students should name the text when they refer to it. In 3rd grade, students should use a combination of direct and indirect citations.
4-5 Students continue with previous skills and reference comments made by speakers and peers. Students cite texts that they've directly quoted, paraphrased, or used for information. When writing, students will use the form of citation dictated by the instructor or the style guide referenced by the instructor.
6-8 Students continue with previous skills and use a style guide to create a proper citation.
9-12 Students continue with previous skills and should be aware of existing style guides and the ways in which they differ.

Read and comprehend grade-level complex texts proficiently.

Clarifications:
See Text Complexity for grade-level complexity bands and a text complexity rubric.

Make inferences to support comprehension.

Clarifications:
Students will make inferences before the words infer or inference are introduced. Kindergarten students will answer questions like “Why is the girl smiling?” or make predictions about what will happen based on the title page. Students will use the terms and apply them in 2nd grade and beyond.

Use appropriate collaborative techniques and active listening skills when engaging in discussions in a variety of situations.

Clarifications:
In kindergarten, students learn to listen to one another respectfully. In grades 1-2, students build upon these skills by justifying what they are thinking. For example: “I think ________ because ________.” The collaborative conversations are becoming academic conversations.
In grades 3-12, students engage in academic conversations discussing claims and justifying their reasoning, refining and applying skills. Students build on ideas, propel the conversation, and support claims and counterclaims with evidence.

Use the accepted rules governing a specific format to create quality work.

Clarifications:
Students will incorporate skills learned into work products to produce quality work. For students to incorporate these skills appropriately, they must receive instruction. A 3rd grade student creating a poster board display must have instruction in how to effectively present information to do quality work.

Use appropriate voice and tone when speaking or writing.

Clarifications:
In kindergarten and 1st grade, students learn the difference between formal and informal language. For example, the way we talk to our friends differs from the way we speak to adults. In 2nd grade and beyond, students practice appropriate social and academic language to discuss texts.

Evaluate how environment and personal health are interrelated.

Clarifications:
Food options within a community; prenatal-care services; availability of recreational facilities; air quality; weather-safety awareness; and weather, air, and water conditions.

Analyze strategies for prevention, detection, and treatment of communicable and chronic diseases.

Clarifications:
Health prevention, detection, and treatment of: breast and testicular cancer; suicide, obesity, and industrial-related chronic disease.

Analyze how heredity and family history can impact personal health.

Clarifications:
Drug use, family obesity, heart disease, mental health, and non-communicable illness or disease.

Assess the degree of susceptibility to injury, illness, or death if engaging in unhealthy/risky behaviors.

Clarifications:
Risks associated with alcohol abuse, including poison, date rape, and death; cancer and chronic lung disease related to tobacco use; overdose from drug use; child abuse or neglect; and dating violence.

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English language learners communicate for social and instructional purposes within the school setting.
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2. Making close reading and rereading of texts central to lessons.
3. Emphasizing text-specific complex questions, and cognitively complex tasks, reinforce focus on the text and cultivate independence.
4. Emphasizing students supporting answers based upon evidence from the text.
5. Providing extensive research and writing opportunities (claims and evidence).

**Science and Engineering Practices** (NRC Framework for K-12 Science Education, 2010)
- Asking questions (for science) and defining problems (for engineering).
- Developing and using models.
- Planning and carrying out investigations.
- Analyzing and interpreting data.
- Using mathematics, information and computer technology, and computational thinking.
- Constructing explanations (for science) and designing solutions (for engineering).
- Engaging in argument from evidence.
- Obtaining, evaluating, and communicating information.

**English Language Development ELD Standards**
Teachers are required to provide listening, speaking, reading and writing instruction that allows English language learners (ELL) to communicate information, ideas and concepts for academic success in the content area of Science. For the given level of English language proficiency and with visual, graphic, or interactive support, students will interact with grade level words, expressions, sentences and discourse to process or produce language necessary for academic success. The ELD standard should specify a relevant content area concept or topic of study chosen by curriculum developers and teachers which maximizes an ELL’s need for communication and social skills. To access an ELL supporting document which delineates performance definitions and descriptors, please click on the following link: https://cpalmsmediaprod.blob.core.windows.net/uploads/docs/standards/eld/sc.pdf

**Additional Instructional Resources:**
A.V.E. for Success Collection is provided by the Florida Association of School Administrators: http://www.fasa.net/4DCGI/cms/review.html?
Action=CMS_Document&DocID=139. Please be aware that these resources have not been reviewed by CPALMS and there may be a charge for the use of some of them in this collection.

**Florida's Benchmarks for Excellent Student Thinking (B.E.S.T.) Standards**
This course includes Florida's B.E.S.T. ELA Expectations (EE) and Mathematical Thinking and Reasoning Standards (MTRs) for students. Florida educators should intentionally embed these standards within the content and their instruction as applicable. For guidance on the implementation of the EEs and MTRs, please visit https://www.cpalms.org/Standards/BEST_Standards.aspx and select the appropriate B.E.S.T. Standards package.
## Educator Certifications

<table>
<thead>
<tr>
<th>Certification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Science (Secondary Grades 7-12)</td>
</tr>
<tr>
<td>Biology (Grades 6-12)</td>
</tr>
<tr>
<td>Middle Grades General Science (Middle Grades 5-9)</td>
</tr>
</tbody>
</table>

## Equivalent Courses

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>2000310</td>
<td>Biology 1</td>
</tr>
</tbody>
</table>
General Course Information and Notes

GENERAL NOTES

For more information about this Cambridge course, visit http://www.cie.org.uk/programmes-and-qualifications/cambridge-advanced/cambridge-international-as-and-a-levels/curriculum/.

GENERAL INFORMATION

Course Number: 2000321

Course Path: Section: Grades PreK to 12 Education Courses > Grade Group: Grades 9 to 12 and Adult Education Courses > Subject: Science > SubSubject: Biological Sciences

Abbreviated Title: AICE BIO 1 AS

Course Length: Year (Y)

Course Attributes:
  * Advanced International Certificate of Education (AICE)

Course Level: 3

Number of Credits: One (1) credit

Grade Level(s): 9,10,11,12

Graduation Requirement: District-Determined

Educator Certifications

Science (Secondary Grades 7-12)
Biology (Grades 6-12)

Equivalent Courses

2000321-Cambridge AICE Biology 1 AS Level
Equivalency end year: 2018
General Course Information and Notes

GENERAL NOTES


GENERAL INFORMATION

Course Number: 2000322

Number of Credits: One (1) credit

Course Type: Core Academic Course

Course Status: Course Approved

Grade Level(s): 9,10,11,12

Graduation Requirement: Biology

Educator Certifications

Science (Secondary Grades 7-12)
Biology (Grades 6-12)

Equivalent Courses

2000310-Biology 1
General Course Information and Notes

GENERAL NOTES

For more information about this Cambridge course, visit http://www.cie.org.uk/programmes-and-qualifications/cambridge-advanced/cambridge-international-as-and-a-levels/curriculum/.

GENERAL INFORMATION

Course Number: 2000323
Course Path: Grades PreK to 12 Education Courses > Grade Group: Grades 9 to 12 and Adult Education Courses > Subject: Science > SubSubject: Biological Sciences
Abbreviated Title: AICE BIO 2 AL
Course Length: Year (Y)
Course Attributes:
- Advanced International Certificate of Education (AICE)
Course Level: 3

Educator Certifications
Biology (Grades 6-12)
Science (Secondary Grades 7-12)

Equivalent Courses
2000323-Cambridge AICE Biology 2 A Level
Equivalency end year: 2018
Discuss the need for adequate monitoring of environmental parameters when making policy decisions.

Characterize the biotic and abiotic components that define freshwater systems, marine systems and terrestrial systems.

Discuss the political, social, and environmental consequences of sustainable use of land.

Evaluate the costs and benefits of renewable and nonrenewable energy sources.

Discuss the large-scale environmental impacts resulting from human activities, including waste spills, oil spills, runoff, greenhouse gases, ozone depletion, and surface and groundwater pollution.

Define a problem based on a specific body of knowledge, for example: biology, chemistry, physics, and earth/space science, and do the following:
1. Pose questions about the natural world, (Articulate the purpose of the investigation and identify the relevant scientific concepts).
2. Conduct systematic observations, (Write procedures that are clear and replicable. Identify observables and examine relationships between test (independent) variable and outcome (dependent) variable. Employ appropriate methods for accurate and consistent observations; conduct and record measurements at appropriate levels of precision. Follow safety guidelines).
3. Examine books and other sources of information to see what is already known,
4. Review what is known in light of empirical evidence, (Examine whether available empirical evidence can be interpreted in terms of existing knowledge and models, and if not, modify or develop new models).
5. Plan investigations, (Design and evaluate a scientific investigation).
6. Use tools to gather, analyze, and interpret data (this includes the use of measurement in metric and other systems, and also the

<table>
<thead>
<tr>
<th>Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>SC.912.L.14.6:</td>
<td>Explain the significance of genetic factors, environmental factors, and pathogenic agents to health from the perspectives of both individual and public health.</td>
</tr>
<tr>
<td>SC.912.L.14.8:</td>
<td>Explain alternation of generations in plants.</td>
</tr>
<tr>
<td>SC.912.L.14.9:</td>
<td>Relate the major structure of fungi to their functions.</td>
</tr>
<tr>
<td>SC.912.L.14.50:</td>
<td>Describe the structure of vertebrate sensory organs. Relate structure to function in vertebrate sensory systems.</td>
</tr>
<tr>
<td>SC.912.L.14.53:</td>
<td>Discuss basic classification and characteristics of plants. Identify bryophytes, pteridophytes, gymnosperms, and angiosperms.</td>
</tr>
<tr>
<td>SC.912.L.15.1:</td>
<td>Explain how the scientific theory of evolution is supported by the fossil record, comparative anatomy, comparative embryology, biogeography, molecular biology, and observed evolutionary change.</td>
</tr>
<tr>
<td>SC.912.L.15.4:</td>
<td>Describe how and why organisms are hierarchically classified and based on evolutionary relationships.</td>
</tr>
<tr>
<td>SC.912.L.15.5:</td>
<td>Explain the reasons for changes in how organisms are classified.</td>
</tr>
<tr>
<td>SC.912.L.15.7:</td>
<td>Discuss distinguishing characteristics of vertebrate and representative invertebrate phyla, and chordate classes using typical examples.</td>
</tr>
<tr>
<td>SC.912.L.15.8:</td>
<td>Describe the scientific explanations of the origin of life on Earth.</td>
</tr>
<tr>
<td>SC.912.L.15.9:</td>
<td>Explain the role of reproductive isolation in the process of speciation.</td>
</tr>
<tr>
<td>SC.912.L.15.11:</td>
<td>Discuss specific fossil hominids and what they show about human evolution.</td>
</tr>
<tr>
<td>SC.912.L.16.6:</td>
<td>Discuss the mechanisms for regulation of gene expression in prokaryotes and eukaryotes at transcription and translation level.</td>
</tr>
<tr>
<td>SC.912.L.16.7:</td>
<td>Describe how viruses and bacteria transfer genetic material between cells and the role of this process in biotechnology.</td>
</tr>
<tr>
<td>SC.912.L.16.11:</td>
<td>Discuss the technologies associated with forensic medicine and DNA identification, including restriction fragment length polymorphism (RFLP) analysis.</td>
</tr>
<tr>
<td>SC.912.L.16.12:</td>
<td>Describe how basic DNA technology (restriction endonucleases, gel electrophoresis, polymerase chain reaction, ligation, and transformation) is used to construct recombinant DNA molecules (DNA cloning).</td>
</tr>
<tr>
<td>SC.912.L.16.15:</td>
<td>Compare and contrast binary fission and mitotic cell division.</td>
</tr>
<tr>
<td>SC.912.L.17.1:</td>
<td>Discuss the characteristics of populations, such as number of individuals, age structure, density, and pattern of distribution.</td>
</tr>
<tr>
<td>SC.912.L.17.3:</td>
<td>Discuss how various oceanic and freshwater processes, such as currents, tides, and waves, affect the abundance of aquatic organisms.</td>
</tr>
<tr>
<td>SC.912.L.17.6:</td>
<td>Compare and contrast the relationships among organisms, including predation, parasitism, competition, commensalism, and mutualism.</td>
</tr>
<tr>
<td>SC.912.L.17.7:</td>
<td>Characterize the biotic and abiotic components that define freshwater systems, marine systems and terrestrial systems.</td>
</tr>
<tr>
<td>SC.912.L.17.8:</td>
<td>Recognize the consequences of the losses of biodiversity due to catastrophic events, climate changes, human activity, and the introduction of invasive, non-native species.</td>
</tr>
<tr>
<td>SC.912.L.17.9:</td>
<td>Use a food web to identify and distinguish producers, consumers, and decomposers. Explain the pathway of energy transfer through trophic levels and the reduction of available energy at successive trophic levels.</td>
</tr>
<tr>
<td>SC.912.L.17.10:</td>
<td>Diagram and explain the biogeochemical cycles of an ecosystem, including water, carbon, and nitrogen cycle.</td>
</tr>
<tr>
<td>SC.912.L.17.11:</td>
<td>Evaluate the costs and benefits of renewable and nonrenewable resources, such as water, energy, fossil fuels, wildlife, and forests.</td>
</tr>
<tr>
<td>SC.912.L.17.12:</td>
<td>Discuss the political, social, and environmental consequences of sustainable use of land.</td>
</tr>
<tr>
<td>SC.912.L.17.13:</td>
<td>Discuss the need for adequate monitoring of environmental parameters when making policy decisions.</td>
</tr>
<tr>
<td>SC.912.L.17.14:</td>
<td>Assess the need for adequate waste management strategies.</td>
</tr>
<tr>
<td>SC.912.L.17.15:</td>
<td>Discuss the effects of technology on environmental quality.</td>
</tr>
<tr>
<td>SC.912.L.17.16:</td>
<td>Discuss the large-scale environmental impacts resulting from human activity, including waste spills, oil spills, runoff, greenhouse gases, ozone depletion, and surface and groundwater pollution.</td>
</tr>
<tr>
<td>SC.912.L.17.17:</td>
<td>Assess the effectiveness of innovative methods of protecting the environment.</td>
</tr>
<tr>
<td>SC.912.L.17.18:</td>
<td>Describe how human population size and resource use relate to environmental quality.</td>
</tr>
<tr>
<td>SC.912.L.17.19:</td>
<td>Describe how different natural resources are produced and how their rates of use and renewal limit availability.</td>
</tr>
<tr>
<td>SC.912.L.17.20:</td>
<td>Predict the impact of individuals on environmental systems and examine how human lifestyles affect sustainability.</td>
</tr>
<tr>
<td>SC.912.L.18.1:</td>
<td>Describe the basic molecular structures and primary functions of the four major categories of biological macromolecules.</td>
</tr>
<tr>
<td>SC.912.L.18.5:</td>
<td>Discuss the use of chemiosmotic gradients for ATP production in chloroplasts and mitochondria.</td>
</tr>
<tr>
<td>SC.912.L.18.7:</td>
<td>Identify the reactants, products, and basic functions of photosynthesis.</td>
</tr>
<tr>
<td>SC.912.L.18.8:</td>
<td>Identify the reactants, products, and basic functions of aerobic and anaerobic cellular respiration.</td>
</tr>
<tr>
<td>SC.912.L.18.9:</td>
<td>Explain the interrelated nature of photosynthesis and cellular respiration.</td>
</tr>
<tr>
<td>SC.912.L.18.10:</td>
<td>Connect the role of adenosine triphosphate (ATP) to energy transfers within a cell.</td>
</tr>
<tr>
<td>SC.912.L.18.11:</td>
<td>Explain the role of enzymes as catalysts that lower the activation energy of biochemical reactions. Identify factors, such as pH and temperature, and their effect on enzyme activity.</td>
</tr>
<tr>
<td>SC.912.L.18.12:</td>
<td>Discuss the special properties of water that contribute to Earth’s suitability as an environment for life: cohesive behavior, ability to moderate temperature, expansion upon freezing, and versatility as a solvent.</td>
</tr>
</tbody>
</table>
7. Pose answers, explanations, or descriptions of events,
8. Generate explanations that explicate or describe natural phenomena (inferences),
9. Use appropriate evidence and reasoning to justify these explanations to others,
10. Communicate results of scientific investigations, and
11. Evaluate the merits of the explanations produced by others.

LAFS.1112.RST.1.1: Cite specific textual evidence to support analysis of science and technical texts, attending to important distinctions the author makes and to any gaps or inconsistencies in the account.

LAFS.1112.RST.1.2: Determine the central ideas or conclusions of a text; summarize complex concepts, processes, or information presented in a text by paraphrasing them in simpler but still accurate terms.

LAFS.1112.RST.1.3: Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks; analyze the specific results based on explanations in the text.

LAFS.1112.RST.1.4: Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 11–12 texts and topics.

LAFS.1112.RST.2.5: Analyze how the text structures information or ideas into categories or hierarchies, demonstrating understanding of the information or ideas.

LAFS.1112.RST.2.6: Analyze the author's purpose in providing an explanation, describing a procedure, or discussing an experiment in a text, identifying important issues that remain unresolved.

LAFS.1112.RST.3.7: Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g., quantitative data, video, multimedia) in order to address a question or solve a problem.

LAFS.1112.RST.3.8: Evaluate the hypotheses, data, analysis, and conclusions in a science or technical text, verifying the data when possible and corroborating or challenging conclusions with other sources of information.

LAFS.1112.RST.3.9: Synthesize information from a range of sources (e.g., texts, experiments, simulations) into a coherent understanding of a process, phenomenon, or concept, resolving conflicting information when possible.

LAFS.1112.RST.4.10: By the end of grade 12, read and comprehend science/technical texts in the grades 11–12 text complexity band independently and proficiently.

LAFS.1112.RST.1.1: Initiate and participate effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grades 11–12 topics, texts, and issues, building on others’ ideas and expressing their own clearly and persuasively.

LAFS.1112.RST.1.2: Integrate multiple sources of information presented in diverse formats and media (e.g., visually, quantitatively, orally) in order to make informed decisions and solve problems, evaluating the credibility and accuracy of each source and noting any discrepancies among the data.

LAFS.1112.RST.1.3: Evaluate a speaker's point of view, reasoning, and use of evidence and rhetoric, assessing the stance, premises, links among ideas, word choice, points of emphasis, and tone used.

LAFS.1112.RST.2.4: Present information, findings, and supporting evidence, conveying a clear and distinct perspective, such that listeners can follow the line of reasoning, alternative or opposing perspectives are addressed, and the organization, development, substance, and style are appropriate to purpose, audience, and a range of formal and informal tasks.

LAFS.1112.RST.2.5: Make strategic use of digital media (e.g., textual, graphical, audio, visual, and interactive elements) in presentations to enhance understanding of findings, reasoning, and evidence and to add interest.

LAFS.1112.RST.2.6: Develop appropriate and relevant evidence to support claims when writing or speaking to diverse audiences.

LAFS.1112.RST.2.7: Support conclusions and findings for an explanation, reasoning, or claim with clearly labeled evidence and data appropriate to the audience.

LAFS.1112.RST.2.8: Integrate information presented in diverse media or formats (e.g., visually, quantitatively, qualitatively) when possible, and assess the audience, complexity, and credibility of the sources.

LAFS.1112.RST.2.9: Generate precise, knowledgeable claim(s), establish the significance of the claim(s), distinguish the claim(s) from alternate or opposing claims, and create an organization that logically sequences the claim(s), counterclaims, reasons, and evidence.

LAFS.1112.RST.2.10: Develop a strong or persuasive line of reasoning and supporting evidence, resolving contradictions when possible, and determine what additional information or research is required to deepen the investigation or complete the task.


SC.912.N.1.5: Identify sources of information and assess their reliability according to the strict standards of scientific investigation.

SC.912.N.1.6: Integrate multiple sources of information presented in diverse formats and media.

SC.912.N.1.7: Describe the role consensus plays in the historical development of a theory in any one of the disciplines of science.

SC.912.N.1.8: Cite specific textual evidence to support analysis of science and technical texts.

SC.912.N.2.5: Describe instances in which scientists' varied backgrounds, talents, interests, and goals influence the inferences and thus the explanations that they make about observations of natural phenomena and describe that competing interpretations (explanations) of scientists are a strength of science as they are a source of new, testable ideas that have the potential to add new evidence to support one or another of the explanations.

SC.912.N.3.1: Explain that a scientific theory is the culmination of many scientific investigations drawing together all the current evidence concerning a substantial range of phenomena; thus, a scientific theory represents the most powerful explanation scientists have to offer.

SC.912.N.3.2: Describe the role consensus plays in the historical development of a theory in any one of the disciplines of science.

SC.912.N.4.2: Weight the merits of alternative strategies for solving a specific societal problem by comparing a number of different costs and benefits, such as human, economic, and environmental.

SC.912.P.10.1: Differentiate among the various forms of energy and recognize that they can be transformed from one form to others.
<table>
<thead>
<tr>
<th>MAFS.912.F-IF.2.4:</th>
<th>For a function that models a relationship between two quantities, interpret key features of graphs and tables in terms of the quantities, and sketch graphs showing key features given a verbal description of the relationship. Key features include: intercepts; intervals where the function is increasing, decreasing, positive, or negative; relative maximums and minimums; symmetries; end behavior; and periodicity. ★</th>
</tr>
</thead>
<tbody>
<tr>
<td>MAFS.912.F-IF.3.7:</td>
<td>Graph polynomial functions, identifying zeros when suitable factorizations are available, and showing end behavior.</td>
</tr>
<tr>
<td>MAFS.912.G-MG.1.2:</td>
<td>Apply concepts of density based on area and volume in modeling situations (e.g., persons per square mile, BTUs per cubic foot). ★</td>
</tr>
<tr>
<td>MAFS.912.N-Q.1.1:</td>
<td>Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays. ★</td>
</tr>
<tr>
<td>MAFS.912.N-Q.1.3:</td>
<td>Choose a level of accuracy appropriate to limitations on measurement when reporting quantities. ★</td>
</tr>
<tr>
<td>MAFS.912.S-IC.2.6:</td>
<td>Evaluate reports based on data. ★</td>
</tr>
<tr>
<td>MAFS.912.S-ID.1.1:</td>
<td>Represent data with plots on the real number line (dot plots, histograms, and box plots). ★</td>
</tr>
<tr>
<td>Clarifications:</td>
<td>In grades 6–8, students describe center and spread in a data distribution. Here they choose a summary statistic appropriate to the characteristics of the data distribution, such as the shape of the distribution or the existence of extreme data points.</td>
</tr>
<tr>
<td>MAFS.912.S-ID.1.2:</td>
<td>Use statistics appropriate to the shape of the data distribution to compare center (median, mean) and spread (interquartile range, standard deviation) of two or more different data sets. ★</td>
</tr>
<tr>
<td>Clarifications:</td>
<td>In grades 6–8, students describe center and spread in a data distribution. Here they choose a summary statistic appropriate to the characteristics of the data distribution, such as the shape of the distribution or the existence of extreme data points.</td>
</tr>
<tr>
<td>MAFS.912.S-ID.1.3:</td>
<td>Interpret differences in shape, center, and spread in the context of the data sets, accounting for possible effects of extreme data points (outliers). ★</td>
</tr>
<tr>
<td>Clarifications:</td>
<td>In grades 6–8, students describe center and spread in a data distribution. Here they choose a summary statistic appropriate to the characteristics of the data distribution, such as the shape of the distribution or the existence of extreme data points.</td>
</tr>
<tr>
<td>MAFS.912.S-ID.1.4:</td>
<td>Use the mean and standard deviation of a data set to fit it to a normal distribution and to estimate population percentages. Recognize that there are data sets for which such a procedure is not appropriate. Use calculators, spreadsheets, and tables to estimate areas under the normal curve. ★</td>
</tr>
<tr>
<td>MAFS.912.S-ID.2.5:</td>
<td>Summarize categorical data for two categories in two-way frequency tables. Interpret relative frequencies in the context of the data (including joint, marginal, and conditional relative frequencies). Recognize possible associations and trends in the data. ★</td>
</tr>
<tr>
<td>MAFS.912.S-ID.2.6:</td>
<td>Represent data on two quantitative variables on a scatter plot, and describe how the variables are related. ★</td>
</tr>
<tr>
<td>a.</td>
<td>Fit a function to the data; use functions fitted to data to solve problems in the context of the data. Use given functions or choose a function suggested by the context. Emphasize linear, and exponential models.</td>
</tr>
<tr>
<td>b.</td>
<td>Informally assess the fit of a function by plotting and analyzing residuals.</td>
</tr>
<tr>
<td>c.</td>
<td>Fit a linear function for a scatter plot that suggests a linear association.</td>
</tr>
</tbody>
</table>
Clarifications:
Students take a more sophisticated look at using a linear function to model the relationship between two numerical variables. In addition to fitting a line to data, students assess how well the model fits by analyzing residuals.

Make sense of problems and persevere in solving them.
Mathematically proficient students start by explaining to themselves the meaning of a problem and looking for entry points to its solution. They analyze givens, constraints, relationships, and goals. They make conjectures about the form and meaning of the solution and plan a solution pathway rather than simply jumping into a solution attempt. They consider analogous problems, and try special cases and simpler forms of the original problem in order to gain insight into its solution. They monitor and evaluate their progress and change course if necessary. Older students might, depending on the context of the problem, transform algebraic expressions or change the viewing window on their graphing calculator to get the information they need. Mathematically proficient students can explain correspondences between equations, verbal descriptions, tables, and graphs or draw diagrams of important features and relationships, graph data, and search for regularity or trends. Younger students might rely on using concrete objects or pictures to help conceptualize and solve a problem. Mathematically proficient students check their answers to problems using a different method, and they continually ask themselves, “Does this make sense?” They can understand the approaches of others to solving complex problems and identify correspondences between different approaches.

Standard Relation to Course: Supporting

Reason abstractly and quantitatively.
Mathematically proficient students make sense of quantities and their relationships in problem situations. They bring two complementary abilities to bear on problems involving quantitative relationships: the ability to decontextualize—to abstract a given situation and represent it symbolically and manipulate the representing symbols as if they have a life of their own, without necessarily attending to their referents—and the ability to contextualize, to pause as needed during the manipulation process in order to probe into the referents for the symbols involved. Quantitative reasoning entails habits of creating a coherent representation of the problem at hand; considering the units involved; attending to the meaning of quantities, not just how to compute them; and knowing and flexibly using different properties of operations and objects.

Standard Relation to Course: Supporting

Construct viable arguments and critique the reasoning of others.
Mathematically proficient students understand and use stated assumptions, definitions, and previously established results in constructing arguments. They make conjectures and build a logical progression of statements to explore the truth of their conjectures. They are able to analyze situations by breaking them into cases, and can recognize and use counterexamples. They justify their conclusions, communicate them to others, and respond to the arguments of others. They reason inductively about data, making plausible arguments that take into account the context from which the data arose. Mathematically proficient students are also able to compare the effectiveness of two plausible arguments, distinguish correct logic or reasoning from that which is flawed, and—if there is a flaw in an argument—explain what it is. Elementary students can construct arguments using concrete referents such as objects, drawings, diagrams, and actions. Such arguments can make sense and be correct, even though they are not generalized or made formal until later grades. Later, students learn to determine domains to which an argument applies. Students at all grades can listen or read arguments or explanations to each other. By the time they reach high school they have the ability to decontextualize—to abstract a given situation and represent it symbolically and manipulate the representing symbols as if they have a life of their own, without necessarily attending to their referents—and the ability to contextualize, to pause as needed during the manipulation process in order to probe into the referents for the symbols involved. Quantitative reasoning entails habits of creating a coherent representation of the problem at hand; considering the units involved; attending to the meaning of quantities, not just how to compute them; and knowing and flexibly using different properties of operations and objects. Such arguments can make sense and be correct, even though they are not generalized or made formal until later grades. Later, students learn to determine domains to which an argument applies. Students at all grades can listen or read the arguments of others, decide whether they make sense, and ask useful questions to clarify or improve the arguments.

Standard Relation to Course: Supporting

Model with mathematics.
Mathematically proficient students can apply the mathematics they know to solve problems arising in everyday life, society, and the workplace. In early grades, this might be as simple as writing an addition equation to describe a situation. In middle grades, a student might apply proportional reasoning to plan a school event or analyze a problem in the community. By high school, a student might use geometry to solve a design problem or use a function to describe how one quantity of interest depends on another. Mathematically proficient students who can apply what they know are comfortable making assumptions and approximations to simplify a complicated situation, realizing that these may need revision later. They are able to identify important quantities in a practical situation and map their relationships using such tools as diagrams, two-way tables, graphs, flowcharts and formulas. They can analyze those relationships mathematically to draw conclusions. They routinely interpret their mathematical results in the context of the situation and reflect on whether the results make sense, possibly improving the model if it has not served its purpose.

Standard Relation to Course: Supporting

Use appropriate tools strategically.
Mathematically proficient students consider the available tools when solving a mathematical problem. These tools might include pencil and paper, concrete models, a ruler, a protractor, a calculator, a spreadsheet, a computer algebra system, a statistical package, or dynamic geometry software. Proficient students are sufficiently familiar with tools appropriate for their grade or course to make sound decisions about when each of these tools might be helpful, recognizing both the insight to be gained and their limitations. For example, mathematically proficient high school students analyze graphs of functions and solutions generated using a graphing calculator. They detect possible errors by strategically using estimation and other mathematical knowledge. When making mathematical models, they know that technology can enable them to visualize the results of varying assumptions, explore consequences, and compare predictions with data. Mathematically proficient students at various grade levels are able to identify relevant external mathematical resources, such as digital content located on a website, and use them to pose or solve problems. They are able to use technological tools to explore and deepen their understanding of concepts.

Standard Relation to Course: Supporting

Attend to precision.
Mathematically proficient students try to communicate precisely to others. They try to use clear definitions in discussion with others and in their own reasoning. They state the meaning of the symbols they choose, including using the equal sign consistently and appropriately. They are careful about specifying units of measure, and labeling axes to clarify the correspondence with quantities in a problem. They calculate accurately and efficiently, express numerical answers with a degree of precision appropriate for the problem context. In the elementary grades, students give carefully formulated explanations to each other. By the time they reach high school they have learned to examine claims and make explicit use of definitions.

Standard Relation to Course: Supporting

Look for and make use of structure.
Mathematically proficient students look closely to discern a pattern or structure. Young students, for example, might notice that three and seven more is the same amount as seven and three more, or they may sort a collection of shapes according to how many sides the shapes have. Later, students will see 7 + 8 equals the well remembered 7 + 5 + 3, in preparation for learning about the distributive property. In the expression x² +
MAFS.K12.MP.7.1: 9x + 14, older students can see the 14 as 2 \times 7 and the 9 as 2 + 7. They recognize the significance of an existing line in a geometric figure and can use the strategy of drawing an auxiliary line for solving problems. They also can step back for an overview and shift perspective. They can see complicated things, such as some algebraic expressions, as single objects or as being composed of several objects. For example, they can see \( 5 - 3(x - y)^2 \) as 5 minus a positive number times a square and use that to realize that its value cannot be more than 5 for any real numbers \( x \) and \( y \).

Standard Relation to Course: Supporting

Look for and express regularity in repeated reasoning.

Mathematically proficient students notice if calculations are repeated, and look both for general methods and for shortcuts. Upper elementary students might notice when dividing 25 by 11 that they are repeating the same calculations over and over again, and conclude they have a repeating decimal. By paying attention to the calculation of slope as they repeatedly check whether points are on the line through (1, 2) with slope 3, middle school students might abstract the equation \( (y - 2)/(x - 1) = 3 \). Noticing the regularity in the way terms cancel when expanding \( (x - 1)(x + 1), (x - 1)(x^2 + x + 1), \) and \( (x - 1)(x^3 + x^2 + x + 1) \) might lead them to the general formula for the sum of a geometric series. As they work to solve a problem, mathematically proficient students maintain oversight of the process, while attending to the details. They continually evaluate the reasonableness of their intermediate results.

MAFS.K12.MP.8.1:

Evaluate how environment and personal health are interrelated.

HE.912.C.1.3:

Clarifications:
Food options within a community; prenatal-care services; availability of recreational facilities; air quality; weather-safety awareness; and weather, air, and water conditions.

HE.912.C.1.5:

Analyze strategies for prevention, detection, and treatment of communicable and chronic diseases.

Clarifications:
Health prevention, detection, and treatment of: breast and testicular cancer, suicide, obesity, and industrial-related chronic disease.

HE.912.C.1.7:

Analyze how heredity and family history can impact personal health.

Clarifications:
Drug use, family obesity, heart disease, mental health, and non-communicable illness or disease.

ELD.K12.ELL.SC.1:

English language learners communicate information, ideas and concepts necessary for academic success in the content area of Science.

ELD.K12.ELL.SI.1:

English language learners communicate for social and instructional purposes within the school setting.

General Course Information and Notes

GENERAL NOTES

Laboratory investigations that include the use of scientific inquiry, research, measurement, problem solving, laboratory apparatus and technologies, experimental procedures, and safety procedures are an integral part of this course. The National Science Teachers Association (NSTA) recommends that at the high school level, all students should be in the science lab or field, collecting data every week. School laboratory investigations (labs) are defined by the National Research Council (NRC) as an experience in the laboratory, classroom, or the field that provides students with opportunities to interact directly with natural phenomena or with data collected by others using tools, materials, data collection techniques, and models (NRC, 2006, p. 3). Laboratory investigations in the high school classroom should help all students develop a growing understanding of the complexity and ambiguity of empirical work, as well as the skills to calibrate and troubleshoot equipment used to make observations. Learners should understand measurement error; and have the skills to aggregate, interpret, and present the resulting data (National Research Council, 2006, p.77, NSTA, 2007).

Honors and Advanced Level Course Note: Advanced courses require a greater demand on students through increased academic rigor. Academic rigor is obtained through the application, analysis, evaluation, and creation of complex ideas that are often abstract and multi-faceted. Students are challenged to think and collaborate critically on the content they are learning. Honors level rigor will be achieved by increasing text complexity through text selection, focus on high-level qualitative measures, and complexity of task. Instruction will be structured to give students a deeper understanding of conceptual themes and organization within and across disciplines. Academic rigor is more than simply assigning to students a greater quantity of work.

Special Notes:

Instructional Practices

Teaching from a range of complex text is optimized when teachers in all subject areas implement the following strategies on a routine basis:

1. Ensuring wide reading from complex text that varies in length.
2. Making close reading and rereading of texts central to lessons.
3. Emphasizing text-specific complex questions, and cognitively complex tasks, reinforce focus on the text and cultivate independence.
4. Emphasizing students supporting answers based upon evidence from the text.
5. Providing extensive research and writing opportunities (claims and evidence).


- Asking questions (for science) and defining problems (for engineering).
- Developing and using models.
- Planning and carrying out investigations.
- Analyzing and interpreting data.
- Using mathematics, information and computer technology, and computational thinking.
- Constructing explanations (for science) and designing solutions (for engineering).
- Engaging in argument from evidence.
- Obtaining, evaluating, and communicating information.

Literacy Standards in Science

Secondary science courses include reading standards for literacy in science and technical subjects 6-12 and writing standards for literacy in history/social studies, science, and technical subjects 6-12. The courses also include speaking and listening standards. For a complete list of standards required for this course click on the blue tile labeled course standards. You may also download the complete course including all required standards and notes sections using the export function located at the top of this page.
Educator Certifications
Science (Secondary Grades 7-12)
Biology (Grades 6-12)
Discuss the technologies associated with forensic medicine and DNA technology.

Discuss the mechanisms for regulation of gene expression in prokaryotes and eukaryotes at transcription and translation level.

Diagram and explain the biogeochemical cycles of an ecosystem, including water, carbon, and nitrogen cycle.

Discuss how various oceanic and freshwater processes, such as currents, saltwater intrusion, and pollution, affect the stability of ecosystems.

Characterize the biotic and abiotic components that define freshwater systems, marine systems, and terrestrial systems.

Discuss the need for adequate monitoring of environmental parameters when making policy decisions.

Discuss the political, social, and environmental consequences of sustainable use of land.

Discuss specific fossil hominids and what they show about human evolution.

Discuss basic classification and characteristics of plants. Identify bryophytes, pteridophytes, gymnosperms, and angiosperms.

Identify the reactants, products, and basic functions of photosynthesis.

Discuss the use of chemiosmotic gradients for ATP production in chloroplasts and mitochondria.

Explain the reasons for changes in how organisms are classified.

Describe how different natural resources are produced and how their rates of use and renewal limit availability.

Assess the effectiveness of innovative methods of protecting the environment.

Examine books and other sources of information to see what is already known,

1. Pose questions about the natural world, (Articulate the purpose of the investigation and identify the relevant scientific concepts).

2. Conduct systematic observations, (Write procedures that are clear and replicable. Identify observables and examine relationships between test (independent) variable and outcome (dependent) variable. Employ appropriate methods for accurate and consistent observations; conduct and record measurements at appropriate levels of precision. Follow safety guidelines).

3. Examine books and other sources of information to see what is already known,

4. Review what is known in light of empirical evidence, (Examine whether available empirical evidence can be interpreted in terms of existing knowledge and models, and if not, modify or develop new models).

5. Plan investigations, (Design and evaluate a scientific investigation).

6. Use tools to gather, analyze, and interpret data (this includes the use of measurement in metric and other systems, and also the

<table>
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<tr>
<th>Course Standards</th>
<th>Description</th>
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<tr>
<td>SC.912.L.14.6:</td>
<td>Explain the significance of genetic factors, environmental factors, and pathogenic agents to health from the perspectives of both individual and public health.</td>
</tr>
<tr>
<td>SC.912.L.14.8:</td>
<td>Explain alternation of generations in plants.</td>
</tr>
<tr>
<td>SC.912.L.14.9:</td>
<td>Relate the major structure of fungi to their functions.</td>
</tr>
<tr>
<td>SC.912.L.14.50:</td>
<td>Describe the structure of vertebrate sensory organs. Relate structure to function in vertebrate sensory systems.</td>
</tr>
<tr>
<td>SC.912.L.14.53:</td>
<td>Discuss basic classification and characteristics of plants. Identify bryophytes, pteridophytes, gymnosperms, and angiosperms.</td>
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<tr>
<td>SC.912.L.15.1:</td>
<td>Explain how the scientific theory of evolution is supported by the fossil record, comparative anatomy, comparative embryology, biogeography, molecular biology, and observed evolutionary change.</td>
</tr>
<tr>
<td>SC.912.L.15.4:</td>
<td>Describe how and why organisms are hierarchically classified and based on evolutionary relationships.</td>
</tr>
<tr>
<td>SC.912.L.15.5:</td>
<td>Explain the reasons for changes in how organisms are classified.</td>
</tr>
<tr>
<td>SC.912.L.15.7:</td>
<td>Discuss distinguishing characteristics of vertebrate and representative invertebrate phyla, and chordate classes using typical examples.</td>
</tr>
<tr>
<td>SC.912.L.15.8:</td>
<td>Describe the scientific explanations of the origin of life on Earth.</td>
</tr>
<tr>
<td>SC.912.L.15.9:</td>
<td>Explain the role of reproductive isolation in the process of speciation.</td>
</tr>
<tr>
<td>SC.912.L.15.11:</td>
<td>Discuss specific fossil hominids and what they show about human evolution.</td>
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<td>SC.912.L.16.6:</td>
<td>Discuss the mechanisms for regulation of gene expression in prokaryotes and eukaryotes at transcription and translation level.</td>
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<tr>
<td>SC.912.L.16.7:</td>
<td>Describe how viruses and bacteria transfer genetic material between cells and the role of this process in biotechnology.</td>
</tr>
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<td>SC.912.L.16.11:</td>
<td>Discuss the technologies associated with forensic medicine and DNA identification, including restriction fragment length polymorphism (RFLP) analysis.</td>
</tr>
<tr>
<td>SC.912.L.16.12:</td>
<td>Describe how basic DNA technology (restriction endonucleases, gel electrophoresis, polymerase chain reaction, ligation, and transformation) is used to construct recombinant DNA molecules (DNA cloning).</td>
</tr>
<tr>
<td>SC.912.L.16.15:</td>
<td>Compare and contrast binary fission and mitotic cell division.</td>
</tr>
<tr>
<td>SC.912.L.17.1:</td>
<td>Discuss the characteristics of populations, such as number of individuals, age structure, density, and pattern of distribution.</td>
</tr>
<tr>
<td>SC.912.L.17.3:</td>
<td>Discuss how various oceanic and freshwater processes, such as currents, tides, and waves, affect the abundance of aquatic organisms.</td>
</tr>
<tr>
<td>SC.912.L.17.6:</td>
<td>Compare and contrast the relationships among organisms, including predation, parasitism, competition, commensalism, and mutualism.</td>
</tr>
<tr>
<td>SC.912.L.17.7:</td>
<td>Characterize the biotic and abiotic components that define freshwater systems, marine systems and terrestrial systems.</td>
</tr>
<tr>
<td>SC.912.L.17.8:</td>
<td>Recognize the consequences of the losses of biodiversity due to catastrophic events, climate changes, human activity, and the introduction of invasive, non-native species.</td>
</tr>
<tr>
<td>SC.912.L.17.9:</td>
<td>Use a food web to identify and distinguish producers, consumers, and decomposers. Explain the pathway of energy transfer through trophic levels and the reduction of available energy at successive trophic levels.</td>
</tr>
<tr>
<td>SC.912.L.17.10:</td>
<td>Diagram and explain the biogeochemical cycles of an ecosystem, including water, carbon, and nitrogen cycle.</td>
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<tr>
<td>SC.912.L.17.11:</td>
<td>Evaluate the costs and benefits of renewable and nonrenewable resources, such as water, energy, fossil fuels, wildlife, and forests.</td>
</tr>
<tr>
<td>SC.912.L.17.12:</td>
<td>Discuss the political, social, and environmental consequences of sustainable use of land.</td>
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<tr>
<td>SC.912.L.17.13:</td>
<td>Discuss the need for adequate monitoring of environmental parameters when making policy decisions.</td>
</tr>
<tr>
<td>SC.912.L.17.14:</td>
<td>Assess the need for adequate waste management strategies.</td>
</tr>
<tr>
<td>SC.912.L.17.15:</td>
<td>Discuss the effects of technology on environmental quality.</td>
</tr>
<tr>
<td>SC.912.L.17.16:</td>
<td>Discuss the large-scale environmental impacts resulting from human activity, including waste spills, oil spills, runoff, greenhouse gases, ozone depletion, and surface and groundwater pollution.</td>
</tr>
<tr>
<td>SC.912.L.17.17:</td>
<td>Assess the effectiveness of innovative methods of protecting the environment.</td>
</tr>
<tr>
<td>SC.912.L.17.18:</td>
<td>Describe how human population size and resource use relate to environmental quality.</td>
</tr>
<tr>
<td>SC.912.L.17.19:</td>
<td>Describe how different natural resources are produced and how their rates of use and renewal limit availability.</td>
</tr>
<tr>
<td>SC.912.L.17.20:</td>
<td>Predict the impact of individuals on environmental systems and examine how human lifestyles affect sustainability.</td>
</tr>
<tr>
<td>SC.912.L.18.1:</td>
<td>Describe the basic molecular structures and primary functions of the four major categories of biological macromolecules.</td>
</tr>
<tr>
<td>SC.912.L.18.5:</td>
<td>Discuss the use of chemiosmotic gradients for ATP production in chloroplasts and mitochondria.</td>
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<td>Identify the reactants, products, and basic functions of photosynthesis.</td>
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<td>SC.912.L.18.8:</td>
<td>Identify the reactants, products, and basic functions of aerobic and anaerobic cellular respiration.</td>
</tr>
<tr>
<td>SC.912.L.18.9:</td>
<td>Explain the interrelated nature of photosynthesis and cellular respiration.</td>
</tr>
<tr>
<td>SC.912.L.18.10:</td>
<td>Connect the role of adenosine triphosphate (ATP) to energy transfers within a cell.</td>
</tr>
<tr>
<td>SC.912.L.18.11:</td>
<td>Explain the role of enzymes as catalysts that lower the activation energy of biochemical reactions. Identify factors, such as pH and temperature, and their effect on enzyme activity.</td>
</tr>
<tr>
<td>SC.912.L.18.12:</td>
<td>Discuss the special properties of water that contribute to Earth's suitability as an environment for life: cohesive behavior, ability to moderate temperature, expansion upon freezing, and versatility as a solvent.</td>
</tr>
</tbody>
</table>
Identify sources of information and assess their reliability according to the strict standards of scientific investigation.

Describe and provide examples of how similar investigations conducted in many parts of the world result in the same outcome.

Weigh the merits of alternative strategies for solving a specific societal problem by comparing a number of different costs and benefits, such as human, economic, and environmental.

Explain that a scientific theory is the culmination of many scientific investigations drawing together all the current evidence concerning a substantial range of phenomena; thus, a scientific theory represents the most powerful explanation scientists have to offer.

Re-examine by new investigations and scientific argumentation. Because of these frequent examinations, scientific knowledge becomes stronger, leading to its durability.

Describe instances in which scientists' varied backgrounds, talents, interests, and goals influence the inferences and thus the explanations that they make about observations of natural phenomena and describe that competing interpretations (explanations) of scientists are a strength of science as they are a source of new, testable ideas that have the potential to add new evidence to support one or another of the explanations.

Explain that scientific knowledge is both durable and robust and open to change. Scientific knowledge can change because it is often examined and re-examined by new investigations and scientific argumentation. Because of these frequent examinations, scientific knowledge becomes stronger, leading to its durability.

Identify which questions can be answered through science and which questions are outside the boundaries of scientific investigation, such as questions addressed by other ways of knowing, such as art, philosophy, and religion.

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Describe oxidation-reduction reactions in living and non-living systems.

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Identify what is science, what clearly is not science, and what superficially resembles science (but fails to meet the criteria for science).

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Describe oxidation-reduction reactions in living and non-living systems.

Mathematicians who engage in discussions that reflect on the mathematical thinking of self and others:

Communicate mathematical ideas, vocabulary and methods effectively.

Teachers who encourage students to participate actively in effortful learning both individually and with others:

Clarifications:

Teachers who encourage students to participate actively in effortful learning both individually and with others:

Clarifications:

Teachers who encourage students to demonstrate understanding by representing problems in multiple ways:

Clarifications:

Teachers who encourage students to complete tasks with mathematical fluency:

Clarifications:

Teachers who engage in discussions that reflect on the mathematical thinking of self and others:

Communicate mathematical ideas, vocabulary and methods effectively.
### MA.K12.MTR.4.1:
- Analyze the mathematical thinking of others.
- Compare the efficiency of a method to those expressed by others.
- Recognize errors and suggest how to correctly solve the task.
- Justify results by explaining methods and processes.
- Construct possible arguments based on evidence.

**Clarifications:**
Teachers who encourage students to engage in discussions that reflect on the mathematical thinking of self and others:
- Establish a culture in which students ask questions of the teacher and their peers, and error is an opportunity for learning.
- Create opportunities for students to discuss their thinking with peers.
- Select, sequence and present student work to advance and deepen understanding of correct and increasingly efficient methods.
- Develop students' ability to justify methods and compare their responses to the responses of their peers.

### MA.K12.MTR.5.1:
- Use patterns and structure to help understand and connect mathematical concepts.

Mathematicians who use patterns and structure to help understand and connect mathematical concepts:
- Focus on relevant details within a problem.
- Create plans and procedures to logically order events, steps or ideas to solve problems.
- Decompose a complex problem into manageable parts.
- Relate previously learned concepts to new concepts.
- Look for similarities among problems.
- Connect solutions of problems to more complicated, large-scale situations.

**Clarifications:**
Teachers who encourage students to use patterns and structure to help understand and connect mathematical concepts:
- Help students recognize the patterns in the world around them and connect these patterns to mathematical concepts.
- Support students to develop generalizations based on the similarities found among problems.
- Provide opportunities for students to create plans and procedures to solve problems.
- Develop students' ability to construct relationships between their current understanding and more sophisticated ways of thinking.

### MA.K12.MTR.6.1:
- Assess the reasonableness of solutions.

Mathematicians who assess the reasonableness of solutions:
- Estimate to discover possible solutions.
- Use benchmark quantities to determine if a solution makes sense.
- Check calculations when solving problems.
- Verify possible solutions by explaining the methods used.
- Evaluate results based on the given context.

**Clarifications:**
Teachers who encourage students to assess the reasonableness of solutions:
- Have students estimate or predict solutions prior to solving.
- Prompt students to continually ask, "Does this solution make sense? How do you know?"
- Reinforce that students check their work as they progress within and after a task.
- Strengthen students' ability to verify solutions through justifications.

### MA.K12.MTR.7.1:
- Apply mathematics to real-world contexts.

Mathematicians who apply mathematics to real-world contexts:
- Connect mathematical concepts to everyday experiences.
- Use models and methods to understand, represent and solve problems.
- Perform investigations to gather data or determine if a method is appropriate.
- Redesign models and methods to improve accuracy or efficiency.

**Clarifications:**
Teachers who encourage students to apply mathematics to real-world contexts:
- Provide opportunities for students to create models, both concrete and abstract, and perform investigations.
- Challenge students to question the accuracy of their models and methods.
- Support students as they validate conclusions by comparing them to the given situation.
- Indicate how various concepts can be applied to other disciplines.

### ELA.K12.EE.1.1:
- Cite evidence to explain and justify reasoning.

**Clarifications:**
K-1 Students include textual evidence in their oral communication with guidance and support from adults. The evidence can consist of details from the text without naming the text. During 1st grade, students learn how to incorporate the evidence in their writing.
2-3 Students include relevant textual evidence in their written and oral communication. Students should name the text when they refer to it. In 3rd grade, students should use a combination of direct and indirect citations.
4-5 Students continue with previous skills and reference comments made by speakers and peers. Students cite texts that they’ve directly quoted, paraphrased, or used for information. When writing, students will use the form of citation dictated by the instructor or the style guide referenced by the instructor.
6-8 Students continue with previous skills and use a style guide to create a proper citation.
9-12 Students continue with previous skills and should be aware of existing style guides and the ways in which they differ.

### ELA.K12.EE.2.1:
- Read and comprehend grade-level complex texts proficiently.

**Clarifications:**
See Text Complexity for grade-level complexity bands and a text complexity rubric.
General Course Information and Notes

**GENERAL NOTES**

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4. Emphasizing students supporting answers based upon evidence from the text.
5. Providing extensive research and writing opportunities (claims and evidence).

**Science and Engineering Practices (NRC Framework for K-12 Science Education, 2010)**

- Asking questions (for science) and defining problems (for engineering).
- Developing and using models.
- Planning and carrying out investigations.
- Analyzing and interpreting data.
Using mathematics, information and computer technology, and computational thinking. 
Constructing explanations (for science) and designing solutions (for engineering). 
Engaging in argument from evidence. 
Obtaining, evaluating, and communicating information.

**Florida's Benchmarks for Excellent Student Thinking (B.E.S.T.) Standards**
This course includes Florida's B.E.S.T. ELA Expectations (EE) and Mathematical Thinking and Reasoning Standards (MTRs) for students. Florida educators should intentionally embed these standards within the content and their instruction as applicable. For guidance on the implementation of the EE and MTRs, please visit https://www.cpalms.org/Standards/BEST_Standards.aspx and select the appropriate B.E.S.T. Standards package.

**English Language Development ELD Standards Special Notes Section:**
Teachers are required to provide listening, speaking, reading and writing instruction that allows English language learners (ELL) to communicate information, ideas and concepts for academic success in the content area of Science. For the given level of English language proficiency and with visual, graphic, or interactive support, students will interact with grade level words, expressions, sentences and discourse to process or produce language necessary for academic success. The ELD standard should specify a relevant content area concept or topic of study chosen by curriculum developers and teachers which maximizes an ELL's need for communication and social skills. To access an ELL supporting document which delineates performance definitions and descriptors, please click on the following link:
https://cpalmsmediaprod.blob.core.windows.net/uploads/docs/standards/eld/sc.pdf

**GENERAL INFORMATION**

- **Course Number:** 2000330
- **Number of Credits:** One (1) credit
- **Course Type:** Core Academic Course
- **Course Status:** State Board Approved
- **Grade Level(s):** 9,10,11,12
- **Graduation Requirement:** District-Determined
- **Course Path: Section:** Grades PreK to 12 Education Courses > Grade Group: Grades 9 to 12 and Adult Education Courses > Subject: Science > SubSubject: Biological Sciences >
- **Abbreviated Title:** BIO 2 HON
- **Course Attributes:** Honors
- **Course Length:** Year (Y)

**Educator Certifications**

- Science (Secondary Grades 7-12)
- Biology (Grades 6-12)
General Course Information and Notes

VERSION DESCRIPTION

The course description for this Pre-Advanced Placement (Pre-AP) course is located on the College Board site at https://pre-ap.collegeboard.org/courses.

GENERAL INFORMATION

Course Number: 2000335

Course Path: Grades PreK to 12 Education Courses > Grade Group: Grades 9 to 12 and Adult Education Courses > Subject: Science > SubSubject: Biological Sciences

Abbreviated Title: PRE-AP BIOLOGY

Course Length: Year (Y)

Course Attributes:

- Honors

Course Level: 3

Number of Credits: One (1) credit

Course Type: Elective Course

Grade Level(s): 9

Educator Certifications

<table>
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<th>Biology (Grades 6-12)</th>
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<tr>
<td>Middle Grades General Science (Middle Grades 5-9)</td>
</tr>
<tr>
<td>Science (Secondary Grades 7-12)</td>
</tr>
</tbody>
</table>
General Course Information and Notes

GENERAL NOTES

The course description for this Advanced Placement courses is located on the College Board site at http://apcentral.collegeboard.com/apc/public/courses/teachers_corner/index.html.

GENERAL INFORMATION

- **Course Number:** 2000340
- **Course Path:** Courses > Grade Group: Grades 9 to 12 and Adult Education Courses > Subject: Science > SubSubject: Biological Sciences
- **Abbreviated Title:** AP BIO
- **Course Length:** Year (Y)
- **Course Attributes:**
  - Advanced Placement (AP)
- **Course Level:** 3
- **Number of Credits:** One (1) credit
- **Course Type:** Core Academic Course
- **Course Status:** Course Approved
- **Grade Level(s):** 9,10,11,12
- **Graduation Requirement:** District-Determined

Educator Certifications

- Science (Secondary Grades 7-12)
- Biology (Grades 6-12)

Equivalent Courses

- 2000340-Advanced Placement Biology
  - Equivalency end year: 2018
### Course Standards

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**SC.912.N.1.1:**

- Pose questions about the natural world. (Articulate the purpose of the investigation and identify the relevant scientific concepts).  
- Conduct systematic observations. (Write procedures that are clear and replicable. Identify observables and examine relationships between test (independent) variable and outcome (dependent) variable. Employ appropriate methods for accurate and consistent observations; conduct and record measurements at appropriate levels of precision. Follow safety guidelines).  
- Examine books and other sources of information to see what is already known.  
- Review what is known in light of empirical evidence. (Examine the following: whether available empirical evidence can be interpreted in terms of existing knowledge and models, and if not, modify or develop new models).  
- Plan investigations. (Design and evaluate a scientific investigation).  
- Use tools to gather, analyze, and interpret data (this includes the use of measurement in metric and other systems, and also the generation and interpretation of graphical representations of data, including data tables and graphs).  
- Conduct systematic observations, (Collect data or evidence in an organized way. Properly use instruments, equipment, and materials (e.g., scales, probeware, meter sticks, microscopes, computers) including set-up, calibration, technique, maintenance, and storage).  
- Pose answers, explanations, or descriptions of events.  
- Generate explanations that explicate or describe natural phenomena (inferences).  
- Use appropriate evidence and reasoning to justify these explanations to others.  
- Communicate results of scientific investigations, and  
- Evaluate the merits of the explanations produced by others.  

**SC.912.N.1.2:**

Describe and explain what characterizes science and its methods.

**LAFS.1112.RST.1.1:**

Cite specific textual evidence to support analysis of science and technical texts, attending to important distinctions the author makes and to any gaps or inconsistencies in the account.
Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases.

- a. Graph linear and quadratic functions and show intercepts, maxima, and minima.
- b. Graph square root, cube root, and piecewise-defined functions, including step functions and absolute value functions.
- c. Graph polynomial functions, identifying zeros when suitable factorizations are available, and showing end behavior.
- d. Graph rational functions, identifying zeros and asymptotes when suitable factorizations are available, and showing end behavior.
- e. Graph exponential and logarithmic functions, showing intercepts and end behavior, and trigonometric functions, showing period, midline, and amplitude, and using phase shift.

MAFS.912.N-Q.1.1: Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays.

MAFS.912.N-Q.1.3: Choose a level of accuracy appropriate to limitations on measurement when reporting quantities.

MAFS.912.S-ID.1.1: Represent data with plots on the real number line (dot plots, histograms, and box plots).

### Clarifications:
In grades 6 – 8, students describe center and spread in a data distribution. Here they choose a summary statistic appropriate to the characteristics of the data distribution, such as the shape of the distribution or the existence of extreme data points.

MAFS.912.S-ID.1.2: Use statistics appropriate to the shape of the data distribution to compare center (median, mean) and spread (interquartile range, standard deviation) of two or more different data sets.

### Clarifications:
In grades 6 – 8, students describe center and spread in a data distribution. Here they choose a summary statistic appropriate to the characteristics of the data distribution, such as the shape of the distribution or the existence of extreme data points.

MAFS.912.S-ID.1.3: Interpret differences in shape, center, and spread in the context of the data sets, accounting for possible effects of extreme data points (outliers).

### Clarifications:
In grades 6 – 8, students describe center and spread in a data distribution. Here they choose a summary statistic appropriate to the characteristics of the data distribution, such as the shape of the distribution or the existence of extreme data points.

MAFS.912.S-ID.1.4: Use the mean and standard deviation of a data set to fit it to a normal distribution and to estimate population percentages. Recognize that there are data sets for which such a procedure is not appropriate. Use calculators, spreadsheets, and tables to estimate areas under the normal curve.

MAFS.912.S-ID.2.5: Summarize categorical data for two categories in two-way frequency tables. Interpret relative frequencies in the context of the data (including joint, marginal, and conditional relative frequencies). Recognize possible associations and trends in the data.

### Clarifications:
Students take a more sophisticated look at using a linear function to model the relationship between two numerical variables. In addition to fitting a line to data, students assess how well the model fits by analyzing residuals.

**Make sense of problems and persevere in solving them.**

Mathematically proficient students start by explaining to themselves the meaning of a problem and looking for entry points to its solution. They analyze givens, constraints, relationships, and goals. They make conjectures about the form and meaning of the solution and plan a solution pathway rather than simply jumping into a solution attempt. They consider analogous problems, and try special cases and simpler forms of the original problem in order to gain insight into its solution. They monitor and evaluate their progress and change course if necessary. Older students might, depending on the context of the problem, transform algebraic expressions or change the viewing window on their graphing calculator to get the information they need. Mathematically proficient students can explain correspondences between equations, verbal descriptions, tables, and graphs or draw diagrams of important features and relationships, graph data, and search for regularity or trends. Younger students might rely on using concrete objects or pictures to help conceptualize and solve a problem. Mathematically proficient students check their answers to problems using a different method, and they continually ask themselves, “Does this make sense?” They can understand the approaches of others to solving complex problems and identify correspondences between different approaches.

**Standard Relation to Course: Supporting**

### Reason abstractly and quantitatively.

Mathematically proficient students make sense of quantities and their relationships in problem situations. They bring two complementary abilities to bear on problems involving quantitative relationships: the ability to decontextualize—to abstract a given situation and represent it symbolically and manipulate the representing symbols as if they have a life of their own, without necessarily attending to their referents—and the ability to contextualize, to pause as needed during the manipulation process in order to probe into the referents for the symbols involved. Quantitative reasoning entails habits of creating a coherent representation of the problem at hand; considering the units involved; attending to the meaning of quantities, not just how to compute them; and knowing and flexibly using different properties of operations and objects.

**Standard Relation to Course: Supporting**

### Construct viable arguments and critique the reasoning of others.

Mathematically proficient students understand and use stated assumptions, definitions, and previously established results in constructing arguments. They make conjectures and build a logical progression of statements to explore the truth of their conjectures. They are able to analyze situations by breaking them into cases, and can recognize and use counterexamples. They justify their conclusions, communicate them to others, and respond to the arguments of others. They reason inductively about data, making plausible arguments that take into account the context from which the data arose. Mathematically proficient students are also able to compare the effectiveness of two plausible arguments, distinguish correct logic or reasoning from that which is flawed, and—if there is a flaw in an argument—explain what it is. Elementary students can construct...
arguments using concrete referents such as objects, drawings, diagrams, and actions. Such arguments can make sense and be correct, even though they are not generalized or made formal until later grades. Later, students learn to determine domains to which an argument applies. Students at all grades can listen or read the arguments of others, decide whether they make sense, and ask useful questions to clarify or improve the arguments.

**Standard Relation to Course: Supporting**

**Model with mathematics.**

Mathematically proficient students can apply the mathematics they know to solve problems arising in everyday life, society, and the workplace. In early grades, this might be as simple as writing an addition equation to describe a situation. In middle grades, a student might apply proportional reasoning to plan a school event or analyze a problem in the community. By high school, a student might use geometry to solve a design problem or use a function to describe how one quantity of interest depends on another. Mathematically proficient students who can apply what they know are comfortable making assumptions and approximations to simplify a complicated situation, realizing that these may need revision later. They are able to identify important quantities in a practical situation and map their relationships using such tools as diagrams, two-way tables, graphs, flowcharts and formulas. They can analyze those relationships mathematically to draw conclusions. They routinely interpret their mathematical results in the context of the situation and reflect on whether the results make sense, possibly improving the model if it has not served its purpose.

**Standard Relation to Course: Supporting**

**Use appropriate tools strategically.**

Mathematically proficient students consider the available tools when solving a mathematical problem. These tools might include pencil and paper, concrete models, a ruler, a protractor, a calculator, a spreadsheet, a computer algebra system, a statistical package, or dynamic geometry software. Proficient students are sufficiently familiar with tools appropriate for their grade or course to make sound decisions about when each of these tools might be helpful, recognizing both the insight to be gained and their limitations. For example, mathematically proficient high school students analyze graphs of functions and solutions generated using a graphing calculator. They detect possible errors by strategically using estimation and other mathematical knowledge. When making mathematical models, they know that technology can enable them to visualize the results of varying assumptions, explore consequences, and compare predictions with data. Mathematically proficient students at various grade levels are able to identify relevant external mathematical resources, such as digital content located on a website, and use them to pose or solve problems. They are able to use technological tools to explore and deepen their understanding of concepts.

**Standard Relation to Course: Supporting**

**Attend to precision.**

Mathematically proficient students try to communicate precisely to others. They try to use clear definitions in discussion with others and in their own reasoning. They state the meaning of the symbols they choose, including using the equal sign consistently and appropriately. They are careful about specifying units of measure, and labeling axes to clarify the correspondence with quantities in a problem. They calculate accurately and efficiently, express numerical answers with a degree of precision appropriate for the problem context. In the elementary grades, students give carefully formulated explanations to each other. By the time they reach high school they have learned to examine claims and make explicit use of definitions.

**Standard Relation to Course: Supporting**

**Look for and make use of structure.**

Mathematically proficient students look closely to discern a pattern or structure. Young students, for example, might notice that three and seven more is the same amount as seven and three more, or they may sort a collection of shapes according to how many sides the shapes have. Later, students will see 7 × 8 equals the well remembered 7 × 5 + 7 × 3, in preparation for learning about the distributive property. In the expression x² + 9x + 14, older students can see the 14 as 2 × 7 and the 9 as 2 + 7. They recognize the significance of an existing line in a geometric figure and can use the strategy of drawing an auxiliary line for solving problems. They also can step back for an overview and shift perspective. They can see complicated things, such as some algebraic expressions, as single objects or as being composed of several objects. For example, they can see 5 − 3(x − y)² as 5 minus a positive number times a square and use that to realize that its value cannot be more than 5 for any real numbers x and y.

**Standard Relation to Course: Supporting**

**Look for and express regularity in repeated reasoning.**

Mathematically proficient students notice if calculations are repeated, and look both for general methods and for shortcuts. Upper elementary students might notice when dividing 25 by 11 that they are repeating the same calculations over and over again, and conclude they have a repeating decimal. By paying attention to the calculation of slope as they repeatedly check whether points are on the line through (1, 2) with slope 3, middle school students might abstract the equation (y − 2)/(x − 1) = 3. Noticing the regularity in the way terms cancel when expanding (x − 1)(x + 1), (x − 1)(x² + x + 1), and (x − 1)(x⁶ + x² + x + 1) might lead them to the general formula for the sum of a geometric series. As they work to solve a problem, mathematically proficient students maintain oversight of the process, while attending to the details. They continually evaluate the reasonableness of their intermediate results.

**Standard Relation to Course: Supporting**

**HE.912.C.1.3:** Evaluate how environment and personal health are interrelated.

**Clarifications:**
- Food options within a community; prenatal-care services; availability of recreational facilities; air quality; weather-safety awareness; and weather, air, and water conditions.

**HE.912.C.1.5:** Analyze strategies for prevention, detection, and treatment of communicable and chronic diseases.

**Clarifications:**
- Health prevention, detection, and treatment of: breast and testicular cancer, suicide, obesity, and industrial-related chronic disease.

**HE.912.C.1.7:** Analyze how heredity and family history can impact personal health.

**Clarifications:**
- Drug use, family obesity, heart disease, mental health, and non-communicable illness or disease.

**ELD.K12.ELL.SC.1:** English language learners communicate information, ideas and concepts necessary for academic success in the content area of Science.

**ELD.K12.ELL.SI.1:** English language learners communicate for social and instructional purposes within the school setting.

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**General Course Information and Notes**
Laboratory investigations that include the use of scientific inquiry, research, measurement, problem solving, laboratory apparatus and technologies, experimental procedures, and safety procedures are an integral part of this course. The National Science Teachers Association (NSTA) recommends that at the high school level, all students should be in the science lab or field, collecting data every week. School laboratory investigations (labs) are defined by the National Research Council (NRC) as an experience in the laboratory, classroom, or the field that provides students with opportunities to interact directly with natural phenomena or with data collected by others using tools, materials, data collection techniques, and models (NRC, 2006, p. 3). Laboratory investigations in the high school classroom should help all students develop a growing understanding of the complexity and ambiguity of empirical work, as well as the skills to calibrate and troubleshoot equipment used to make observations. Learners should understand measurement error; and have the skills to aggregate, interpret, and present the resulting data (National Research Council, 2006, p.77; NSTA, 2007).

Special Notes:

Instructional Practices
Teaching from a range of complex text is optimized when teachers in all subject areas implement the following strategies on a routine basis:

1. Ensuring wide reading from complex text that varies in length.
2. Making close reading and rereading of texts central to lessons.
3. Emphasizing text-specific complex questions, and cognitively complex tasks, reinforce focus on the text and cultivate independence.
4. Emphasizing students supporting answers based upon evidence from the text.
5. Providing extensive research and writing opportunities (claims and evidence).


- Asking questions (for science) and defining problems (for engineering).
- Developing and using models.
- Planning and carrying out investigations.
- Analyzing and interpreting data.
- Using mathematics, information and computer technology, and computational thinking.
- Constructing explanations (for science) and designing solutions (for engineering).
- Engaging in argument from evidence.
- Obtaining, evaluating, and communicating information.

Literacy Standards in Science
Secondary science courses include reading standards for literacy in science and technical subjects 6-12 and writing standards for literacy in history/social studies, science, and technical subjects 6-12. The courses also include speaking and listening standards. For a complete list of standards required for this course click on the blue tile labeled course standards. You may also download the complete course including all required standards and notes sections using the export function located at the top of this page.

English Language Development ELD Standards Special Notes Section:
Teachers are required to provide listening, speaking, reading and writing instruction that allows English language learners (ELL) to communicate information, ideas and concepts for academic success in the content area of Science. For the given level of English language proficiency and with visual, graphic, or interactive support, students will interact with grade level words, expressions, sentences and discourse to process or produce language necessary for academic success. The ELD standard should specify a relevant content area concept or topic of study chosen by curriculum developers and teachers which maximizes an ELL's need for communication and social skills. To access an ELL supporting document which delineates performance definitions and descriptors, please click on the following link:
https://cpalmsmediaprod.blob.core.windows.net/uploads/docs/standards/eld/sc.pdf

Additional Instructional Resources:
A.V.E. for Success Collection is provided by the Florida Association of School Administrators: http://www.fasa.net/4DCGI/cms/review.html?
Action=CMS_Document&DocID=439. Please be aware that these resources have not been reviewed by CPALMS and there may be a charge for the use of some of them in this collection.

GENERAL INFORMATION

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#### SC.912.N.1.1:

Define a problem based on a specific body of knowledge, for example: biology, chemistry, physics, and earth/space science, and do the following:

1. Pose questions about the natural world, (articulate the purpose of the investigation and identify the relevant scientific concepts).
2. Conduct systematic observations, (Write procedures that are clear and replicable. Identify observables and examine relationships between test (independent) variable and outcome (dependent) variable. Employ appropriate methods for accurate and consistent observations; conduct and record measurements at appropriate levels of precision. Follow safety guidelines).
3. Examine books and other sources of information to see what is already known, (Review what is known in light of empirical evidence, (Examine the available empirical evidence can be interpreted in terms of existing knowledge and models, and if not, modify or develop new models)).
4. Plan investigations, (Design and evaluate a scientific investigation).
5. Use tools to gather, analyze, and interpret data (this includes the use of measurement in metric and other systems, and also the generation and interpretation of graphical representations of data, including data tables and graphs), (Collect data or evidence in an organized way. Properly use instruments, equipment, and materials (e.g., scales, probeware, meter sticks, microscopes, computers) including set-up, calibration, technique, maintenance, and storage).
6. Pose answers, explanations, or descriptions of events, (Generate explanations that explicate or describe natural phenomena (inferences), Use appropriate evidence and reasoning to justify these explanations to others, Communicate results of scientific investigations, and Evaluate the merits of the explanations produced by others).

#### SC.912.N.1.2:

Describe and explain what characterizes science and its methods.

Mathematicians who participate in effortful learning both individually and with others:

- Analyze the problem in a way that makes sense given the task.
| **MA.K12.MTR.1.1:** | **Clarifications:**  
| | Teachers who encourage students to participate actively in effortful learning both individually and with others:  
| | • Cultivate a community of growth mindset learners.  
| | • Foster perseverance in students by choosing tasks that are challenging.  
| | • Develop students’ ability to analyze and problem solve.  
| | • Recognize students’ effort when solving challenging problems.  
| | | **MA.K12.MTR.2.1:**  
| | Demonstrate understanding by representing problems in multiple ways. Mathematicians who demonstrate understanding by representing problems in multiple ways:  
| | • Build understanding through modeling and using manipulatives.  
| | • Represent solutions to problems in multiple ways using objects, drawings, tables, graphs and equations.  
| | • Progress from modeling problems with objects and drawings to using algorithms and equations.  
| | • Express connections between concepts and representations.  
| | • Choose a representation based on the given context or purpose.  
| | **Clarifications:**  
| | Teachers who encourage students to demonstrate understanding by representing problems in multiple ways:  
| | • Help students make connections between concepts and representations.  
| | • Provide opportunities for students to use manipulatives when investigating concepts.  
| | • Guide students from concrete to pictorial to abstract representations as understanding progresses.  
| | • Show students that various representations can have different purposes and can be useful in different situations.  
| | **MA.K12.MTR.3.1:**  
| | Complete tasks with mathematical fluency. Mathematicians who complete tasks with mathematical fluency:  
| | • Select efficient and appropriate methods for solving problems within the given context.  
| | • Maintain flexibility and accuracy while performing procedures and mental calculations.  
| | • Complete tasks accurately and with confidence.  
| | • Adapt procedures to apply them to a new context.  
| | • Use feedback to improve efficiency when performing calculations.  
| | **Clarifications:**  
| | Teachers who encourage students to complete tasks with mathematical fluency:  
| | • Provide students with the flexibility to solve problems by selecting a procedure that allows them to solve efficiently and accurately.  
| | • Offer multiple opportunities for students to practice efficient and generalizable methods.  
| | • Provide opportunities for students to reflect on the method they used and determine if a more efficient method could have been used.  
| | **MA.K12.MTR.4.1:**  
| | Engage in discussions that reflect on the mathematical thinking of self and others. Mathematicians who engage in discussions that reflect on the mathematical thinking of self and others:  
| | • Communicate mathematical ideas, vocabulary and methods effectively.  
| | • Analyze the mathematical thinking of others.  
| | • Compare the efficiency of a method to those expressed by others.  
| | • Recognize errors and suggest how to correctly solve the task.  
| | • Justify results by explaining methods and processes.  
| | • Construct possible arguments based on evidence.  
| | **Clarifications:**  
| | Teachers who encourage students to engage in discussions that reflect on the mathematical thinking of self and others:  
| | • Establish a culture in which students ask questions of the teacher and their peers, and error is an opportunity for learning.  
| | • Create opportunities for students to discuss their thinking with peers.  
| | • Select, sequence and present student work to advance and deepen understanding of correct and increasingly efficient methods.  
| | • Develop students’ ability to justify methods and compare their responses to the responses of their peers.  
| | **MA.K12.MTR.5.1:**  
| | Use patterns and structure to help understand and connect mathematical concepts. Mathematicians who use patterns and structure to help understand and connect mathematical concepts:  
| | • Focus on relevant details within a problem.  
| | • Create plans and procedures to logically order events, steps or ideas to solve problems.  
| | • Decompose a complex problem into manageable parts.  
| | • Relate previously learned concepts to new concepts.  
| | • Look for similarities among problems.  
| | • Connect solutions of problems to more complicated large-scale situations.  
| | **Clarifications:**  
| | Teachers who encourage students to use patterns and structure to help understand and connect mathematical concepts:  
| | • Help students recognize the patterns in the world around them and connect these patterns to mathematical concepts.  
| | • Support students to develop generalizations based on the similarities found among problems.  
| | • Provide opportunities for students to create plans and procedures to solve problems.  
| | • Develop students' ability to construct relationships between their current understanding and more sophisticated ways of thinking.  
| | **Assess the reasonableness of solutions.**  
| | Mathematicians who assess the reasonableness of solutions:
MA.K12.MTR.6.1:
- Estimate to discover possible solutions.
- Use benchmark quantities to determine if a solution makes sense.
- Check calculations when solving problems.
- Verify possible solutions by explaining the methods used.
- Evaluate results based on the given context.

**Clarifications:**
Teachers who encourage students to assess the reasonableness of solutions:
- Have students estimate or predict solutions prior to solving.
- Prompt students to continually ask, "Does this solution make sense? How do you know?"
- Reinforce that students check their work as they progress within and after a task.
- Strengthen students' ability to verify solutions through justifications.

Apply mathematics to real-world contexts.
Mathematicians who apply mathematics to real-world contexts:
- Connect mathematical concepts to everyday experiences.
- Use models and methods to understand, represent and solve problems.
- Perform investigations to gather data or determine if a method is appropriate. • Redesign models and methods to improve accuracy or efficiency.

MA.K12.MTR.7.1:

**Clarifications:**
Teachers who encourage students to apply mathematics to real-world contexts:
- Provide opportunities for students to create models, both concrete and abstract, and perform investigations.
- Challenge students to question the accuracy of their models and methods.
- Support students as they validate conclusions by comparing them to the given situation.
- Indicate how various concepts can be applied to other disciplines.

Cite evidence to explain and justify reasoning.

**Clarifications:**
K-1 Students include textual evidence in their oral communication with guidance and support from adults. The evidence can consist of details from the text without naming the text. During 1st grade, students learn how to incorporate the evidence in their writing. 2-3 Students include relevant textual evidence in their written and oral communication. Students should name the text when they refer to it. In 3rd grade, students should use a combination of direct and indirect citations.
4-5 Students continue with previous skills and reference comments made by speakers and peers. Students cite texts that they've directly quoted, paraphrased, or used for information. When writing, students will use the form of citation dictated by the instructor or the style guide referenced by the instructor.
6-8 Students continue with previous skills and use a style guide to create a proper citation.
9-12 Students continue with previous skills and should be aware of existing style guides and the ways in which they differ.

ELA.K12.EE.1.1:

**Clarifications:**
Students will make inferences before the words infer or inference are introduced. Kindergarten students will answer questions like “Why is the girl smiling?” or make predictions about what will happen based on the title page. Students will use the terms and apply them in 2nd grade and beyond.

ELA.K12.EE.2.1:

**Clarifications:**
See Text Complexity for grade-level complexity bands and a text complexity rubric.

Make inferences to support comprehension.

ELA.K12.EE.3.1:

**Clarifications:**
Students will make inferences before the words infer or inference are introduced. Kindergarten students will answer questions like “Why is the girl smiling?” or make predictions about what will happen based on the title page. Students will use the terms and apply them in 2nd grade and beyond.

ELA.K12.EE.4.1:

**Clarifications:**
In kindergarten, students learn to listen to one another respectfully. In grades 1-2, students build upon these skills by justifying what they are thinking. For example: “I think _______ because _______.” The collaborative conversations are becoming academic conversations.
In grades 3-12, students engage in academic conversations discussing claims and justifying their reasoning, refining and applying skills. Students build on ideas, propel the conversation, and support claims and counterclaims with evidence.

ELA.K12.EE.5.1:

**Clarifications:**
Students will incorporate skills learned into work products to produce quality work. For students to incorporate these skills appropriately, they must receive instruction. A 3rd grade student creating a poster board display must have instruction in how to effectively present information to do quality work.

Use appropriate voice and tone when speaking or writing.

ELA.K12.EE.6.1:

**Clarifications:**
In kindergarten and 1st grade, students learn the difference between formal and informal language. For example, the way we talk to our friends differs from the way we speak to adults. In 2nd grade and beyond, students practice appropriate social and academic language to discuss texts.

HE.912.C.1.3:

**Clarifications:**
Food options within a community; prenatal-care services; availability of recreational facilities; air quality; weather-safety awareness; and weather, air, and water conditions.

HE.912.C.1.5:

**Clarifications:**
Analyze strategies for prevention, detection, and treatment of communicable and chronic diseases.
Health prevention, detection, and treatment of: breast and testicular cancer, suicide, obesity, and industrial-related chronic disease.

HE.912.C.1.7: Analyze how heredity and family history can impact personal health.

Clarifications:
Drug use, family obesity, heart disease, mental health, and non-communicable illness or disease.

ELD.K12.ELL.SC.1: English language learners communicate information, ideas and concepts necessary for academic success in the content area of Science.

ELD.K12.ELL.SI.1: English language learners communicate for social and instructional purposes within the school setting.

General Course Information and Notes

General Information and Notes

Laboratory investigations that include the use of scientific inquiry, research, measurement, problem solving, laboratory apparatus and technologies, experimental procedures, and safety procedures are an integral part of this course. The National Science Teachers Association (NSTA) recommends that at the high school level, all students should be in the science lab or field, collecting data every week. School laboratory investigations (labs) are defined by the National Research Council (NRC) as an experience in the laboratory, classroom, or the field that provides students with opportunities to interact directly with natural phenomena or with data collected by others using tools, materials, data collection techniques, and models (NRC, 2006, p. 3). Laboratory investigations in the high school classroom should help all students develop a growing understanding of the complexity and ambiguity of empirical work, as well as the skills to calibrate and troubleshoot equipment used to make observations. Learners should understand measurement error; and have the skills to aggregate, interpret, and present the resulting data (National Research Council, 2006, p.77; NSTA, 2007).

Special Notes:
Instructional Practices
Teaching from a range of complex text is optimized when teachers in all subject areas implement the following strategies on a routine basis:

1. Ensuring wide reading from complex text that varies in length.
2. Making close reading and rereading of texts central to lessons.
3. Emphasizing text-specific complex questions, and cognitively complex tasks, reinforce focus on the text and cultivate independence.
4. Emphasizing students supporting answers based upon evidence from the text.
5. Providing extensive research and writing opportunities (claims and evidence).


- Asking questions (for science) and defining problems (for engineering).
- Developing and using models.
- Planning and carrying out investigations.
- Analyzing and interpreting data.
- Using mathematics, information and computer technology, and computational thinking.
- Constructing explanations (for science) and designing solutions (for engineering).
- Engaging in argument from evidence.
- Obtaining, evaluating, and communicating information.

Florida's Benchmarks for Excellent Student Thinking (B.E.S.T.) Standards

This course includes Florida's B.E.S.T. ELA Expectations (EE) and Mathematical Thinking and Reasoning Standards (MTRs) for students. Florida educators should intentionally embed these standards within the content and their instruction as applicable. For guidance on the implementation of the EEs and MTRs, please visit https://www.cpalms.org/Standards/BEST_Standards.aspx and select the appropriate B.E.S.T. Standards package.

English Language Development ELD Standards Special Notes Section:

Teachers are required to provide listening, speaking, reading and writing instruction that allows English language learners (ELL) to communicate information, ideas and concepts for academic success in the content area of Science. For the given level of English language proficiency and with visual, graphic, or interactive support, students will interact with grade level words, expressions, sentences and discourse to process or produce language necessary for academic success. The ELD standard should specify a relevant content area concept or topic of study chosen by curriculum developers and teachers which maximizes an ELL’s need for communication and social skills. To access an ELL supporting document which delineates performance definitions and descriptors, please click on the following link:

https://cpalmsmediaprod.blob.core.windows.net/uploads/docs/standards/eld/sc.pdf

Additional Instructional Resources:
A.Y.E. for Success Collection is provided by the Florida Association of School Administrators: http://www.fasa.net/4DCGI/cms/review.html?
Action=CMS_Document&DocID=139. Please be aware that these resources have not been reviewed by CPALMS and there may be a charge for the use of some of them in this collection.

General Information

Course Number: 2000350
Number of Credits: One (1) credit
Course Type: Core Academic Course
Course Status: State Board Approved
Grade Levels: 9, 10, 11, 12, 30, 31
Graduation Requirement: Equally Rigorous Science

Course Path: Section: Grades PreK to 12 Education Courses > Grade Group: Grades 9 to 12 and Adult Education Courses > Subject: Science > SubSubject: Biological Sciences >

Abbreviated Title: ANAT PHYSIO
Course Length: Year (Y)
Course Level: 2

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### Educator Certifications

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<td>Science</td>
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<td>Biology</td>
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<td>Health</td>
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Anatomy and Physiology Honors (#2000360) 2015 - 2022 (current)

Course Standards

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<tr>
<th>Name</th>
<th>Description</th>
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<tr>
<td>SC.912.L.14.11:</td>
<td>Classify and state the defining characteristics of epithelial tissue, connective tissue, muscle tissue, and nervous tissue.</td>
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<tr>
<td>SC.912.L.14.12:</td>
<td>Describe the anatomy and histology of bone tissue.</td>
</tr>
<tr>
<td>SC.912.L.14.13:</td>
<td>Distinguish between bones of the axial skeleton and the appendicular skeleton.</td>
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<tr>
<td>SC.912.L.14.14:</td>
<td>Identify the major bones of the axial and appendicular skeleton.</td>
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<tr>
<td>SC.912.L.14.15:</td>
<td>Identify major markings (such as foramina, fossae, tubercles, etc.) on a skeleton. Explain why these markings are important.</td>
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<tr>
<td>SC.912.L.14.16:</td>
<td>Describe the anatomy and histology, including ultrastructure, of muscle tissue.</td>
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<tr>
<td>SC.912.L.14.17:</td>
<td>List the steps involved in the sliding filament of muscle contraction.</td>
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<tr>
<td>SC.912.L.14.18:</td>
<td>Describe signal transmission across a myoneural junction.</td>
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<tr>
<td>SC.912.L.14.19:</td>
<td>Explain the physiology of skeletal muscle.</td>
</tr>
<tr>
<td>SC.912.L.14.20:</td>
<td>Identify the major muscles of the human on a model or diagram.</td>
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<tr>
<td>SC.912.L.14.21:</td>
<td>Describe the anatomy, histology, and physiology of the central and peripheral nervous systems and name the major divisions of the nervous system.</td>
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<tr>
<td>SC.912.L.14.22:</td>
<td>Describe the physiology of nerve conduction, including the generator potential, action potential, and the synapse.</td>
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<td>SC.912.L.14.23:</td>
<td>Identify the parts of a reflex arc.</td>
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<tr>
<td>SC.912.L.14.24:</td>
<td>Identify the major parts of a cross section through the spinal cord.</td>
</tr>
<tr>
<td>SC.912.L.14.25:</td>
<td>Identify the functions of the major parts of the brain, including the meninges, medulla, pons, midbrain, hypothalamus, thalamus, cerebellum and cerebrum.</td>
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<tr>
<td>SC.912.L.14.26:</td>
<td>Identify the major functions of the spinal cord.</td>
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<tr>
<td>SC.912.L.14.27:</td>
<td>Define the terms endocrine and exocrine.</td>
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<tr>
<td>SC.912.L.14.29:</td>
<td>Describe the physiology of hormones including the different types and the mechanisms of their action.</td>
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<tr>
<td>SC.912.L.14.30:</td>
<td>Describe the composition and physiology of blood, including that of the plasma and the formed elements.</td>
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<tr>
<td>SC.912.L.14.31:</td>
<td>Describe the steps in hemostasis, including the mechanism of coagulation. Include the basis for blood typing and transfusion reactions.</td>
</tr>
<tr>
<td>SC.912.L.14.32:</td>
<td>Describe the factors affecting blood flow through the cardiovascular system.</td>
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<td>SC.912.L.14.33:</td>
<td>Explain the components of an electrocardiogram.</td>
</tr>
<tr>
<td>SC.912.L.14.34:</td>
<td>Describe normal heart sounds and what they mean.</td>
</tr>
<tr>
<td>SC.912.L.14.35:</td>
<td>Describe hypertension and some of the factors that produce it.</td>
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<tr>
<td>SC.912.L.14.36:</td>
<td>Describe the histology of the heart, including its chambers and valves.</td>
</tr>
<tr>
<td>SC.912.L.14.37:</td>
<td>Describe the histology of the major arteries and veins of systemic, pulmonary, hepatic portal, and coronary circulation.</td>
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<tr>
<td>SC.912.L.14.38:</td>
<td>Describe the histology of the lymphatic system.</td>
</tr>
<tr>
<td>SC.912.L.14.39:</td>
<td>Describe the histology of the respiratory system.</td>
</tr>
<tr>
<td>SC.912.L.14.41:</td>
<td>Describe the histology of the digestive system, including mechanical digestion, chemical digestion, absorption and the neural and hormonal mechanisms of control.</td>
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<tr>
<td>SC.912.L.14.42:</td>
<td>Describe the physiology of urine formation by the kidney.</td>
</tr>
<tr>
<td>SC.912.L.14.43:</td>
<td>Describe the anatomy, histology, and physiology of the kidneys.</td>
</tr>
<tr>
<td>SC.912.L.14.44:</td>
<td>Describe the histology of the kidneys.</td>
</tr>
<tr>
<td>SC.912.L.14.45:</td>
<td>Describe the functions of the kidney, the ureters, the urinary bladder, and the urethra.</td>
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<tr>
<td>SC.912.L.14.46:</td>
<td>Describe the functions associated with the sympathetic and parasympathetic nervous systems.</td>
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<tr>
<td>SC.912.L.14.47:</td>
<td>Describe the structure of vertebrate sensory organs. Relate structure to function in vertebrate sensory systems.</td>
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<tr>
<td>SC.912.L.14.48:</td>
<td>Describe the function of the vertebrate integumentary system.</td>
</tr>
<tr>
<td>SC.912.L.14.49:</td>
<td>Explain the basic functions of the human immune system, including specific and nonspecific immune response, vaccines, and antibiotics.</td>
</tr>
<tr>
<td>SC.912.L.14.50:</td>
<td>Explain the relationship between mutation, cell cycle, and uncontrolled cell growth potentially resulting in cancer.</td>
</tr>
<tr>
<td>SC.912.L.14.51:</td>
<td>Explain the impact of biotechnology on the individual, society and the environment, including medical and ethical issues.</td>
</tr>
<tr>
<td>SC.912.L.14.52:</td>
<td>Describe the process of human development from fertilization to birth and major changes that occur in each trimester of pregnancy.</td>
</tr>
<tr>
<td>SC.912.L.14.53:</td>
<td>Describe the important structural characteristics of monosaccharides, disaccharides, and polysaccharides and explain the functions of carbohydrates in living things.</td>
</tr>
<tr>
<td>SC.912.L.14.54:</td>
<td>Describe the structures of fatty acids, triglycerides, phospholipids, and steroids. Explain the functions of lipids in living organisms. Identify some reactions that fatty acids undergo. Relate the structure and function of cell membranes.</td>
</tr>
<tr>
<td>SC.912.L.14.56:</td>
<td>Discuss the role of anaerobic respiration in living things and in human society.</td>
</tr>
<tr>
<td>SC.912.L.14.57:</td>
<td>Identify the reactants, products, and basic functions of aerobic and anaerobic cellular respiration.</td>
</tr>
<tr>
<td>SC.912.L.14.58:</td>
<td>Explain the role of enzymes as catalysts that lower the activation energy of biochemical reactions. Identify factors, such as pH and temperature, and their effect on enzyme activity.</td>
</tr>
</tbody>
</table>

Define a problem based on a specific body of knowledge, for example: biology, chemistry, physics, and earth/space science, and do the following:

1. Pose questions about the natural world. (Articulate the purpose of the investigation and identify the relevant scientific concepts).
2. Conduct systematic observations. (Write procedures that are clear and replicable. Identify observables and examine relationships between test (independent) variable and outcome (dependent) variable. Employ appropriate methods for accurate and consistent observations; conduct and record measurements at appropriate levels of precision. Follow safety guidelines).
Examine books and other sources of information to see what is already known.
Review what is known in light of empirical evidence, (Examine whether available empirical evidence can be interpreted in terms of existing knowledge and models, and if not, modify or develop new models).
Plan investigations, (Design and evaluate a scientific investigation).
Use tools to gather, analyze, and interpret data (this includes the use of measurement in metric and other systems, and also the generation and interpretation of graphical representations of data, including data tables and graphs), (Collect data or evidence in an organized way. Properly use instruments, equipment, and materials (e.g., scales, probeware, meter sticks, microscopes, computers) including set-up, calibration, technique, maintenance, and storage).
Pose questions, explanations, or descriptions of events,
Generate explanations that explicate or describe natural phenomena (inferences),
Use appropriate evidence and reasoning to justify these explanations to others,
Communicate results of scientific investigations, and
Evaluate the merits of the explanations produced by others.
### LAFS.1112.WHST.2.4:
Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.

### LAFS.1112.WHST.2.5:
Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience.

### LAFS.1112.WHST.2.6:
Use technology, including the Internet, to produce, publish, and update individual or shared writing products in response to ongoing feedback, including new arguments or information.

### LAFS.1112.WHST.3.7:
Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation.

### LAFS.1112.WHST.3.8:
Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the strengths and limitations of each source in terms of the specific task, purpose, and audience; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and overreliance on any one source and following a standard format for citation.

### LAFS.1112.WHST.3.9:
Draw evidence from informational texts to support analysis, reflection, and research.

### LAFS.1112.WHST.4.10:
Write routinely over extended time frames (time for reflection and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences.

### MAFS.912.F-IF.2.4:
For a function that models a relationship between two quantities, interpret key features of graphs and tables in terms of the quantities, and sketch graphs showing key features given a verbal description of the relationship. Key features include: intercepts; intervals where the function is increasing, decreasing, positive, or negative; relative maximums and minimums; symmetries; end behavior; and periodicity. ★

- a. Graph linear and quadratic functions and show intercepts, maxima, and minima.
- b. Graph square root, cube root, and piecewise-defined functions, including step functions and absolute value functions.
- c. Graph polynomial functions, identifying zeros when suitable factorizations are available, and showing end behavior.
- d. Graph rational functions, identifying zeros and asymptotes when suitable factorizations are available, and showing end behavior.
- e. Graph exponential and logarithmic functions, showing intercepts and end behavior, and trigonometric functions, showing period, midline, and amplitude, and using phase shift.

### MAFS.912.F-IF.3.7:
Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases. ★

### MAFS.912.F-IF.3.8:
Use functions to model relationships between quantities. ★

- a. Fit a linear function for a scatter plot that suggests a linear association.
- b. Informally assess the fit of a function by plotting and analyzing residuals.
- c. Fit a linear function for a scatter plot that suggests a linear association.

### MAFS.912.F-Q.1.3:
Graph square root, cube root, and piecewise-defined functions, including step functions and absolute value functions.

### MAFS.912.N-Q.1.3:
Use given functions or choose a function that models a relationship between two quantities. Use functions to model relationships between quantities. ★

- a. Fit a function to the data; use functions fitted to data to solve problems in the context of the data. Use given functions or choose a function suggested by the context. Emphasize linear, and exponential models.
- b. Informally assess the fit of a function by plotting and analyzing residuals.
- c. Fit a linear function for a scatter plot that suggests a linear association.

### MAFS.912.S-ID.2.6:
Evaluate reports based on data. ★

#### Clarifications:
- a. Use statistics appropriate to the shape of the data distribution to compare center (median, mean) and spread (interquartile range, standard deviation of two or more different data sets. ★
- b. Interpret differences in shape, center, and spread in the context of the data sets, accounting for possible effects of extreme data points (outliers). ★
- c. Use the mean and standard deviation of a data set to fit it to a normal distribution and to estimate population percentages. Recognize that there are data sets for which such a procedure is not appropriate. Use calculators, spreadsheets, and tables to estimate areas under the normal curve. ★
- d. Summarize categorical data for two categories in two-way frequency tables. Interpret relative frequencies in the context of the data (including joint, marginal, and conditional relative frequencies). Recognize possible associations and trends in the data. ★
- e. Represent data on two quantitative variables on a scatter plot, and describe how the variables are related. ★
- a. Fit a function to the data; use functions fitted to data to solve problems in the context of the data. Use given functions or choose a function suggested by the context. Emphasize linear, and exponential models.
- b. Informally assess the fit of a function by plotting and analyzing residuals.
- c. Fit a linear function for a scatter plot that suggests a linear association.

### MAFS.912.S-ID.2.5:
Represent data on two quantitative variables on a scatter plot, and describe how the variables are related. ★

### MAFS.912.S-ID.2.4:
Represent data on a single quantitative variable, using graphs (e.g., histograms, box plots, dot plots) to show the distribution of the data. ★

### MAFS.912.S-ID.2.3:
Use technology to analyze data. ★

#### Clarifications:
- a. Compute the mean and standard deviation of a data set. ★
- b. Interpret differences in shape, center, and spread in the context of the data sets, accounting for possible effects of extreme data points (outliers). ★
- c. Use the mean and standard deviation of a data set to fit it to a normal distribution and to estimate population percentages. Recognize that there are data sets for which such a procedure is not appropriate. Use calculators, spreadsheets, and tables to estimate areas under the normal curve. ★
- d. Summarize categorical data for two categories in two-way frequency tables. Interpret relative frequencies in the context of the data (including joint, marginal, and conditional relative frequencies). Recognize possible associations and trends in the data. ★
- e. Represent data on two quantitative variables on a scatter plot, and describe how the variables are related. ★
- a. Fit a function to the data; use functions fitted to data to solve problems in the context of the data. Use given functions or choose a function suggested by the context. Emphasize linear, and exponential models.
- b. Informally assess the fit of a function by plotting and analyzing residuals.
- c. Fit a linear function for a scatter plot that suggests a linear association.

### MAFS.912.S-ID.2.2:
Represent data on a single quantitative variable, using graphs (e.g., histograms, box plots, dot plots) to show the distribution of the data. ★

### MAFS.912.S-ID.2.1:
Use technology to analyze data. ★

#### Clarifications:
- a. Compute the mean and standard deviation of a data set. ★
- b. Interpret differences in shape, center, and spread in the context of the data sets, accounting for possible effects of extreme data points (outliers). ★
- c. Use the mean and standard deviation of a data set to fit it to a normal distribution and to estimate population percentages. Recognize that there are data sets for which such a procedure is not appropriate. Use calculators, spreadsheets, and tables to estimate areas under the normal curve. ★
- d. Summarize categorical data for two categories in two-way frequency tables. Interpret relative frequencies in the context of the data (including joint, marginal, and conditional relative frequencies). Recognize possible associations and trends in the data. ★
- e. Represent data on two quantitative variables on a scatter plot, and describe how the variables are related. ★
- a. Fit a function to the data; use functions fitted to data to solve problems in the context of the data. Use given functions or choose a function suggested by the context. Emphasize linear, and exponential models.
- b. Informally assess the fit of a function by plotting and analyzing residuals.
- c. Fit a linear function for a scatter plot that suggests a linear association.

### Make sense of problems and persevere in solving them.

Mathematically proficient students start by explaining to themselves the meaning of a problem and looking for entry points to its solution. They analyze givers, constraints, relationships, and goals. They make conjectures about the form and meaning of the solution and plan a solution pathway rather than simply jumping into a solution attempt. They consider analogous problems, and try special cases and simpler forms of the original problem in order to gain insight into its solution. They monitor and evaluate their progress and change course if necessary. Older students might, depending on the context of the problem, transform algebraic expressions or change the viewing window on their graphing calculator to get the information they need. Mathematically proficient students can explain correspondences between equations, verbal descriptions, tables, and graphs or draw diagrams of important features and relationships, graph data, and search for regularity or trends. Younger students might rely on using concrete objects or pictures to help conceptualize and solve a problem. Mathematically proficient students check their answers to problems using a different method, and they continually ask themselves, “Does this make sense?” They can understand the approaches of others to solving problems.

### MAFS.K12_MP.1.1:
Use concrete objects or pictures to help conceptualize and solve a problem. Mathematically proficient students start by explaining to themselves the meaning of a problem and looking for entry points to its solution. They analyze givers, constraints, relationships, and goals. They make conjectures about the form and meaning of the solution and plan a solution pathway rather than simply jumping into a solution attempt. They consider analogous problems, and try special cases and simpler forms of the original problem in order to gain insight into its solution. They monitor and evaluate their progress and change course if necessary. Older students might, depending on the context of the problem, transform algebraic expressions or change the viewing window on their graphing calculator to get the information they need. Mathematically proficient students can explain correspondences between equations, verbal descriptions, tables, and graphs or draw diagrams of important features and relationships, graph data, and search for regularity or trends. Younger students might rely on using concrete objects or pictures to help conceptualize and solve a problem. Mathematically proficient students check their answers to problems using a different method, and they continually ask themselves, “Does this make sense?” They can understand the approaches of others to solving problems.
complex problems and identify correspondences between different approaches.

**Standard Relation to Course: Supporting**

**MAFS.K12.MP.2.1:**

Reason abstractly and quantitatively.

Mathematically proficient students make sense of quantities and their relationships in problem situations. They bring two complementary abilities to bear on problems involving quantitative relationships: the ability to decontextualize—to abstract a given situation and represent it symbolically and manipulate the representing symbols as if they have a life of their own, without necessarily attending to their referents—and the ability to contextualize, to pause as needed during the manipulation process in order to probe into the referents for the symbols involved. Quantitative reasoning entails habits of creating a coherent representation of the problem at hand; considering the units involved; attending to the meaning of quantities, not just how to compute them; and knowing and flexibly using different properties of operations and objects.

**Standard Relation to Course: Supporting**

**MAFS.K12.MP.3.1:**

Construct viable arguments and critique the reasoning of others.

Mathematically proficient students understand and use stated assumptions, definitions, and previously established results in constructing arguments. They make conjectures and build a logical progression of statements to explore the truth of their conjectures. They are able to analyze situations by breaking them into cases, and can recognize and use counterexamples. They justify their conclusions, communicate them to others, and respond to the arguments of others. They reason inductively about data, making plausible arguments that take into account the context from which the data arose. Mathematically proficient students are also able to compare the effectiveness of two plausible arguments, distinguish correct logic or reasoning from that which is flawed, and—if there is a flaw in an argument—explain what it is. Elementary students can construct arguments using concrete referents such as objects, drawings, diagrams, and actions. Such arguments can make sense and be correct, even though they are not generalized or made formal until later grades. Later, students learn to determine domains to which an argument applies. Students at all grades can listen or read the arguments of others, decide whether they make sense, and ask useful questions to clarify or improve the arguments.

**Standard Relation to Course: Supporting**

**MAFS.K12.MP.4.1:**

Model with mathematics.

Mathematically proficient students can apply the mathematics they know to solve problems arising in everyday life, society, and the workplace. In early grades, this might be as simple as writing an addition equation to describe a situation. In middle grades, a student might apply proportional reasoning to plan a school event or analyze a problem in the community. By high school, a student might use geometry software to solve a design problem or function to describe how one quantity changes with respect to another. Mathematically proficient students at each level are able to identify important quantities in a practical situation, choose appropriate representations for them, and use their insights to make approximations and estimate errors. They detect possible errors by analyzing the arguments in domain-specific tasks, compare predictions with data, and make and use approximations to simplify a complicated situation, connecting their approximations to the context and the mathematical problem. These tools might include pencil and paper, concrete models, a ruler, a protractor, a calculator, a spreadsheet, a computer algebra system, a statistical package, or a dynamic geometry software.

**Standard Relation to Course: Supporting**

**MAFS.K12.MP.5.1:**

Use appropriate tools strategically.

Mathematically proficient students consider the available tools when solving a mathematical problem. These tools might include pencil and paper, concrete models, a ruler, a protractor, a calculator, a spreadsheet, a computer algebra system, a statistical package, or dynamic geometry software. Proficient students are sufficiently familiar with tools appropriate for their grade or course to make sound decisions about when each of these tools might be helpful, recognizing both the insight to be gained and their limitations. For example, mathematically proficient high school students analyze graphs of functions and solutions generated using a graphing calculator. They detect possible errors by strategically using estimation and other mathematical knowledge. When making mathematical models, they know that technology can enable them to visualize the results of varying assumptions, explore consequences, and compare predictions with data. Mathematically proficient students at various grade levels are able to identify relevant external mathematical resources, such as digital content located on a website, and use them to pose or solve problems. They are able to use technological tools to explore and deepen their understanding of concepts.

**Standard Relation to Course: Supporting**

**MAFS.K12.MP.6.1:**

Attend to precision.

Mathematically proficient students try to communicate precisely to others. They try to use clear definitions in discussion with others and in their own reasoning. They state the meaning of the symbols they choose, including using the equal sign consistently and appropriately. They are careful about specifying units of measure, and labeling axes to clarify the correspondence with quantities in a problem. They calculate accurately and efficiently, express numerical answers with a degree of precision appropriate for the problem context. In the elementary grades, students give carefully formulated explanations to each other. By the time they reach high school they have learned to examine claims and make explicit use of definitions.

**Standard Relation to Course: Supporting**

**MAFS.K12.MP.7.1:**

Look for and make use of structure.

Mathematically proficient students look closely to discern a pattern or structure. Young students, for example, might notice that three and seven more is the same amount as seven and three more, or they may sort a collection of shapes according to how many sides the shapes have. Later, students will see that 7 × 8 equals the well remembered 7 × 5 + 7 times a square and use that to realize that its value cannot be more than 5 for any real numbers x and y.

**Standard Relation to Course: Supporting**

**MAFS.K12.MP.8.1:**

Look for and express regularity in repeated reasoning.

Mathematically proficient students notice if calculations are repeated, and look both for general methods and for shortcuts. Upper elementary students might notice when dividing 25 by 11 that they are repeating the same calculations over and over again, and conclude they have a repeating decimal. By paying attention to the calculation of slope as they repeatedly check whether points are on the line through (1, 2) with slope 3, middle school students might abstract the equation (y = -3)x + 1 = 3. Noticing the regularity in the way terms cancel when expanding (x - 1)² + x + 1, (x - 1)² = x² + x + 1, and (x - 1)(x² + x + 1) might lead them to the general formula for the sum of a geometric series. As they work to solve a problem, mathematically proficient students maintain oversight of the process, while attending to the details. They continually evaluate the reasonableness of their intermediate results.
General Course Information and Notes

GENERAL NOTES

While the content focus of this course is consistent with the Anatomy and Physiology course, students will explore these concepts in greater depth. In general, the academic pace and rigor will be greatly increased for honors level course work. Laboratory investigations that include the use of scientific inquiry, research, measurement, problem solving, laboratory apparatus and technologies, experimental procedures, and safety procedures are an integral part of this course. The National Science Teachers Association (NSTA) recommends that at the high school level, all students should be in the science lab or field, collecting data every week. School laboratory investigations (labs) are defined by the National Research Council (NRC) as an experience in the laboratory, classroom, or the field that provides students with opportunities to interact directly with natural phenomena or with data collected by others using tools, materials, data collection techniques, and models (NRC, 2006, p. 3). Laboratory investigations in the high school classroom should help all students develop a growing understanding of the complexity and ambiguity of empirical work, as well as the skills to calibrate and troubleshoot equipment used to make observations. Learners should understand measurement error; and have the skills to aggregate, interpret, and present the resulting data (National Research Council, 2006, p. 77; NSTA, 2007).

Honors and Advanced Level Course Note: Advanced courses require a greater demand on students through increased academic rigor. Academic rigor is obtained through the application, analysis, evaluation, and creation of complex ideas that are often abstract and multi-faceted. Students are challenged to think and collaborate critically on the content they are learning. Honors level rigor will be achieved by increasing text complexity through text selection, focus on high-level qualitative measures, and complexity of task. Instruction will be structured to give students a deeper understanding of conceptual themes and organization within and across disciplines. Academic rigor is more than simply assigning to students a level of rigor will be achieved by increasing text complexity through text selection, focus on high-level qualitative measures, and complexity of task. Instruction will be structured to give students a deeper understanding of conceptual themes and organization within and across disciplines. Academic rigor is more than simply assigning to students a

Special Notes:

Instructional Practices

Teaching from a range of complex text is optimized when teachers in all subject areas implement the following strategies on a routine basis:

1. Ensuring wide reading from complex text that varies in length.
2. Making close reading and rereading of texts central to lessons.
3. Emphasizing text-specific complex questions, and cognitively complex tasks, reinforce focus on the text and cultivate independence.
4. Emphasizing students supporting answers based upon evidence from the text.
5. Providing extensive research and writing opportunities (claims and evidence).


- Asking questions (for science) and defining problems (for engineering).
- Developing and using models.
- Planning and carrying out investigations.
- Analyzing and interpreting data.
- Using mathematics, information and computer technology, and computational thinking.
- Constructing explanations (for science) and designing solutions (for engineering).
- Engaging in argument from evidence.
- Obtaining, evaluating, and communicating information.

Literacy Standards in Science

Secondary science courses include reading standards for literacy in science and technical subjects 6-12 and writing standards for literacy in history/social studies, science, and technical subjects 6-12. The courses also include speaking and listening standards. For a complete list of standards required for this course click on the blue tile labeled course standards. You may also download the complete course including all required standards and notes sections using the export function located at the top of this page.

English Language Development ELD Standards Special Notes Section:

Teachers are required to provide listening, speaking, reading and writing instruction that allows English language learners (ELL) to communicate information, ideas and concepts for academic success in the content area of Science. For the given level of English language proficiency and with visual, graphic, or interactive support, students will interact with grade level words, expressions, sentences and discourse to process or produce language necessary for academic success. The ELD standard should specify a relevant content area concept or topic of study chosen by curriculum developers and teachers which maximizes an ELL's need for communication and social skills. To access an ELL supporting document which delineates performance definitions and descriptors, please click on the following link: https://cpalmenmediaprod.blob.core.windows.net/uploads/docs/standards/eld/sc.pdf

Additional Instructional Resources:

A.V.E. for Success Collection is provided by the Florida Association of School Administrators: http://www.fasa.net/4DCGI/cms/review.html?Action=CMS_Detail&DocID=139. Please be aware that these resources have not been reviewed by CPALMS and there may be a charge for the use of some of them in this collection.
### GENERAL INFORMATION

**Course Number:** 2000360

**Course Path:** Section: Grades PreK to 12 Education Courses > Grade Group: Grades 9 to 12 and Adult Education Courses > Subject: Science > SubSubject: Biological Sciences

**Abbreviated Title:** ANAT PHYSIO HON

**Course Length:** Year (Y)

**Course Attributes:**
- Honors

**Course Level:** 3

**Course Type:** Core Academic Course

**Course Status:** Course Approved

**Grade Level(s):** 9,10,11,12

**Graduation Requirement:** Equally Rigorous Science

### Educator Certifications

<table>
<thead>
<tr>
<th>Science (Secondary Grades 7-12)</th>
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</thead>
<tbody>
<tr>
<td>Biology (Grades 6-12)</td>
</tr>
<tr>
<td>Health (Elementary and Secondary Grades K-12)</td>
</tr>
<tr>
<td>Health Education (Secondary Grades 7-12)</td>
</tr>
</tbody>
</table>
Course Standards

<table>
<thead>
<tr>
<th>Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>SC.912.L.14.11:</td>
<td>Classify and state the defining characteristics of epithelial tissue, connective tissue, muscle tissue, and nervous tissue.</td>
</tr>
<tr>
<td>SC.912.L.14.12:</td>
<td>Describe the anatomy and histology of bone tissue.</td>
</tr>
<tr>
<td>SC.912.L.14.13:</td>
<td>Distinguish between bones of the axial skeleton and the appendicular skeleton.</td>
</tr>
<tr>
<td>SC.912.L.14.14:</td>
<td>Identify the major bones of the axial and appendicular skeleton.</td>
</tr>
<tr>
<td>SC.912.L.14.15:</td>
<td>Identify major markings (such as foramina, fossae, tubercles, etc.) on a skeleton. Explain why these markings are important.</td>
</tr>
<tr>
<td>SC.912.L.14.16:</td>
<td>Describe the anatomy and histology, including ultrastructure, of muscle tissue.</td>
</tr>
<tr>
<td>SC.912.L.14.17:</td>
<td>List the steps involved in the sliding filament of muscle contraction.</td>
</tr>
<tr>
<td>SC.912.L.14.18:</td>
<td>Describe signal transmission across a myoneuronal junction.</td>
</tr>
<tr>
<td>SC.912.L.14.19:</td>
<td>Explain the physiology of skeletal muscle.</td>
</tr>
<tr>
<td>SC.912.L.14.20:</td>
<td>Identify the major muscles of the human on a model or diagram.</td>
</tr>
<tr>
<td>SC.912.L.14.21:</td>
<td>Describe the anatomy, histology, and physiology of the central and peripheral nervous systems and name the major divisions of the nervous system.</td>
</tr>
<tr>
<td>SC.912.L.14.22:</td>
<td>Describe the physiology of nerve conduction, including the generator potential, action potential, and the synapse.</td>
</tr>
<tr>
<td>SC.912.L.14.23:</td>
<td>Identify the parts of a reflex arc.</td>
</tr>
<tr>
<td>SC.912.L.14.24:</td>
<td>Identify the major parts of a cross section through the spinal cord.</td>
</tr>
<tr>
<td>SC.912.L.14.25:</td>
<td>Identify the functions of the major parts of the brain, including the meninges, medulla, pons, midbrain, hypothalamus, thalamus, cerebellum and cerebrum.</td>
</tr>
<tr>
<td>SC.912.L.14.26:</td>
<td>Define the terms endocrine and exocrine.</td>
</tr>
<tr>
<td>SC.912.L.14.28:</td>
<td>Describe the physiology of hormones including the different types and the mechanisms of their action.</td>
</tr>
<tr>
<td>SC.912.L.14.29:</td>
<td>Describe the composition and physiology of blood, including that of the plasma and the formed elements.</td>
</tr>
<tr>
<td>SC.912.L.14.30:</td>
<td>Describe the steps in hemostasis, including the mechanism of coagulation. Include the basis for blood typing and transfusion reactions.</td>
</tr>
<tr>
<td>SC.912.L.14.31:</td>
<td>Describe the factors affecting blood flow through the cardiovascular system.</td>
</tr>
<tr>
<td>SC.912.L.14.32:</td>
<td>Explain the components of an electrocardiogram.</td>
</tr>
<tr>
<td>SC.912.L.14.34:</td>
<td>Describe hypertension and some of the factors that produce it.</td>
</tr>
<tr>
<td>SC.912.L.14.35:</td>
<td>Describe the histology of the major arteries and veins of systemic, pulmonary, hepatic portal, and coronary circulation.</td>
</tr>
<tr>
<td>SC.912.L.14.36:</td>
<td>Describe the histology of the respiratory system.</td>
</tr>
<tr>
<td>SC.912.L.14.37:</td>
<td>Describe the physiology of the respiratory system including the mechanisms of ventilation, gas exchange, gas transport and the mechanisms that control the rate of ventilation.</td>
</tr>
<tr>
<td>SC.912.L.14.38:</td>
<td>Describe the histology of the alimentary canal and its associated accessory organs.</td>
</tr>
<tr>
<td>SC.912.L.14.39:</td>
<td>Describe the physiology of the digestive system, including mechanical digestion, chemical digestion, absorption and the neural and hormonal mechanisms of control.</td>
</tr>
<tr>
<td>SC.912.L.14.40:</td>
<td>Describe the histology of the large and small intestines and the accessory organs.</td>
</tr>
<tr>
<td>SC.912.L.14.41:</td>
<td>Describe fetal circulation and changes that occur to the circulatory system at birth.</td>
</tr>
<tr>
<td>SC.912.L.14.42:</td>
<td>Describe the anatomy and the physiology of the lymph system.</td>
</tr>
<tr>
<td>SC.912.L.14.43:</td>
<td>Describe the histology of the lymphatic system.</td>
</tr>
<tr>
<td>SC.912.L.14.44:</td>
<td>Describe the physiology of urine formation by the kidney.</td>
</tr>
<tr>
<td>SC.912.L.14.46:</td>
<td>Describe the physiology of the kidney, including renal blood flow, glomerular filtration, reabsorption, tubular secretion, the formation of urine, and the control of urine volume.</td>
</tr>
<tr>
<td>SC.912.L.14.47:</td>
<td>Describe the histology of the urinary bladder and urethra.</td>
</tr>
<tr>
<td>SC.912.L.14.48:</td>
<td>Describe the anatomy, histology, and physiology of the ureters, the urinary bladder and the urethra.</td>
</tr>
<tr>
<td>SC.912.L.14.49:</td>
<td>Identify the major functions associated with the sympathetic and parasympathetic nervous systems.</td>
</tr>
<tr>
<td>SC.912.L.14.50:</td>
<td>Describe the structure of vertebrate sensory organs. Relate structure to function in vertebrate sensory systems.</td>
</tr>
<tr>
<td>SC.912.L.14.51:</td>
<td>Describe the function of the vertebrate integumentary system.</td>
</tr>
<tr>
<td>SC.912.L.14.52:</td>
<td>Explain the basic functions of the human immune system, including specific and nonspecific immune response, vaccines, and antibiotics.</td>
</tr>
<tr>
<td>SC.912.L.14.53:</td>
<td>Explain the relationship between mutation, cell cycle, and uncontrolled cell growth potentially resulting in cancer.</td>
</tr>
<tr>
<td>SC.912.L.14.54:</td>
<td>Evaluate the impact of biotechnology on the individual, society, and the environment, including medical and ethical issues.</td>
</tr>
<tr>
<td>SC.912.L.14.55:</td>
<td>Describe the basic anatomy and physiology of the human reproductive system. Describe the process of human development from fertilization to birth and major changes that occur in each trimester of pregnancy.</td>
</tr>
<tr>
<td>SC.912.L.14.56:</td>
<td>Describe the important structural characteristics of monosaccharides, disaccharides, and polysaccharides and explain the functions of carbohydrates in living things.</td>
</tr>
<tr>
<td>SC.912.L.14.57:</td>
<td>Describe the structures of fatty acids, triglycerides, phospholipids, and steroids. Explain the functions of lipids in living organisms. Identify some reactions that fatty acids undergo. Relate the structure and function of cell membranes.</td>
</tr>
<tr>
<td>SC.912.L.14.59:</td>
<td>Discuss the role of anaerobic respiration in living things and in human society.</td>
</tr>
<tr>
<td>SC.912.L.14.60:</td>
<td>Identify the reactants, products, and basic functions of aerobic and anaerobic cellular respiration.</td>
</tr>
<tr>
<td>SC.912.L.14.61:</td>
<td>Explain the role of enzymes as catalysts that lower the activation energy of biochemical reactions. Identify factors, such as pH and temperature, and their effect on enzyme activity.</td>
</tr>
</tbody>
</table>

Define a problem based on a specific body of knowledge, for example: biology, chemistry, physics, and earth/space science, and do the following:

1. Pose questions about the natural world, (Articulate the purpose of the investigation and identify the relevant scientific concepts).
2. Conduct systematic observations, (Write procedures that are clear and replicable. Identify observables and examine relationships between test (independent) variable and outcome (dependent) variable. Employ appropriate methods for accurate and consistent observations; conduct and record measurements at appropriate levels of precision. Follow safety guidelines).
3. Examine books and other sources of information to see what is already known,
4. Review what is known in light of empirical evidence, (Examine whether available empirical evidence can be interpreted in terms of existing knowledge and models, and if not, modify or develop new models).
5. Plan investigations, (Design and evaluate a scientific investigation).
6. Use tools to gather, analyze, and interpret data (this includes the use of measurement in metric and other systems, and also the generation and interpretation of graphical representations of data, including data tables and graphs), (Collect data or evidence in an organized way. Properly use instruments, equipment, and materials (e.g., scales, probeware, meter sticks, microscopes, computers) including set-up, calibration, technique, maintenance, and storage).
7. Pose answers, explanations, or descriptions of events,
8. Generate explanations that explicate or describe natural phenomena (inferences),
9. Use appropriate evidence and reasoning to justify these explanations to others,
10. Communicate results of scientific investigations, and
11. Evaluate the merits of the explanations produced by others.

SC.912.N.1.1:
Describe and explain what characterizes science and its methods.

<table>
<thead>
<tr>
<th>SC.912.N.1.1:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mathematicians who participate in effortful learning both individually and with others:</td>
</tr>
<tr>
<td>• Analyze the problem in a way that makes sense given the task.</td>
</tr>
<tr>
<td>• Ask questions that will help with solving the task.</td>
</tr>
<tr>
<td>• Build perseverance by modifying methods as needed while solving a challenging task.</td>
</tr>
<tr>
<td>• Stay engaged and maintain a positive mindset when working to solve tasks.</td>
</tr>
<tr>
<td>• Help and support each other when attempting a new method or approach.</td>
</tr>
</tbody>
</table>

MA.K12.MTR.1.1:
Demonstrate understanding by representing problems in multiple ways.

<table>
<thead>
<tr>
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</tr>
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<tbody>
<tr>
<td>Mathematicians who demonstrate understanding by representing problems in multiple ways:</td>
</tr>
<tr>
<td>• Build understanding through modeling and using manipulatives.</td>
</tr>
<tr>
<td>• Represent solutions to problems in multiple ways using objects, drawings, tables, graphs and equations.</td>
</tr>
<tr>
<td>• Progress from modeling problems with objects and drawings to using algorithms and equations.</td>
</tr>
<tr>
<td>• Express connections between concepts and representations.</td>
</tr>
<tr>
<td>• Choose a representation based on the given context or purpose.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Clarifications:</th>
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</thead>
<tbody>
<tr>
<td>Teachers who encourage students to participate actively in effortful learning both individually and with others:</td>
</tr>
<tr>
<td>• Cultivate a community of growth mindset learners.</td>
</tr>
<tr>
<td>• Foster perseverance in students by choosing tasks that are challenging.</td>
</tr>
<tr>
<td>• Develop students' ability to analyze and problem solve.</td>
</tr>
<tr>
<td>• Recognize students' effort when solving challenging problems.</td>
</tr>
</tbody>
</table>

MA.K12.MTR.2.1:
Complete tasks with mathematical fluency.

<table>
<thead>
<tr>
<th>MA.K12.MTR.2.1:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mathematicians who complete tasks with mathematical fluency:</td>
</tr>
<tr>
<td>• Select efficient and appropriate methods for solving problems within the given context.</td>
</tr>
<tr>
<td>• Maintain flexibility and accuracy while performing procedures and mental calculations.</td>
</tr>
<tr>
<td>• Complete tasks accurately and with confidence.</td>
</tr>
<tr>
<td>• Adapt procedures to apply them to a new context.</td>
</tr>
<tr>
<td>• Use feedback to improve efficiency when performing calculations.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
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</tr>
</thead>
<tbody>
<tr>
<td>Teachers who encourage students to complete tasks with mathematical fluency:</td>
</tr>
<tr>
<td>• Help students make connections between concepts and representations.</td>
</tr>
<tr>
<td>• Provide opportunities for students to use manipulatives when investigating concepts.</td>
</tr>
<tr>
<td>• Guide students from concrete to pictorial to abstract representations as understanding progresses.</td>
</tr>
<tr>
<td>• Show students that various representations can have different purposes and can be useful in different situations.</td>
</tr>
</tbody>
</table>

MA.K12.MTR.4.1:
Engage in discussions that reflect on the mathematical thinking of self and others.

<table>
<thead>
<tr>
<th>MA.K12.MTR.4.1:</th>
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</thead>
<tbody>
<tr>
<td>Mathematicians who engage in discussions that reflect on the mathematical thinking of self and others:</td>
</tr>
<tr>
<td>• Communicate mathematical ideas, vocabulary and methods effectively.</td>
</tr>
<tr>
<td>• Analyze the mathematical thinking of others.</td>
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<tr>
<td>• Compare the efficiency of a method to those expressed by others.</td>
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<tr>
<td>• Recognize errors and suggest how to correctly solve the task.</td>
</tr>
<tr>
<td>• Justify results by explaining methods and processes.</td>
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<tr>
<td>• Construct possible arguments based on evidence.</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Clarifications:</th>
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</thead>
<tbody>
<tr>
<td>Teachers who encourage students to engage in discussions that reflect on the mathematical thinking of self and others:</td>
</tr>
<tr>
<td>• Establish a culture in which students ask questions of the teacher and their peers, and error is an opportunity for learning.</td>
</tr>
<tr>
<td>• Create opportunities for students to discuss their thinking with peers.</td>
</tr>
<tr>
<td>• Select, sequence and present student work to advance and deepen understanding of correct and increasingly efficient methods.</td>
</tr>
<tr>
<td>• Develop students' ability to justify methods and compare their responses to the responses of their peers.</td>
</tr>
</tbody>
</table>

Use patterns and structure to help understand and connect mathematical concepts.
Mathematicians who use patterns and structure to help understand and connect mathematical concepts:
- Focus on relevant details within a problem.
- Create plans and procedures to logically order events, steps or ideas to solve problems.
- Decompose a complex problem into manageable parts.
- Relate previously learned concepts to new concepts.
- Look for similarities among problems.
- Connect solutions of problems to more complicated large-scale situations.

Clarifications:
Teachers who encourage students to use patterns and structure to help understand and connect mathematical concepts:
- Help students recognize the patterns in the world around them and connect these patterns to mathematical concepts.
- Support students to develop generalizations based on the similarities found among problems.
- Provide opportunities for students to create plans and procedures to solve problems.
- Develop students' ability to construct relationships between their current understanding and more sophisticated ways of thinking.

Assess the reasonableness of solutions.
Mathematicians who assess the reasonableness of solutions:
- Estimate to discover possible solutions.
- Use benchmark quantities to determine if a solution makes sense.
- Check calculations when solving problems.
- Verify possible solutions by explaining the methods used.
- Evaluate results based on the given context.

Clarifications:
Teachers who encourage students to assess the reasonableness of solutions:
- Have students estimate or predict solutions prior to solving.
- Prompt students to continually ask, “Does this solution make sense? How do you know?”
- Reinforce that students check their work as they progress within and after a task.
- Strengthen students’ ability to verify solutions through justifications.

Apply mathematics to real-world contexts.
Mathematicians who apply mathematics to real-world contexts:
- Connect mathematical concepts to everyday experiences.
- Use models and methods to understand, represent and solve problems.
- Perform investigations to gather data or determine if a method is appropriate.
- Redesign models and methods to improve accuracy or efficiency.

Clarifications:
Teachers who encourage students to apply mathematics to real-world contexts:
- Provide opportunities for students to create models, both concrete and abstract, and perform investigations.
- Challenge students to question the accuracy of their models and methods.
- Support students as they validate conclusions by comparing them to the given situation.
- Indicate how various concepts can be applied to other disciplines.

Cite evidence to explain and justify reasoning.

Clarifications:
K-1 Students include textual evidence in their oral communication with guidance and support from adults. The evidence can consist of details from the text without naming the text. During 1st grade, students learn how to incorporate the evidence in their writing.
2-3 Students include relevant textual evidence in their written and oral communication. Students should name the text when they refer to it. In 3rd grade, students should use a combination of direct and indirect citations.
4-5 Students continue with previous skills and reference comments made by speakers and peers. Students cite texts that they've directly quoted, paraphrased, or used for information. When writing, students will use the form of citation dictated by the instructor or the style guide referenced by the instructor.
6-8 Students continue with previous skills and use a style guide to create a proper citation.
9-12 Students continue with previous skills and should be aware of existing style guides and the ways in which they differ.

Read and comprehend grade-level complex texts proficiently.

Clarifications:
See Text Complexity for grade-level complexity bands and a text complexity rubric.

Make inferences to support comprehension.

Clarifications:
Students will make inferences before the words infer or inference are introduced. Kindergarten students will answer questions like “Why is the girl smiling?” or make predictions about what will happen based on the title page. Students will use the terms and apply them in 2nd grade and beyond.

Use appropriate collaborative techniques and active listening skills when engaging in discussions in a variety of situations.

Clarifications:
In kindergarten, students learn to listen to one another respectfully.
In grades 1-2, students build upon these skills by justifying what they are thinking. For example: “I think _____ because _____.” The collaborative conversations are becoming academic conversations.
In grades 3-12, students engage in academic conversations discussing claims and justifying their reasoning, refining and applying skills. Students build on ideas, propel the conversation, and support claims and counterclaims with evidence.
Use the accepted rules governing a specific format to create quality work.

**ELA.K12.EE.5.1:**

**Clarifications:**
Students will incorporate skills learned into work products to produce quality work. For students to incorporate these skills appropriately, they must receive instruction. A 3rd grade student creating a poster board display must have instruction in how to effectively present information to do quality work.

Use appropriate voice and tone when speaking or writing.

**ELA.K12.EE.6.1:**

**Clarifications:**
In kindergarten and 1st grade, students learn the difference between formal and informal language. For example, the way we talk to our friends differs from the way we speak to adults. In 2nd grade and beyond, students practice appropriate social and academic language to discuss texts.

Evaluate how environment and personal health are interrelated.

**HE.912.C.1.3:**

**Clarifications:**
Food options within a community; prenatal-care services; availability of recreational facilities; air quality; weather-safety awareness; and weather, air, and water conditions.

**HE.912.C.1.5:**

**Clarifications:**
Health prevention, detection, and treatment of: breast and testicular cancer, suicide, obesity, and industrial-related chronic disease.

**HE.912.C.1.7:**

**Clarifications:**
Drug use, family obesity, heart disease, mental health, and non-communicable illness or disease.

English language learners communicate information, ideas and concepts necessary for academic success in the content area of Science.

English language learners communicate for social and instructional purposes within the school setting.

General Course Information and Notes

**GENERAL NOTES**

While the content focus of this course is consistent with the Anatomy and Physiology course, students will explore these concepts in greater depth. In general, the academic pace and rigor will be greatly increased for honors level work. Laboratory investigations that include the use of scientific inquiry, research, measurement, problem solving, laboratory apparatus and technologies, experimental procedures, and safety procedures are an integral part of this course. The National Science Teachers Association (NSTA) recommends that at the high school level, all students should be in the science lab or field, collecting data every week. School laboratory investigations (labs) are defined by the National Research Council (NRC) as an experience in the laboratory, classroom, or the field that provides students with opportunities to interact directly with natural phenomena or with data collected by others using tools, materials, data collection techniques, and models (NRC, 2006, p. 3). Laboratory investigations in the high school classroom should help all students develop a growing understanding of the complexity and ambiguity of empirical work, as well as the skills to calibrate and troubleshoot equipment used to make observations. Learners should understand measurement error; and have the skills to aggregate, interpret, and present the resulting data (National Research Council, 2006, p.77; NSTA, 2007).

**Honors and Advanced Level Course Note:** Advanced courses require a greater demand on students through increased academic rigor. Academic rigor is obtained through the application, analysis, evaluation, and creation of complex ideas that are often abstract and multi-faceted. Students are challenged to think and collaborate critically on the content they are learning. Honors level rigor will be achieved by increasing text complexity through text selection, focus on high-level qualitative measures, and complexity of task. Instruction will be structured to give students a deeper understanding of conceptual themes and organization within and across disciplines. Academic rigor is more than simply assigning to students a greater quantity of work.

**Special Notes:**

**Instructional Practices**
Teaching from a range of complex text is optimized when teachers in all subject areas implement the following strategies on a routine basis:

1. Ensuring wide reading from complex text that varies in length.
2. Making close reading and rereading of texts central to lessons.
3. Emphasizing text-specific complex questions, and cognitively complex tasks, reinforce focus on the text and cultivate independence.
4. Emphasizing students supporting answers based upon evidence from the text.
5. Providing extensive research and writing opportunities (claims and evidence).

**Science and Engineering Practices** *(NRC Framework for K-12 Science Education, 2010)*
- Asking questions (for science) and defining problems (for engineering).
- Developing and using models.
- Planning and carrying out investigations.
- Analyzing and interpreting data.
- Using mathematics, information and computer technology, and computational thinking.
- Constructing explanations (for science) and designing solutions (for engineering).
- Engaging in argument from evidence.
- Obtaining, evaluating, and communicating information.

**Florida's Benchmarks for Excellent Student Thinking (B.E.S.T.) Standards**
This course includes Florida's B.E.S.T. ELA Expectations (EE) and Mathematical Thinking and Reasoning Standards (MTRs) for students. Florida educators should intentionally embed these standards within the content and their instruction as applicable. For guidance on the implementation of the EEs and MTRs, please visit https://www.cpalms.org/Standards/BEST_Standards.aspx and select the appropriate B.E.S.T. Standards package.

**English Language Development ELD Standards Special Notes Section:**
Teachers are required to provide listening, speaking, reading and writing instruction that allows English language learners (ELL) to communicate information, ideas and...
concepts for academic success in the content area of Science. For the given level of English language proficiency and with visual, graphic, or interactive support, students will interact with grade level words, expressions, sentences and discourse to process or produce language necessary for academic success. The ELD standard should specify a relevant content area concept or topic of study chosen by curriculum developers and teachers which maximizes an ELL's need for communication and social skills. To access an ELL supporting document which delineates performance definitions and descriptors, please click on the following link:

https://cpalmsmediaprod.blob.core.windows.net/uploads/docs/standards/eld/sc.pdf

Additional Instructional Resources:
A.V.E. for Success Collection is provided by the Florida Association of School Administrators: http://www.fasa.net/4DCGI/cms/review.html?Action=CMS_Document&DocID=139. Please be aware that these resources have not been reviewed by CPALMS and there may be a charge for the use of some of them in this collection.

GENERAL INFORMATION

Course Number: 2000360

Course Path: Section: Grades PreK to 12 Education Courses > Grade Group: Grades 9 to 12 and Adult Education Courses > Subject: Science > SubSubject: Biological Sciences

Abbreviated Title: ANAT PHYSIO HON

Course Length: Year (Y)

Course Attributes:
- Honors

Course Level: 3

Number of Credits: One (1) credit

Course Type: Core Academic Course

Course Status: State Board Approved

Grade Level(s): 9,10,11,12

Graduation Requirement: Equally Rigorous Science

Educator Certifications

<table>
<thead>
<tr>
<th>Subject</th>
<th>Grade Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Science (Secondary Grades 7-12)</td>
<td></td>
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<tr>
<td>Biology (Grades 6-12)</td>
<td></td>
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<tr>
<td>Health (Elementary and Secondary Grades K-12)</td>
<td></td>
</tr>
<tr>
<td>Health Education (Secondary Grades 7-12)</td>
<td></td>
</tr>
</tbody>
</table>
### Course Standards

<table>
<thead>
<tr>
<th>Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>LAFS.1112.RST.1.1:</td>
<td>Cite specific textual evidence to support analysis of science and technical texts, attending to important distinctions the author makes and to any gaps or inconsistencies in the account.</td>
</tr>
<tr>
<td>LAFS.1112.RST.1.2:</td>
<td>Determine the central ideas or conclusions of a text; summarize complex concepts, processes, or information presented in a text by paraphrasing them in simpler but still accurate terms.</td>
</tr>
<tr>
<td>LAFS.1112.RST.1.3:</td>
<td>Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks; analyze the specific results based on explanations in the text.</td>
</tr>
<tr>
<td>LAFS.1112.RST.2.4:</td>
<td>Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 11–12 texts and topics.</td>
</tr>
<tr>
<td>LAFS.1112.RST.2.5:</td>
<td>Analyze how the text structures information or ideas into categories or hierarchies, demonstrating understanding of the information or ideas.</td>
</tr>
<tr>
<td>LAFS.1112.RST.2.6:</td>
<td>Analyze the author's purpose in providing an explanation, describing a procedure, or discussing an experiment in a text, identifying important issues that remain unresolved.</td>
</tr>
<tr>
<td>LAFS.1112.RST.3.7:</td>
<td>Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g., quantitative data, video, multimedia) in order to address a question or solve a problem.</td>
</tr>
<tr>
<td>LAFS.1112.RST.3.8:</td>
<td>Evaluate the hypotheses, data, analysis, and conclusions in a science or technical text, verifying the data when possible and corroborating or challenging conclusions with other sources of information.</td>
</tr>
<tr>
<td>LAFS.1112.RST.3.9:</td>
<td>Synthesize information from a range of sources (e.g., texts, experiments, simulations) into a coherent understanding of a process, phenomenon, or concept, resolving conflicting information when possible.</td>
</tr>
<tr>
<td>LAFS.1112.RST.4.10:</td>
<td>By the end of grade 12, read and comprehend science/technical texts in the grades 11–12 text complexity band independently and proficiently.</td>
</tr>
<tr>
<td><strong>LAFS.1112.SL.1.1:</strong></td>
<td>Initiate and participate effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grades 11–12 topics, texts, and issues, building on others' ideas and expressing their own clearly and persuasively.</td>
</tr>
<tr>
<td>a.</td>
<td>Come to discussions prepared, having read and researched material under study; explicitly draw on that preparation by referring to evidence from texts and other research on the topic or issue to stimulate a thoughtful, well-reasoned exchange of ideas.</td>
</tr>
<tr>
<td>b.</td>
<td>Work with peers to promote civil, democratic discussions and decision-making, set clear goals and deadlines, and establish individual roles as needed.</td>
</tr>
<tr>
<td>c.</td>
<td>Propel conversations by posing and responding to questions that probe reasoning and evidence; ensure a hearing for a full range of positions on a topic or issue; clarify, verify, or challenge ideas and conclusions; and promote divergent and creative perspectives.</td>
</tr>
<tr>
<td>d.</td>
<td>Respond thoughtfully to diverse perspectives; synthesize comments, claims, and evidence made on all sides of an issue; resolve contradictions when possible; and determine what additional information or research is required to deepen the investigation or complete the task.</td>
</tr>
<tr>
<td>LAFS.1112.SL.1.2:</td>
<td>Integrate multiple sources of information presented in diverse formats and media (e.g., visually, quantitatively, orally) in order to make informed decisions and solve problems, evaluating the credibility and accuracy of each source and noting any discrepancies among the data.</td>
</tr>
<tr>
<td>LAFS.1112.SL.1.3:</td>
<td>Evaluate a speaker's point of view, reasoning, and use of evidence and rhetoric, assessing the stance, premises, links among ideas, word choice, points of emphasis, and tone used.</td>
</tr>
<tr>
<td>LAFS.1112.SL.2.4:</td>
<td>Present information, findings, and supporting evidence, conveying a clear and distinct perspective, such that listeners can follow the line of reasoning, alternative or opposing perspectives are addressed, and the organization, development, substance, and style are appropriate to purpose, audience, and a range of formal and informal tasks.</td>
</tr>
<tr>
<td>LAFS.1112.SL.2.5:</td>
<td>Make strategic use of digital media (e.g., textual, graphical, audio, visual, and interactive elements) in presentations to enhance understanding of findings, reasoning, and evidence and to add interest.</td>
</tr>
<tr>
<td>LAFS.1112.WHST.1.1:</td>
<td>Write arguments focused on discipline-specific content.</td>
</tr>
<tr>
<td>a.</td>
<td>Introduce precise, knowledgeable claim(s), establish the significance of the claim(s), distinguish the claim(s) from alternate or opposing claims, and create an organization that logically sequences the claim(s), counterclaims, reasons, and evidence.</td>
</tr>
<tr>
<td>b.</td>
<td>Develop claim(s) and counterclaims fairly and thoroughly, supplying the most relevant data and evidence for each while pointing out the strengths and limitations of both claim(s) and counterclaims in a discipline-appropriate form that anticipates the audience's knowledge level, concerns, values, and possible biases.</td>
</tr>
<tr>
<td>c.</td>
<td>Use words, phrases, and clauses as well as varied syntax to link the major sections of the text, create cohesion, and clarify the relationships between claim(s) and reasons, between reasons and evidence, and between claim(s) and counterclaims.</td>
</tr>
<tr>
<td>d.</td>
<td>Establish and maintain a formal style and objective tone while attending to the norms and conventions of the discipline in which they are writing.</td>
</tr>
<tr>
<td>e.</td>
<td>Provide a concluding statement or section that follows from or supports the argument presented.</td>
</tr>
<tr>
<td>LAFS.1112.WHST.1.2:</td>
<td>Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes.</td>
</tr>
<tr>
<td>a.</td>
<td>Introduce a topic and organize complex ideas, concepts, and information so that each new element builds on that which precedes it to create a unified whole; include formatting (e.g., headings), graphics (e.g., figures, tables), and multimedia when useful to aiding comprehension.</td>
</tr>
<tr>
<td>b.</td>
<td>Develop the topic thoroughly by selecting the most significant and relevant facts, extended definitions, concrete details, quotations, or other information and examples appropriate to the audience's knowledge of the topic.</td>
</tr>
<tr>
<td>c.</td>
<td>Use varied transitions and sentence structures to link the major sections of the text, create cohesion, and clarify the relationships among complex ideas and concepts.</td>
</tr>
<tr>
<td>d.</td>
<td>Use precise language, domain-specific vocabulary and techniques such as metaphor, simile, and analogy to manage the complexity of the topic; convey a knowledgeable stance in a style that responds to the discipline and context as well as to the expertise of likely readers.</td>
</tr>
<tr>
<td>e.</td>
<td>Provide a concluding statement or section that follows from and supports the information or explanation provided (e.g., articulating implications or the significance of the topic).</td>
</tr>
<tr>
<td>LAFS.1112.WHST.2.4:</td>
<td>Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.</td>
</tr>
</tbody>
</table>
Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience.

Use technology, including the Internet, to produce, publish, and update individual or shared writing products in response to ongoing feedback, including new arguments or information.

Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation.

Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the strengths and limitations of each source in terms of the specific task, purpose, and audience; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and overreliance on any one source and following a standard format for citation.

Draw evidence from informational texts to support analysis, reflection, and research.

Write routinely over extended time frames (time for reflection and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences.

Critically evaluate the claims, reasoning, and evidence in science and technical texts, attending to the precise details of explanations or descriptions.

Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks, attending to special cases or exceptions defined in the text.

Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 9–10 texts and topics.

Analyze the structure of the relationships among concepts in a text, including relationships among key terms (e.g., force, friction, reaction force, energy).

Translate quantitative or technical information expressed in words in a text into visual form (e.g., a table or chart) and translate information expressed visually or mathematically (e.g., in an equation) into words.

Compare and contrast findings presented in a text to those from other sources (including their own experiments), noting when the findings support or contradict previous explanations or accounts.

Integrate multiple sources of information presented in diverse media or formats (e.g., visually, quantitatively, orally) evaluating the credibility and accuracy of each source.

Evaluate a speaker's point of view, reasoning, and use of evidence and rhetoric, identifying any fallacious reasoning or exaggerated or distorted evidence.

Present information, findings, and supporting evidence clearly, concisely, and logically such that listeners can follow the line of reasoning and the development, organization, development, substance, and style are appropriate to purpose, audience, and task.

Make strategic use of digital media (e.g., textual, graphical, audio, visual, and interactive elements) in presentations to enhance understanding of findings, reasoning, and evidence and to add interest.

Write informative/explanatory texts, including the narration of historical events, scientific procedures/experiments, or technical processes.

a. Introduce a topic and organize ideas, concepts, and information to make important connections and distinctions; include formatting (e.g., headings), graphics (e.g., figures, tables), and multimedia when useful to aiding comprehension.

b. Develop the topic with well-chosen, relevant, and sufficient facts, extended definitions, concrete details, quotations, or other information and examples appropriate to the audience's knowledge of the topic.

c. Use varied transitions and sentence structures to link the major sections of the text, create cohesion, and clarify the relationships among ideas and concepts.

d. Use precise language and domain-specific vocabulary to manage the complexity of the topic and convey a style appropriate to the discipline and context as well as to the expertise of likely readers.

e. Establish and maintain a formal style and objective tone while attending to the norms and conventions of the discipline in which they are writing.

f. Provide a concluding statement or section that follows from and supports the information or explanation presented (e.g., articulating implications or the significance of the topic).

Draw evidence from informational texts to support analysis, reflection, and research.

Relate structure to function for the components of plant and animal cells. Explain the role of cell membranes as a highly selective barrier (passive and active transport).

Compare and contrast the general structures of plant and animal cells. Compare and contrast the general structures of prokaryotic and eukaryotic cells.

Explain the evidence supporting the scientific theory of the origin of eukaryotic cells (endosymbiosis).

Relate the structure of each of the major plant organs and tissues to physiological processes.

Explain alternation of generations in plants.

Relate the major structure of fungi to their functions.

Discuss the relationship between the evolution of land plants and their anatomy.

Discuss basic classification and characteristics of plants. Identify bryophytes, pteridophytes, gymnosperms, and angiosperms.

Explain how the scientific theory of evolution is supported by the fossil record, comparative anatomy, comparative embryology, biogeography, molecular biology, and observed evolutionary change.

Describe how biological diversity is increased by the origin of new species and how it is decreased by the natural process of extinction.

Describe how and why organisms are hierarchically classified and based on evolutionary relationships.

Explain the reasons for changes in how organisms are classified.

Discuss distinguishing characteristics of the domains and kingdoms of living organisms.

Use Mendel's laws of segregation and independent assortment to analyze patterns of inheritance.

Discuss observed inheritance patterns caused by various modes of inheritance, including dominant, recessive, codominant, sex-linked, polygenic, and multiple alleles.

Describe changes in ecosystems resulting from seasonal variations, climate change and succession.

Compare and contrast the relationships among organisms, including predation, parasitism, competition, commensalism, and mutualism.

Characterize the biotic and abiotic components that define freshwater systems, marine systems and terrestrial systems.

Recognize the consequences of the losses of biodiversity due to catastrophic events, climate changes, human activity, and the introduction of invasive, non-native species.

Use a food web to identify and distinguish producers, consumers, and decomposers. Explain the pathway of energy transfer through trophic levels and the reduction of available energy at successive trophic levels.
Diagram and explain the biogeochemical cycles of an ecosystem, including water, carbon, and nitrogen cycle.

Discuss the use of chemiosmotic gradients for ATP production in chloroplasts and mitochondria.

Identify the reactants, products, and basic functions of photosynthesis.

Identify the reactants, products, and basic functions of aerobic and anaerobic cellular respiration.

Explain the interrelated nature of photosynthesis and cellular respiration.

Connect the role of adenosine triphosphate (ATP) to energy transfers within a cell.

Discuss the special properties of water that contribute to Earth's suitability as an environment for life: cohesive behavior, ability to moderate temperature, expansion upon freezing, and versatility as a solvent.

Define a problem based on a specific body of knowledge, for example: biology, chemistry, physics, and earth/space science, and do the following:

1. Pose questions about the natural world. (Articulate the purpose of the investigation and identify the relevant scientific concepts).
2. Conduct systematic observations. (Write procedures that are clear and replicable. Identify observables and examine relationships between test (independent) variable and outcome (dependent) variable. Employ appropriate methods for accurate and consistent observations; conduct and record measurements at appropriate levels of precision. Follow safety guidelines).
3. Examine books and other sources of information to see what is already known.
4. Review what is known in light of empirical evidence. (Examine whether available empirical evidence can be interpreted in terms of existing knowledge and models, and if not, modify or develop new models).
5. Plan investigations. (Design and evaluate a scientific investigation).
6. Use tools to gather, analyze, and interpret data (this includes the use of measurement in metric and other systems, and also the generation and interpretation of graphical representations of data, including data tables and graphs). (Collect data or evidence in an organized way. Properly use instruments, equipment, and materials (e.g., scales, probeware, meter sticks, microscopes, computers) including set-up, calibration, technique, maintenance, and storage).
7. Pose answers, explanations, or descriptions of events.
8. Generate explanations that explicate or describe natural phenomena (inferences).
9. Use appropriate evidence and reasoning to justify these explanations to others.
10. Communicate results of scientific investigations, and
11. Evaluate the merits of the explanations produced by others.

Describe and explain what characterizes science and its methods.

Explain that scientific knowledge is both durable and robust and open to change. Scientific knowledge can change because it is often examined and re-examined by new investigations and scientific argumentation. Because of these frequent examinations, scientific knowledge becomes stronger, leading to its durability.

Describe the properties of the carbon atom that make the diversity of carbon compounds possible.

Differentiate among the various forms of energy and recognize that they can be transformed from one form to others.

Explore the theory of electromagnetism by comparing and contrasting the different parts of the electromagnetic spectrum in terms of wavelength, frequency, and energy, and relate them to phenomena and applications.

Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases.

- Graph linear and quadratic functions and show intercepts, maxima, and minima.
- Graph square root, cube root, and piecewise-defined functions, including step functions and absolute value functions.
- Graph polynomial functions, identifying zeros when suitable factorizations are available, and showing end behavior.
- Graph rational functions, identifying zeros and asymptotes when suitable factorizations are available, and showing end behavior.
- Graph exponential and logarithmic functions, showing intercepts and end behavior, and trigonometric functions, showing period, midline, and amplitude, and using phase shift.

Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays.

Choose a level of accuracy appropriate to limitations on measurement when reporting quantities.

Mathematically proficient students start by explaining to themselves the meaning of a problem and looking for entry points to its solution. They analyze givens, constraints, relationships, and goals. They make conjectures about the form and meaning of the solution and plan a solution pathway rather than simply jumping into a solution attempt. They consider analogous problems, and try special cases and simpler forms of the original problem in order to gain insight into its solution. They monitor and evaluate their progress and change course if necessary. Older students might, depending on the context of the problem, transform algebraic expressions or change the viewing window on their graphing calculator to get information they need. Mathematically proficient students can explain correspondences between equations, verbal descriptions, tables, and graphs or draw diagrams of important features and relationships, graph data, and search for regularity or trends. Younger students might rely on using concrete objects or pictures to help conceptualize and solve a problem. Mathematically proficient students check their answers to problems using a different method, and they continually ask themselves, "Does this make sense?" They can understand the approaches of others to solving complex problems and identify correspondences between different approaches.

Mathematically proficient students make sense of quantities and their relationships in problem situations. They bring two complementary abilities to bear on problems involving quantitative relationships: the ability to decontextualize—to abstract a given situation and represent it symbolically and manipulatively the representing symbols as if they have a life of their own, without necessarily attending to their referents—and the ability to contextualize, to pause as needed during the manipulation process in order to probe into the referents for the symbols involved. Quantitative reasoning entails habits of creating a coherent representation of the problem at hand; considering the units involved; attending to the meaning of quantities, not just how to compute them; and knowing and flexibly using different properties of operations and objects.
Mathematically proficient students understand and use stated assumptions, definitions, and previously established results in constructing arguments. They make conjectures and build a logical progression of statements to explore the truth of their conjectures. They are able to analyze situations by breaking them into cases, and can recognize and use counterexamples. They justify their conclusions, communicate them to others, and respond to the arguments of others. They reason inductively about data, making plausible arguments that take into account the context from which the data arose. Mathematically proficient students are also able to compare the effectiveness of two plausible arguments, distinguish correct logic or reasoning from that which is flawed, and—if there is a flaw in an argument—explain what it is. Elementary students can construct arguments using concrete referents such as objects, drawings, diagrams, and actions. Such arguments can make sense and be correct, even though they are not generalized or made formal until later grades. Later, students learn to determine domains to which an argument applies. Students at all grades can listen or read the arguments of others, decide whether they make sense, and ask useful questions to clarify or improve the arguments.

**Standard Relation to Course: Supporting**

**Construct viable arguments and critique the reasoning of others.**

Mathematically proficient students can apply the mathematics they know to solve problems arising in everyday life, society, and the workplace. In early grades, this might be as simple as writing an addition equation to describe a situation. In middle grades, a student might apply proportional reasoning to plan a school event or analyze a problem in the community. By high school, a student might use geometry to solve a design problem or use a function to describe how one quantity of interest depends on another. Mathematically proficient students who can apply what they know are comfortable making assumptions and approximations to simplify a complicated situation, realizing that these may need revision later. They are able to identify important quantities in a practical situation and map their relationships using such tools as diagrams, two-way tables, graphs, flowcharts and formulas. They can analyze those relationships mathematically to draw conclusions. They routinely interpret their mathematical results in the context of the situation and reflect on whether the results make sense, possibly improving the model if it has not served its purpose.

**Standard Relation to Course: Supporting**

**Model with mathematics.**

Mathematically proficient students attempt to communicate precisely to others. They try to use clear definitions in discussion with others and in their own reasoning. They state the meaning of the symbols they choose, including using the equal sign consistently and appropriately. They are careful about specifying units of measure, and labeling axes to clarify the correspondence with quantities in a problem. They calculate accurately and efficiently, express numerical answers with a degree of precision appropriate for the problem context. In the elementary grades, students give carefully formulated explanations to each other. By the time they reach high school they have learned to examine claims and make explicit use of definitions.

**Standard Relation to Course: Supporting**

**Use appropriate tools strategically.**

Mathematically proficient students look closely to discern a pattern or structure. Young students, for example, might notice that three and seven more is the same amount as seven and three more, or they may sort a collection of shapes according to how many sides the shapes have. Later, students will see 7 + 8 equals the well remembered 7 + 5 + 3, in preparation for learning about the distributive property. In the expression 2 + 3x, older students can see the 3x as 2 × 7. They recognize the significance of an existing line in a geometric figure and can use the strategy of drawing an auxiliary line for solving problems. They also can step back for an overview and shift perspective. They can see complicated things, such as some algebraic expressions, as single objects or as being composed of several objects. For example, they can see 5 – 3(x – y)² as 5 minus a positive number times a square and use that to realize that its value cannot be more than 5 for any real numbers x and y.

**Standard Relation to Course: Supporting**

**Attend to precision.**

Look for and make use of structure. Mathematically proficient students notice if calculations are repeated, and look both for general methods and for shortcuts. Upper elementary students might notice when dividing 25 by 11 that they are repeating the same calculations over and over again, and conclude they have a repeating decimal. By paying attention to the calculation of slope as they repeatedly check whether points are on the line through $(1, 2)$ with slope 3, middle school students might abstract the equation $(y – 2) = 3(x – 1)$ to $(y – 1) = 3(x – 1)$. Noticing the regularity in the way terms cancel when expanding $(x – 1)(x + 1)$, $(x – 1)²(x + 1)$, and $(x – 1)(x² + x + 1)$ might lead them to the general formula for the sum of a geometric series. As they work to solve a problem, mathematically proficient students maintain oversight of the process, while attending to the details. They continually evaluate the reasonableness of their intermediate results.

**Standard Relation to Course: Supporting**

**Look for and express regularity in repeated reasoning.**

Mathematically proficient learners create communication undergo generalization makes sense, and concepts necessary for academic success within the content area of Science.

**General Course Information and Notes**

**GENERAL NOTES**

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**ELD.K12.ELL.SI.1:** English language learners communicate for social and instructional purposes within the school setting.

**ELD.K12.ELL.SC.1:** English language learners communicate for social and instructional purposes within the school setting.
Laboratory investigations that include the use of scientific inquiry, research, measurement, problem solving, laboratory apparatus and technologies, experimental procedures, and safety procedures are an integral part of this course. The National Science Teachers Association (NSTA) recommends that at the high school level, all students should be in the science lab or field, collecting data every week. School laboratory investigations (labs) are defined by the National Research Council (NRC) as an experience in the laboratory, classroom, or the field that provides students with opportunities to interact directly with natural phenomena or with data collected by others using tools, materials, data collection techniques, and models (NRC, 2006, p. 3). Laboratory investigations in the high school classroom should help all students develop a growing understanding of the complexity and ambiguity of empirical work, as well as the skills to calibrate and troubleshoot equipment used to make observations. Learners should understand measurement error; and have the skills to aggregate, interpret, and present the resulting data (National Research Council, 2006, p.77; NSTA, 2007).

**Special Notes:**

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Teaching from a range of complex text is optimized when teachers in all subject areas implement the following strategies on a routine basis:

1. Ensuring wide reading from complex text that varies in length.
2. Making close reading and rereading of texts central to lessons.
3. Emphasizing text-specific complex questions, and cognitively complex tasks, reinforce focus on the text and cultivate independence.
4. Emphasizing students supporting answers based upon evidence from the text.
5. Providing extensive research and writing opportunities (claims and evidence).

**Science and Engineering Practices** (NRC Framework for K-12 Science Education, 2010)

- Asking questions (for science) and defining problems (for engineering).
- Developing and using models.
- Planning and carrying out investigations.
- Analyzing and interpreting data.
- Using mathematics, information and computer technology, and computational thinking.
- Constructing explanations (for science) and designing solutions (for engineering).
- Engaging in argument from evidence.
- Obtaining, evaluating, and communicating information.

**Literacy Standards in Science**

Secondary science courses include reading standards for literacy in science and technical subjects 6-12 and writing standards for literacy in history/social studies, science, and technical subjects 6-12. The courses also include speaking and listening standards. For a complete list of standards required for this course click on the blue tile labeled course standards. You may also download the complete course including all required standards and notes sections using the export function located at the top of this page.

**English Language Development ELD Standards Special Notes Section:**

Teachers are required to provide listening, speaking, reading and writing instruction that allows English language learners (ELL) to communicate information, ideas and concepts for academic success in the content area of Science. For the given level of English language proficiency and with visual, graphic, or interactive support, students will interact with grade level words, expressions, sentences and discourse to process or produce language necessary for academic success. The ELD standard should specify a relevant content area concept or topic of study chosen by curriculum developers and teachers which maximizes an ELL's need for communication and social skills. To access an ELL supporting document which delineates performance definitions and descriptors, please click on the following link:

https://cpalmsmediaprod.blob.core.windows.net/uploads/docs/standards/eld/sc.pdf

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**GENERAL INFORMATION**

**Course Number:** 2000370

**Course Path:** Section: Grades PreK to 12 Education Courses > Grade Group: Grades 9 to 12 and Adult Education Courses > Subject: Science > SubSubject: Biological Sciences >

**Abbreviated Title:** BOTANY

**Number of Credits:** One (1) credit

**Course Type:** Elective Course

**Course Status:** Course Approved

**Grade Level(s):** 9,10,11,12

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**Educator Certifications**

- Science (Secondary Grades 7-12)
- Biology (Grades 6-12)
### Course Standards

<table>
<thead>
<tr>
<th>Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>SC.912.L.14.2</td>
<td>Relate structure to function for the components of plant and animal cells. Explain the role of cell membranes as a highly selective barrier (passive and active transport).</td>
</tr>
<tr>
<td>SC.912.L.14.3</td>
<td>Compare and contrast the general structures of plant and animal cells. Compare and contrast the general structures of prokaryotic and eukaryotic cells.</td>
</tr>
<tr>
<td>SC.912.L.14.5</td>
<td>Explain the evidence supporting the scientific theory of the origin of eukaryotic cells (endosymbiosis).</td>
</tr>
<tr>
<td>SC.912.L.14.7</td>
<td>Relate the structure of each of the major plant organs and tissues to physiological processes.</td>
</tr>
<tr>
<td>SC.912.L.14.8</td>
<td>Explain alternation of generations in plants.</td>
</tr>
<tr>
<td>SC.912.L.14.9</td>
<td>Relate the major structure of fungi to their functions.</td>
</tr>
<tr>
<td>SC.912.L.14.10</td>
<td>Discuss the relationship between the evolution of land plants and their anatomy.</td>
</tr>
<tr>
<td>SC.912.L.14.15</td>
<td>Discuss basic classification and characteristics of plants. Identify bryophytes, pteridophytes, gymnosperms, and angiosperms.</td>
</tr>
<tr>
<td>SC.912.L.15.1</td>
<td>Explain how the scientific theory of evolution is supported by the fossil record, comparative anatomy, comparative embryology, biogeography, molecular biology, and observed evolutionary change.</td>
</tr>
<tr>
<td>SC.912.L.15.3</td>
<td>Describe how biological diversity is increased by the origin of new species and how it is decreased by the natural process of extinction.</td>
</tr>
<tr>
<td>SC.912.L.15.4</td>
<td>Describe how and why organisms are hierarchically classified and based on evolutionary relationships.</td>
</tr>
<tr>
<td>SC.912.L.15.5</td>
<td>Explain the reasons for changes in how organisms are classified.</td>
</tr>
<tr>
<td>SC.912.L.15.6</td>
<td>Discuss distinguishing characteristics of the domains and kingdoms of living organisms.</td>
</tr>
<tr>
<td>SC.912.L.16.1</td>
<td>Use Mendel's laws of segregation and independent assortment to analyze patterns of inheritance.</td>
</tr>
<tr>
<td>SC.912.L.16.2</td>
<td>Discuss observed inheritance patterns caused by various modes of inheritance, including dominant, recessive, codominant, sex-linked, polygenic, and multiple alleles.</td>
</tr>
<tr>
<td>SC.912.L.17.4</td>
<td>Describe changes in ecosystems resulting from seasonal variations, climate change and succession.</td>
</tr>
<tr>
<td>SC.912.L.17.6</td>
<td>Compare and contrast the relationships among organisms, including predation, parasitism, competition, commensalism, and mutualism.</td>
</tr>
<tr>
<td>SC.912.L.17.7</td>
<td>Characterize the biotic and abiotic components that define freshwater systems, marine systems and terrestrial systems.</td>
</tr>
<tr>
<td>SC.912.L.17.8</td>
<td>Recognize the consequences of the losses of biodiversity due to catastrophic events, climate changes, human activity, and the introduction of invasive, non-native species.</td>
</tr>
<tr>
<td>SC.912.L.17.9</td>
<td>Use a food web to identify and distinguish producers, consumers, and decomposers. Explain the pathway of energy transfer through trophic levels and the reduction of available energy at successive trophic levels.</td>
</tr>
<tr>
<td>SC.912.L.17.10</td>
<td>Diagram and explain the biogeochemical cycles of an ecosystem, including water, carbon, and nitrogen cycle.</td>
</tr>
<tr>
<td>SC.912.L.18.1</td>
<td>Describe the basic molecular structures and primary functions of the four major categories of biological macromolecules.</td>
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<tr>
<td>SC.912.L.18.5</td>
<td>Discuss the use of chemiosmotic gradients for ATP production in chloroplasts and mitochondria.</td>
</tr>
<tr>
<td>SC.912.L.18.7</td>
<td>Identify the reactants, products, and basic functions of photosynthesis.</td>
</tr>
<tr>
<td>SC.912.L.18.8</td>
<td>Identify the reactants, products, and basic functions of aerobic and anaerobic cellular respiration.</td>
</tr>
<tr>
<td>SC.912.L.18.9</td>
<td>Explain the interrelated nature of photosynthesis and cellular respiration.</td>
</tr>
<tr>
<td>SC.912.L.18.10</td>
<td>Connect the role of adenosine triphosphate (ATP) to energy transfers within a cell.</td>
</tr>
<tr>
<td>SC.912.L.18.11</td>
<td>Explain the role of enzymes as catalysts that lower the activation energy of biochemical reactions. Identify factors, such as pH and temperature, and their effect on enzyme activity.</td>
</tr>
<tr>
<td>SC.912.L.18.12</td>
<td>Discuss the special properties of water that contribute to Earth's suitability as an environment for life: cohesive behavior, ability to moderate temperature, expansion upon freezing, and versatility as a solvent.</td>
</tr>
</tbody>
</table>

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<thead>
<tr>
<th>Name</th>
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<tbody>
<tr>
<td>SC.912.N.1.1.1</td>
<td>Define a problem based on a specific body of knowledge, for example: biology, chemistry, physics, and earthspace science, and do the following:</td>
</tr>
<tr>
<td></td>
<td>1. Pose questions about the natural world, (Articulate the purpose of the investigation and identify the relevant scientific concepts).</td>
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<td></td>
<td>2. Conduct systematic observations, (Write procedures that are clear and replicable. Identify observables and examine relationships between test (independent) variable and outcome (dependent) variable. Employ appropriate methods for accurate and consistent observations; conduct and record measurements at appropriate levels of precision. Follow safety guidelines).</td>
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<td></td>
<td>3. Examine books and other sources of information to see what is already known,</td>
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<td></td>
<td>4. Review what is known in light of empirical evidence, (Examine whether available empirical evidence can be interpreted in terms of existing knowledge and models, and if not, modify or develop new models).</td>
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<td></td>
<td>5. Plan investigations, (Design and evaluate a scientific investigation).</td>
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<td></td>
<td>6. Use tools to gather, analyze, and interpret data (this includes the use of measurement in metric and other systems, and also the generation and interpretation of graphical representations of data, including data tables and graphs), (Collect data or evidence in an organized way. Properly use instruments, equipment, and materials (e.g., scales, probeware, meter sticks, microscopes, computers) including set-up, calibration, technique, maintenance, and storage).</td>
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<td></td>
<td>7. Pose answers, explanations, or descriptions of events,</td>
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<td></td>
<td>8. Generate explanations that explicate or describe natural phenomena (inferences),</td>
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<td></td>
<td>9. Use appropriate evidence and reasoning to justify these explanations to others,</td>
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<td></td>
<td>10. Communicate results of scientific investigations, and</td>
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<td></td>
<td>11. Evaluate the merits of the explanations produced by others.</td>
</tr>
<tr>
<td>SC.912.N.1.2</td>
<td>Describe and explain what characterizes science and its methods.</td>
</tr>
<tr>
<td>SC.912.N.2.4</td>
<td>Explain that scientific knowledge is both durable and robust and open to change. Scientific knowledge can change because it is often examined and re-examined by new investigations and scientific argumentation. Because of these frequent examinations, scientific knowledge becomes stronger, leading to its durability.</td>
</tr>
<tr>
<td>SC.912.P.8.12</td>
<td>Describe the properties of the carbon atom that make the diversity of carbon compounds possible.</td>
</tr>
</tbody>
</table>
Differentiate among the various forms of energy and recognize that they can be transformed from one form to others.

Explore the theory of electromagnetism by comparing and contrasting the different parts of the electromagnetic spectrum in terms of wavelength, frequency, and energy, and relate them to phenomena and applications.

Explain how various factors, such as concentration, temperature, and presence of a catalyst affect the rate of a chemical reaction.

Mathematicians who participate in effortful learning both individually and with others:
- Analyze the problem in a way that makes sense given the task.
- Ask questions that will help with solving the task.
- Build perseverance by modifying methods as needed while solving a challenging task.
- Stay engaged and maintain a positive mindset when working to solve tasks.
- Help and support each other when attempting a new method or approach.

Clarifications:
Teachers who encourage students to participate actively in effortful learning both individually and with others:
- Cultivate a community of growth mindset learners.
- Foster perseverance in students by choosing tasks that are challenging.
- Develop students' ability to analyze and problem solve.
- Recognize students' effort when solving challenging problems.

Demonstrate understanding by representing problems in multiple ways.
Mathematicians who demonstrate understanding by representing problems in multiple ways:
- Build understanding through modeling and using manipulatives.
- Represent solutions to problems in multiple ways using objects, drawings, tables, graphs and equations.
- Progress from modeling problems with objects and drawings to using algorithms and equations.
- Express connections between concepts and representations.
- Choose a representation based on the given context or purpose.

Clarifications:
Teachers who encourage students to demonstrate understanding by representing problems in multiple ways:
- Help students make connections between concepts and representations.
- Provide opportunities for students to use manipulatives when investigating concepts.
- Guide students from concrete to pictorial to abstract representations as understanding progresses.
- Show students that various representations can have different purposes and can be useful in different situations.

Complete tasks with mathematical fluency.
Mathematicians who complete tasks with mathematical fluency:
- Select efficient and appropriate methods for solving problems within the given context.
- Maintain flexibility and accuracy while performing procedures and mental calculations.
- Complete tasks accurately and with confidence.
- Adapt procedures to apply them to a new context.
- Use feedback to improve efficiency when performing calculations.

Clarifications:
Teachers who encourage students to complete tasks with mathematical fluency:
- Provide students with the flexibility to solve problems by selecting a procedure that allows them to solve efficiently and accurately.
- Offer multiple opportunities for students to practice efficient and generalizable methods.
- Provide opportunities for students to reflect on the method they used and determine if a more efficient method could have been used.

Engage in discussions that reflect on the mathematical thinking of self and others.
Mathematicians who engage in discussions that reflect on the mathematical thinking of self and others:
- Communicate mathematical ideas, vocabulary and methods effectively.
- Analyze the mathematical thinking of others.
- Compare the efficiency of a method to those expressed by others.
- Recognize errors and suggest how to correctly solve the task.
- Justify results by explaining methods and processes.
- Construct possible arguments based on evidence.

Clarifications:
Teachers who encourage students to engage in discussions that reflect on the mathematical thinking of self and others:
- Establish a culture in which students ask questions of the teacher and their peers, and error is an opportunity for learning.
- Create opportunities for students to discuss their thinking with peers.
- Select, sequence and present student work to advance and deepen understanding of correct and increasingly efficient methods.
- Develop students’ ability to justify methods and compare their responses to the responses of their peers.

Use patterns and structure to help understand and connect mathematical concepts.
Mathematicians who use patterns and structure to help understand and connect mathematical concepts:
- Focus on relevant details within a problem.
- Create plans and procedures to logically order events, steps or ideas to solve problems.
- Decompose a complex problem into manageable parts.
- Relate previously learned concepts to new concepts.
- Look for similarities among problems.
- Connect solutions of problems to more complicated large-scale situations.

Clarifications:
Teachers who encourage students to use patterns and structure to help understand and connect mathematical concepts:
- Help students recognize the patterns in the world around them and connect these patterns to mathematical concepts.
### MA.K12.MTR.6.1:

**Assess the reasonableness of solutions.**

Mathematicians who assess the reasonableness of solutions:

- Estimate to discover possible solutions.
- Use benchmark quantities to determine if a solution makes sense.
- Check calculations when solving problems.
- Verify possible solutions by explaining the methods used.
- Evaluate results based on the given context.

**Clarifications:**

- Teachers who encourage students to assess the reasonableness of solutions:
  - Have students estimate or predict solutions prior to solving.
  - Prompt students to continually ask, “Does this solution make sense? How do you know?”
  - Reinforce that students check their work as they progress within and after a task.
  - Strengthen students' ability to verify solutions through justifications.

### MA.K12.MTR.7.1:

**Apply mathematics to real-world contexts.**

Mathematicians who apply mathematics to real-world contexts:

- Connect mathematical concepts to everyday experiences.
- Use models and methods to understand, represent and solve problems.
- Perform investigations to gather data or determine if a method is appropriate. • Redesign models and methods to improve accuracy or efficiency.

**Clarifications:**

- Teachers who encourage students to apply mathematics to real-world contexts:
  - Provide opportunities for students to create models, both concrete and abstract, and perform investigations.
  - Challenge students to question the accuracy of their models and methods.
  - Support students as they validate conclusions by comparing them to the given situation.
  - Indicate how various concepts can be applied to other disciplines.

### ELA.K12.EE.1.1:

**Cite evidence to explain and justify reasoning.**

K-1 Students include textual evidence in their oral communication with guidance and support from adults. The evidence can consist of details from the text without naming the text. During 1st grade, students learn how to incorporate the evidence in their writing.

2-3 Students include relevant textual evidence in their written and oral communication. Students should name the text when they refer to it. In 3rd grade, students should use a combination of direct and indirect citations.

4-5 Students continue with previous skills and reference comments made by speakers and peers. Students cite texts that they’ve directly quoted, paraphrased, or used for information. When writing, students will use the form of citation dictated by the instructor or the style guide referenced by the instructor.

6-8 Students continue with previous skills and use a style guide to create a proper citation.

9-12 Students continue with previous skills and should be aware of existing style guides and the ways in which they differ.

**Clarifications:**

- K-1 Students should incorporate strategies that allow them to use evidence logically.

**ELA.K12.EE.2.1:**

Read and comprehend grade-level complex texts proficiently.

**Clarifications:**

See Text Complexity for grade-level complexity bands and a text complexity rubric.

**ELA.K12.EE.3.1:**

Make inferences to support comprehension.

**Clarifications:**

- Students will make inferences before the words infer or inference are introduced. Kindergarten students will answer questions like “Why is the girl smiling?” or make predictions about what will happen based on the title page. Students will use the terms and apply them in 2nd grade and beyond.

**ELA.K12.EE.4.1:**

Use appropriate collaborative techniques and active listening skills when engaging in discussions in a variety of situations.

**Clarifications:**

- In kindergarten, students learn to listen to one another respectfully.
- In grades 1-2, students build upon these skills by justifying what they are thinking. For example: “I think _____ because _____.” The collaborative conversations are becoming academic conversations.
- In grades 3-12, students engage in academic conversations discussing claims and justifying their reasoning, refining and applying skills. Students build on ideas, propel the conversation, and support claims and counterclaims with evidence.

**ELA.K12.EE.5.1:**

Use the accepted rules governing a specific format to create quality work.

**Clarifications:**

- Students will incorporate skills learned into work products to produce quality work. For students to incorporate these skills appropriately, they must receive instruction. A 3rd grade student creating a poster board display must have instruction in how to effectively present information to do quality work.

**ELA.K12.EE.6.1:**

Use appropriate voice and tone when speaking or writing.

**Clarifications:**

- In kindergarten and 1st grade, students learn the difference between formal and informal language. For example, the way we talk to our friends differs from the way we speak to adults. In 2nd grade and beyond, students practice appropriate social and academic language to discuss texts.
General Course Information and Notes

**GENERAL NOTES**

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- Constructing explanations (for science) and designing solutions (for engineering).
- Engaging in argument from evidence.
- Obtaining, evaluating, and communicating information.

**Florida's Benchmarks for Excellent Student Thinking (B.E.S.T.) Standards**
This course includes Florida's B.E.S.T. ELA Expectations (EE) and Mathematical Thinking and Reasoning Standards (MTRs) for students. Florida educators should intentionally embed these standards within the content and their instruction as applicable. For guidance on the implementation of the EE's and MTRs, please visit https://www.cpalms.org/Standards/BEST_Standards.aspx and select the appropriate B.E.S.T. Standards package.

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**GENERAL INFORMATION**

**Course Number:** 2000370

**Course Path:** Sections: Grades PreK to 12 Education
Courses > **Grade Group:** Grades 9 to 12 and Adult
Education Courses > **Subject:** Science > **SubSubject:** Biological Sciences > **Abbreviated Title:** BOTANY
**Course Length:** Year (Y)
**Course Level:** 2

**Number of Credits:** One (1) credit

**Course Type:** Elective Course

**Course Status:** State Board Approved

**Grade Level(s):** 9,10,11,12

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**Educator Certifications**

**Science (Secondary Grades 7-12)**

**Biology (Grades 6-12)**
### Course Standards

<table>
<thead>
<tr>
<th>Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>LAFS.1112.RST.1.1</td>
<td>Cite specific textual evidence to support analysis of science and technical texts, attending to important distinctions the author makes and to any gaps or inconsistencies in the account.</td>
</tr>
<tr>
<td>LAFS.1112.RST.1.2</td>
<td>Determine the central ideas or conclusions of a text; summarize complex concepts, processes, or information presented in a text by paraphrasing them in simpler but still accurate terms.</td>
</tr>
<tr>
<td>LAFS.1112.RST.1.3</td>
<td>Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks; analyze the specific results based on explanations in the text.</td>
</tr>
<tr>
<td>LAFS.1112.RST.2.4</td>
<td>Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 11–12 texts and topics.</td>
</tr>
<tr>
<td>LAFS.1112.RST.2.5</td>
<td>Analyze how the text structures information or ideas into categories or hierarchies, demonstrating understanding of the information or ideas.</td>
</tr>
<tr>
<td>LAFS.1112.RST.2.6</td>
<td>Analyze the author's purpose in providing an explanation, describing a procedure, or discussing an experiment in a text, identifying important issues that remain unresolved.</td>
</tr>
<tr>
<td>LAFS.1112.RST.3.7</td>
<td>Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g., quantitative data, video, multimedia) in order to address a question or solve a problem.</td>
</tr>
<tr>
<td>LAFS.1112.RST.3.8</td>
<td>Evaluate the hypotheses, data, analysis, and conclusions in a science or technical text, verifying the data when possible and corroborating or challenging conclusions with other sources of information.</td>
</tr>
<tr>
<td>LAFS.1112.RST.3.9</td>
<td>Synthesize information from a range of sources (e.g., texts, experiments, simulations) into a coherent understanding of a process, phenomenon, or concept, resolving conflicting information when possible.</td>
</tr>
<tr>
<td>LAFS.1112.RST.4.10</td>
<td>By the end of grade 12, read and comprehend science/technical texts in the grades 11–12 text complexity band independently and proficiently.</td>
</tr>
<tr>
<td>LAFS.1112.SL.1.1</td>
<td>Initiate and participate effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grades 11–12 topics, texts, and issues, building on others' ideas and expressing their own clearly and persuasively.</td>
</tr>
<tr>
<td>a.</td>
<td>Come to discussions prepared, having read and researched material under study; explicitly draw on that preparation by referring to evidence from texts and other research on the topic or issue to stimulate a thoughtful, well-reasoned exchange of ideas.</td>
</tr>
<tr>
<td>b.</td>
<td>Work with peers to promote civil, democratic discussions and decision-making, set clear goals and deadlines, and establish individual roles as needed.</td>
</tr>
<tr>
<td>c.</td>
<td>Propose and respond to questions that probe reasoning and evidence; ensure a hearing for a full range of positions on a topic or issue; clarify, verify, or challenge ideas and conclusions; and promote divergent and creative perspectives.</td>
</tr>
<tr>
<td>d.</td>
<td>Respond thoughtfully to diverse perspectives; synthesize comments, claims, and evidence made on all sides of an issue; resolve contradictions when possible; and determine what additional information or research is required to deepen the investigation or complete the task.</td>
</tr>
<tr>
<td>LAFS.1112.SL.1.2</td>
<td>Integrate multiple sources of information presented in diverse formats and media (e.g., visually, quantitatively, orally) in order to make informed decisions and solve problems, evaluating the credibility and accuracy of each source and noting any discrepancies among the data.</td>
</tr>
<tr>
<td>LAFS.1112.SL.1.3</td>
<td>Evaluate a speaker's point of view, reasoning, and use of evidence and rhetoric, assessing the stance, premises, links among ideas, word choice, points of emphasis, and tone used.</td>
</tr>
<tr>
<td>LAFS.1112.SL.2.4</td>
<td>Present information, findings, and supporting evidence, conveying a clear and distinct perspective, such that listeners can follow the line of reasoning, alternative or opposing perspectives are addressed, and the organization, development, substance, and style are appropriate to purpose, audience, and a range of formal and informal tasks.</td>
</tr>
<tr>
<td>LAFS.1112.SL.2.5</td>
<td>Make strategic use of digital media (e.g., textual, graphical, audio, visual, and interactive elements) in presentations to enhance understanding of findings, reasoning, and evidence to add interest.</td>
</tr>
<tr>
<td>LAFS.1112.WHST.1.1</td>
<td>Write arguments focused on discipline-specific content.</td>
</tr>
<tr>
<td>a.</td>
<td>Introduce precise, knowledgeable claim(s), establish the significance of the claim(s), distinguish the claim(s) from alternate or opposing claims, and create an organization that logically sequences the claim(s), counterclaims, reasons, and evidence.</td>
</tr>
<tr>
<td>b.</td>
<td>Develop claim(s) and counterclaims fairly and thoroughly, supplying the most relevant data and evidence for each while pointing out the strengths and limitations of both claim(s) and counterclaims in a discipline-appropriate form that anticipates the audience's knowledge level, concerns, values, and possible biases.</td>
</tr>
<tr>
<td>c.</td>
<td>Use words, phrases, and clauses as well as varied syntax to link the major sections of the text, create cohesion, and clarify the relationships between claim(s) and reasons, between reasons and evidence, and between claim(s) and counterclaims.</td>
</tr>
<tr>
<td>d.</td>
<td>Establish and maintain a formal style and objective tone while attending to the norms and conventions of the discipline in which they are writing.</td>
</tr>
<tr>
<td>e.</td>
<td>Provide a concluding statement or section that follows from or supports the argument presented.</td>
</tr>
<tr>
<td>LAFS.1112.WHST.1.2</td>
<td>Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes.</td>
</tr>
<tr>
<td>a.</td>
<td>Introduce a topic and organize complex ideas, concepts, and information so that each new element builds on that which precedes it to create a unified whole; include formatting (e.g., headings), graphics (e.g., figures, tables), and multimedia when useful to aiding comprehension.</td>
</tr>
<tr>
<td>b.</td>
<td>Develop the topic thoroughly by selecting the most significant and relevant facts, extended definitions, concrete details, quotations, or other information and examples appropriate to the audience's knowledge of the topic.</td>
</tr>
<tr>
<td>c.</td>
<td>Use varied transitions and sentence structures to link the major sections of the text, create cohesion, and clarify the relationships among complex ideas and concepts.</td>
</tr>
<tr>
<td>d.</td>
<td>Use precise language, domain-specific vocabulary and techniques such as metaphor, simile, and analogy to manage the complexity of the topic; convey a knowledgeable stance in a style that responds to the discipline and context as well as to the expertise of likely readers.</td>
</tr>
<tr>
<td>e.</td>
<td>Provide a concluding statement or section that follows from and supports the information or explanation provided (e.g., articulating implications or the significance of the topic).</td>
</tr>
<tr>
<td>LAFS.1112.WHST.2.4</td>
<td>Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.</td>
</tr>
</tbody>
</table>
Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience.

Use technology, including the internet, to produce, publish, and update individual or shared writing products in response to ongoing feedback, including new arguments or information.

Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation.

Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the strengths and limitations of each source in terms of the specific task, purpose, and audience; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and overreliance on any one source and following a standard format for citation.

Draw evidence from informational texts to support analysis, reflection, and research.

Write routinely extended over extended time frames (time for reflection and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific purposes, and audiences.

Cite specific textual evidence to support analysis of science and technical texts, attending to the precise details of explanations or descriptions.

Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks, attending to special cases or exceptions defined in the text.

Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 9–10 texts and topics.

Analyze the structure of the relationships among concepts in a text, including relationships among key terms (e.g., force, friction, reaction force, energy).

Translate quantitative or technical information expressed in words in a text into visual form (e.g., a table or chart) and translate information expressed visually or mathematically (e.g., in an equation) into words.

By the end of grade 10, read and comprehend science/technical texts in the grades 9–10 text complexity band independently and proficiently.

Integrate multiple sources of information presented in diverse media or formats (e.g., visually, quantitatively, orally) evaluating the credibility and accuracy of each source.

Evaluate a speaker's point of view, reasoning, and use of evidence and rhetoric, identifying any fallacious reasoning or exaggerated or distorted evidence.

Present information, findings, and supporting evidence clearly, concisely, and logically such that listeners can follow the line of reasoning and the organization, development, substance, and style are appropriate to purpose, audience, and task.

Make strategic use of digital media (e.g., textual, graphical, audio, visual, and interactive elements) in presentations to enhance understanding of findings, reasoning, and evidence and to add interest.

Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes. a. Introduce a topic and organize ideas, concepts, and information to make important connections and distinctions; include formatting (e.g., headings), graphics (e.g., figures, tables), and multimedia when useful to aiding comprehension.

b. Develop the topic with well-chosen, relevant, and sufficient facts, extended definitions, concrete details, quotations, or other information and examples appropriate to the audience's knowledge of the topic.

c. Use varied transitions and sentence structures to link the major sections of the text, create cohesion, and clarify the relationships among ideas and concepts.

d. Use precise language and domain-specific vocabulary to manage the complexity of the topic and convey a style appropriate to the discipline and context as well as to the expertise of likely readers.

e. Establish and maintain a formal style and objective tone while attending to the norms and conventions of the discipline in which they are writing.

f. Provide a concluding statement or section that follows from and supports the information or explanation presented (e.g., articulating implications or the significance of the topic).

List the conditions for Hardy-Weinberg equilibrium in a population and why these conditions are not likely to appear in nature. Use the Hardy-Weinberg equation to predict genotypes in a population from observed phenotypes.

Discuss the characteristics of populations, such as number of individuals, age structure, density, and pattern of distribution.

Discuss how various oceanic and freshwater processes, such as currents, tides, and waves, affect the abundance of aquatic organisms.

Describe changes in ecosystems resulting from seasonal variations, climate change and succession.

Analyze how population size is determined by births, deaths, immigration, emigration, and limiting factors (biotic and abiotic) that determine carrying capacity.

Compare and contrast the relationships among organisms, including predation, parasitism, competition, commensalism, and mutualism.

Characterize the biotic and abiotic components that define freshwater systems, marine systems and terrestrial systems.

Recognize the consequences of the losses of biodiversity due to catastrophic events, climate changes, human activity, and the introduction of invasive, non-native species.

Use a food web to identify and distinguish producers, consumers, and decomposers. Explain the pathway of energy transfer through trophic levels and the reduction of available energy at successive trophic levels.

Diagram and explain the biogeochemical cycles of an ecosystem, including water, carbon, and nitrogen cycle.

Evaluate the costs and benefits of renewable and nonrenewable resources, such as water, energy, fossil fuels, wildlife, and forests.

Discuss the large-scale environmental impacts resulting from human activity, including waste spills, oil spills, runoff, greenhouse gases, ozone depletion, and surface and groundwater pollution.

Assess the effectiveness of innovative methods of protecting the environment.

Describe how different natural resources are produced and how their rates of use and renewal limit availability.

Define a problem based on a specific body of knowledge, for example: biology, chemistry, physics, and earth/space science, and do the following:

1. Pose questions about the natural world. (Articulate the purpose of the investigation and identify the relevant scientific concepts).

2. Conduct systematic observations. (Write procedures that are clear and replicable. Identify observables and examine relationships between test (independent) variable and outcome (dependent) variable. Employ appropriate methods for accurate and consistent observations;
### SC.912.N.1.1:

- Conduct and record measurements at appropriate levels of precision. Follow safety guidelines.

- Examine books and other sources of information to see what is already known.

- Review what is known in light of empirical evidence. (Examine whether available empirical evidence can be interpreted in terms of existing knowledge and models, and if not, modify or develop new models.)

- Plan investigations. (Design and evaluate a scientific investigation.)

- Use tools to gather, analyze, and interpret data (this includes the use of measurement in metric and other systems, and also the generation and interpretation of graphical representations of data, including data tables and graphs). (Collect data or evidence in an organized way. Properly use instruments, equipment, and materials (e.g., scales, probeware, meter sticks, microscopes, computers) including set-up, calibration, technique, maintenance, and storage.)

- Pose answers, explanations, or descriptions of events.

- Generate explanations that explicate or describe natural phenomena (inferences).

- Use appropriate evidence and reasoning to justify these explanations to others.

- Communicate results of scientific investigations, and

- Evaluate the merits of the explanations produced by others.

### SC.912.N.1.2:

- Describe and explain what characterizes science and its methods.

- Recognize that the strength or usefulness of a scientific claim is evaluated through scientific argumentation, which depends on critical and logical thinking, and the active consideration of alternative scientific explanations to explain the data presented.

- Identify sources of information and assess their reliability according to the strict standards of scientific investigation.

- Describe and provide examples of how similar investigations conducted in many parts of the world result in the same outcome.

- Describe how scientific inferences are drawn from scientific observations and provide examples from the content being studied.

- Describe the function of models in science, and identify the wide range of models used in science.

- Explain that a scientific theory is the culmination of many scientific investigations and represents the best explanation of a phenomenon or set of phenomena; thus, a scientific theory represents the most powerful explanation scientists have to offer.

- Weigh the merits of alternative strategies for solving a specific societal problem by comparing a number of different costs and benefits, such as human, economic, and environmental.

- Explore the Law of Conservation of Energy by differentiating among open, closed, and isolated systems and explain that the total energy in an isolated system is a conserved quantity.

### MAFS.912.F-IF.3.7:

Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases. ★

- a. Graph linear and quadratic functions and show intercepts, maxima, and minima.
- b. Graph square root, cube root, and piecewise-defined functions, including step functions and absolute value functions.
- c. Graph polynomial functions, identifying zeros when suitable factorizations are available, and showing end behavior.
- d. Graph rational functions, identifying zeros and asymptotes when suitable factorizations are available, and showing end behavior.
- e. Graph exponential and logarithmic functions, showing intercepts and end behavior, and trigonometric functions, showing period, midline, and amplitude, and using phase shift.

### MAFS.912.N-Q.1.1:

Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays. ★

### MAFS.912.N-Q.1.3:

Choose a level of accuracy appropriate to limitations on measurement when reporting quantities. ★

### MAFS.912.MP.1.1:

**Make sense of problems and persevere in solving them.**

Mathematically proficient students start by explaining to themselves the meaning of a problem and looking for entry points to its solution. They analyze givens, constraints, relationships, and goals. They make conjectures about the form and meaning of the solution and plan a solution pathway rather than simply jumping into a solution attempt. They consider analogous problems, and try special cases and simpler forms of the original problem in order to gain insight into its solution. They monitor and evaluate their progress and change course if necessary. Older students might, depending on the context of the problem, transform algebraic expressions or change the viewing window on their graphing calculator. They know that they have solved a problem when they have explained and understood the solution and can generalize the approach they used to solve the problem.

**Standard Relation to Course: Supporting**

### MAFS.912.MP.2.1:

**Reason abstractly and quantitatively.**

Mathematically proficient students make sense of quantities and their relationships in problem situations. They bring two complementary abilities to bear on problems involving quantitative relationships: the ability to decontextualize—to abstract a given situation and represent it symbolically and manipulate the representing symbols as if they have a life of their own, without necessarily attending to their referents—and the ability to contextualize, to pause as needed during the manipulation process in order to probe into the referents for the symbols involved. Quantitative reasoning entails habits of creating a coherent representation of the problem at hand; considering the units involved; attending to the meaning of quantities, not just how to compute them; and knowing and flexibly using different properties of operations and objects.

**Standard Relation to Course: Supporting**

Construct viable arguments and critique the reasoning of others.
Mathematically proficient students understand and use stated assumptions, definitions, and previously established results in constructing arguments. They make conjectures and build a logical progression of statements to explore the truth of their conjectures. They are able to analyze situations by breaking them into cases, and can recognize and use counterexamples. They justify their conclusions, communicate them to others, and respond to the arguments of others. They reason inductively about data, making plausible arguments that take into account the context from which the data arose. Mathematically proficient students are also able to compare the effectiveness of two plausible arguments, distinguish correct logic or reasoning from that which is flawed, and—if there is a flaw in an argument—explain what it is. Elementary students can construct arguments using concrete referents such as objects, drawings, diagrams, and actions. Such arguments can make sense and be correct, even though they are not generalized or made formal until later grades. Later, students learn to determine domains to which an argument applies. Students at all grades can listen or read the arguments of others, decide whether they make sense, and ask useful questions to clarify or improve the arguments.

Standard Relation to Course: Supporting

Model with mathematics.

Mathematically proficient students can apply the mathematics they know to solve problems arising in everyday life, society, and the workplace. In early grades, this might be as simple as writing an addition equation to describe a situation. In middle grades, a student might apply proportional reasoning to plan a school event or analyze a problem in the community. By high school, a student might use geometry to solve a design problem or use a function to describe how one quantity of interest depends on another. Mathematically proficient students who can apply what they know are comfortable making assumptions and approximations to simplify a complicated situation, realizing that these may need revision later. They are able to identify important quantities in a practical situation and map their relationships using such tools as diagrams, two-way tables, graphs, flowcharts and formulas. They can analyze those relationships mathematically to draw conclusions. They routinely interpret their mathematical results in the context of the situation and reflect on whether the results make sense, possibly improving the model if it has not served its purpose.

Standard Relation to Course: Supporting

Use appropriate tools strategically.

Mathematically proficient students consider the available tools when solving a mathematical problem. These tools might include pencil and paper, concrete models, a ruler, a protractor, a calculator, a spreadsheet, a computer algebra system, a statistical package, or dynamic geometry software. Proficient students are sufficiently familiar with tools appropriate for their grade or course to make sound decisions about when each of these tools might be helpful, recognizing both the insight to be gained and their limitations. For example, mathematically proficient high school students analyze graphs of functions and solutions generated using a graphing calculator. They detect possible errors by strategically using estimation and other mathematical knowledge. When making mathematical models, they know that technology can enable them to visualize the results of varying assumptions, explore consequences, and compare predictions with data. Mathematically proficient students at various grade levels are able to identify relevant external mathematical resources, such as digital content located on a website, and use them to pose or solve problems. They are able to use technological tools to explore and deepen their understanding of concepts.

Standard Relation to Course: Supporting

Attend to precision.

Mathematically proficient students try to communicate precisely to others. They try to use clear definitions in discussion with others and in their own reasoning. They state the meaning of the symbols they choose, including using the equal sign consistently and appropriately. They are careful about specifying units of measure, and labeling axes to clarify the correspondence with quantities in a problem. They calculate accurately and efficiently, express numerical answers with a degree of precision appropriate for the problem context. In the elementary grades, students give carefully formulated explanations to each other. By the time they reach high school they have learned to examine claims and make explicit use of definitions.

Standard Relation to Course: Supporting

Look for and make use of structure.

Mathematically proficient students look closely to discern a pattern or structure. Young students, for example, might notice that three and seven more is the same amount as seven and three more, or they may sort a collection of shapes according to how many sides the shapes have. Later, students will see 7 × 8 equals the well remembered 7 × 5 + 7 × 3, in preparation for learning about the distributive property. In the expression x² + 9x + 14, older students can see the 14 as 2 × 7. They recognize the significance of an existing line in a geometric figure and can use the strategy of drawing an auxiliary line or segment to frame geometric relationships. They are also able to compare the effectiveness of two methods and for shortcuts. Upper elementary students might notice when dividing 25 by 11 that they are repeating the same calculation over and over again, and conclude they have a repeating decimal. By paying attention to the calculation of slope as they repeatedly check whether points are on the line through (1, 2) with slope 3, middle school students might abstract the equation (y − 2) = 3. Noticing the regularity in the way terms cancel when expanding (x − 1)(x + 1), (x − 1)(x² + x + 1), and (x − 1)(x⁴ + x² + x + 1) might lead them to the general formula for the sum of a geometric series. As they work to solve a problem, mathematically proficient students maintain oversight of the process, while attending to the details. They continually evaluate the reasonableness of their intermediate results.

Standard Relation to Course: Supporting

General Course Information and Notes

GENERAL NOTES

Laboratory investigations that include the use of scientific inquiry, research, measurement, problem solving, laboratory apparatus and technologies, experimental
procedures, and safety procedures are an integral part of this course. The National Science Teachers Association (NSTA) recommends that at the high school level, all students should be in the science lab or field, collecting data every week. School laboratory investigations (labs) are defined by the National Research Council (NRC) as an experience in the laboratory, classroom, or the field that provides students with opportunities to interact directly with natural phenomena or with data collected by others using tools, materials, data collection techniques, and models (NRC, 2006, p. 3). Laboratory investigations in the high school classroom should help all students develop a growing understanding of the complexity and ambiguity of empirical work, as well as the skills to calibrate and troubleshoot equipment used to make observations. Learners should understand measurement error; and have the skills to aggregate, interpret, and present the resulting data (National Research Council, 2006, p.77; NSTA, 2007).

Special Notes:

Instructional Practices

Teaching from a range of complex text is optimized when teachers in all subject areas implement the following strategies on a routine basis:

1. Ensuring wide reading from complex text that varies in length.
2. Making close reading and rereading of texts central to lessons.
3. Emphasizing text-specific complex questions, and cognitively complex tasks, reinforce focus on the text and cultivate independence.
4. Emphasizing students supporting answers based upon evidence from the text.
5. Providing extensive research and writing opportunities (claims and evidence).


- Asking questions (for science) and defining problems (for engineering).
- Developing and using models.
- Planning and carrying out investigations.
- Analyzing and interpreting data.
- Using mathematics, information and computer technology, and computational thinking.
- Constructing explanations (for science) and designing solutions (for engineering).
- Engaging in argument from evidence.
- Obtaining, evaluating, and communicating information.

Literacy Standards in Science

Secondary science courses include reading standards for literacy in science and technical subjects 6-12 and writing standards for literacy in history/social studies, science, and technical subjects 6-12. The courses also include speaking and listening standards. For a complete list of standards required for this course click on the blue tile labeled course standards. You may also download the complete course including all required standards and notes sections using the export function located at the top of this page.

English Language Development ELD Standards Special Notes Section:

Teachers are required to provide listening, speaking, reading and writing instruction that allows English language learners (ELL) to communicate information, ideas and concepts for academic success in the content area of Science. For the given level of English language proficiency and with visual, graphic, or interactive support, students will interact with grade level words, expressions, sentences and discourse to process or produce language necessary for academic success. The ELD standard should specify a relevant content area concept or topic of study chosen by curriculum developers and teachers which maximizes an ELL’s need for communication and social skills. To access an ELL supporting document which delineates performance definitions and descriptors, please click on the following link: https://cpalmsmediaprod.blob.core.windows.net/uploads/docs/standards/eld/sc.pdf

GENERAL INFORMATION

Course Number: 2000380
Number of Credits: One (1) credit
Course Type: Elective Course
Course Status: Course Approved
Grade Level(s): 9,10,11,12

Course Path: Section: Grades PreK to 12 Education Courses > Grade Group: Grades 9 to 12 and Adult Education Courses > Subject: Science > SubSubject: Biological Sciences
Abbreviated Title: ECOLOGY
Course Length: Year (Y)
Course Level: 2

Educator Certifications

Science (Secondary Grades 7-12)
Biology (Grades 6-12)
## Course Standards

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<th>Name</th>
<th>Description</th>
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<tr>
<td>SC.912.L.15.12:</td>
<td>List the conditions for Hardy-Weinberg equilibrium in a population and why these conditions are not likely to appear in nature. Use the Hardy-Weinberg equation to predict genotypes in a population from observed phenotypes.</td>
</tr>
<tr>
<td>SC.912.L.15.13:</td>
<td>Describe the conditions required for natural selection, including: overproduction of offspring, inherited variation, and the struggle to survive, which result in differential reproductive success.</td>
</tr>
<tr>
<td>SC.912.L.15.14:</td>
<td>Discuss mechanisms of evolutionary change other than natural selection such as genetic drift and gene flow.</td>
</tr>
<tr>
<td>SC.912.L.15.15:</td>
<td>Describe how mutation and genetic recombination increase genetic variation.</td>
</tr>
<tr>
<td>SC.912.L.17.1:</td>
<td>Discuss the characteristics of populations, such as number of individuals, age structure, density, and pattern of distribution.</td>
</tr>
<tr>
<td>SC.912.L.17.2:</td>
<td>Explain the general distribution of life in aquatic systems as a function of chemistry, geography, light, depth, salinity, and temperature.</td>
</tr>
<tr>
<td>SC.912.L.17.3:</td>
<td>Discuss how various oceanic and freshwater processes, such as currents, tides, and waves, affect the abundance of aquatic organisms.</td>
</tr>
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<td>SC.912.L.17.4:</td>
<td>Describe changes in ecosystems resulting from seasonal variations, climate change and succession.</td>
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<td>SC.912.L.17.5:</td>
<td>Analyze how population size is determined by births, deaths, immigration, emigration, and limiting factors (biotic and abiotic) that determine carrying capacity.</td>
</tr>
<tr>
<td>SC.912.L.17.6:</td>
<td>Compare and contrast the relationships among organisms, including predation, parasitism, competition, commensalism, and mutualism.</td>
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<td>SC.912.L.17.7:</td>
<td>Characterize the biotic and abiotic components that define freshwater systems, marine systems and terrestrial systems.</td>
</tr>
<tr>
<td>SC.912.L.17.8:</td>
<td>Recognize the consequences of the losses of biodiversity due to catastrophic events, climate changes, human activity, and the introduction of invasive, non-native species.</td>
</tr>
<tr>
<td>SC.912.L.17.9:</td>
<td>Use a food web to identify and distinguish producers, consumers, and decomposers. Explain the pathway of energy transfer through trophic levels and the reduction of available energy at successive trophic levels.</td>
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<tr>
<td>SC.912.L.17.10:</td>
<td>Diagram and explain the biogeochemical cycles of an ecosystem, including water, carbon, and nitrogen cycle.</td>
</tr>
<tr>
<td>SC.912.L.17.11:</td>
<td>Evaluate the costs and benefits of renewable and nonrenewable resources, such as water, energy, fossil fuels, wildlife, and forests.</td>
</tr>
<tr>
<td>SC.912.L.17.12:</td>
<td>Discuss the large-scale environmental impacts resulting from human activity, including waste spills, oil spills, runoff, greenhouse gases, ozone depletion, and surface and groundwater pollution.</td>
</tr>
<tr>
<td>SC.912.L.17.13:</td>
<td>Assess the effectiveness of innovative methods of protecting the environment.</td>
</tr>
<tr>
<td>SC.912.L.17.19:</td>
<td>Define a problem based on a specific body of knowledge, for example: biology, chemistry, physics, and earth/space science, and do the following: 1. Pose questions about the natural world. (Articulate the purpose of the investigation and identify the relevant scientific concepts), 2. Conduct systematic observations. (Write procedures that are clear and replicable. Identify observables and examine relationships between test (independent) variable and outcome (dependent) variable. Employ appropriate methods for accurate and consistent observations; conduct and record measurements at appropriate levels of precision. Follow safety guidelines). 3. Examine books and other sources of information to see what is already known, 4. Review what is known in light of empirical evidence, (Examine whether available empirical evidence can be interpreted in terms of existing knowledge and models, and if not, modify or develop new models). 5. Plan investigations, (Design and evaluate a scientific investigation). 6. Use tools to gather, analyze, and interpret data (this includes the use of measurement in metric and other systems, and also the generation and interpretation of graphical representations of data, including data tables and graphs), (Collect data or evidence in an organized way. Properly use instruments, equipment, and materials (e.g., scales, probeware, meter sticks, microscopes, computers) including set-up, calibration, technique, maintenance, and storage). 7. Pose answers, explanations, or descriptions of events, 8. Generate explanations that explicate or describe natural phenomena (inferences), 9. Use appropriate evidence and reasoning to justify these explanations to others, 10. Communicate results of scientific investigations, and 11. Evaluate the merits of the explanations produced by others.</td>
</tr>
<tr>
<td>SC.912.N.1.1:</td>
<td>Recognize that the strength or usefulness of a scientific claim is evaluated through scientific argumentation, which depends on critical and logical thinking, and the active consideration of alternative scientific explanations to explain the data presented.</td>
</tr>
<tr>
<td>SC.912.N.1.3:</td>
<td>Identify sources of information and assess their reliability according to the strict standards of scientific investigation.</td>
</tr>
<tr>
<td>SC.912.N.1.4:</td>
<td>Describe how scientific inferences are drawn from scientific observations and provide examples from the content being studied.</td>
</tr>
<tr>
<td>SC.912.N.1.5:</td>
<td>Identify what is science, what clearly is not science, and what superficially resembles science (but fails to meet the criteria for science).</td>
</tr>
<tr>
<td>SC.912.N.1.6:</td>
<td>Explain that scientific knowledge is both durable and robust and open to change. Scientific knowledge can change because it is often examined and re-examined by new investigations and scientific argumentation. Because of these frequent examinations, scientific knowledge becomes stronger, leading to its durability.</td>
</tr>
<tr>
<td>SC.912.N.1.7:</td>
<td>Describe instances in which scientists’ varied backgrounds, talents, interests, and goals influence the inferences and thus the explanations that they make about observations of natural phenomena and describe that competing interpretations (explanations) of scientists are a strength of science as they are a source of new, testable ideas that have the potential to add new evidence to support one or another of the explanations.</td>
</tr>
<tr>
<td>SC.912.N.1.8:</td>
<td>Explain that a scientific theory is the culmination of many scientific investigations drawing together all the current evidence concerning a substantial range of phenomena; thus, a scientific theory represents the most powerful explanation scientists have to offer.</td>
</tr>
<tr>
<td>SC.912.N.3.5:</td>
<td>Describe the function of models in science, and identify the wide range of models used in science.</td>
</tr>
<tr>
<td>SC.912.N.4.1:</td>
<td>Explain how scientific knowledge and reasoning provide an empirically-based perspective to inform society’s decision making.</td>
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</tbody>
</table>
Weigh the merits of alternative strategies for solving a specific societal problem by comparing a number of different costs and benefits, such as human, economic, and environmental.

Differentiate among the various forms of energy and recognize that they can be transformed from one form to others.

Explore the Law of Conservation of Energy by differentiating among open, closed, and isolated systems and explain that the total energy in an isolated system is a conserved quantity.

Mathematicians who participate in effortful learning both individually and with others:
- Analyze the problem in a way that makes sense given the task.
- Ask questions that will help with solving the task.
- Build perseverance by modifying methods as needed while solving a challenging task.
- Stay engaged and maintain a positive mindset when working to solve tasks.
- Help and support each other when attempting a new method or approach.

Clarifications:
- Teachers who encourage students to participate actively in effortful learning both individually and with others:
  - Cultivate a community of growth mindset learners.
  - Foster perseverance in students by choosing tasks that are challenging.
  - Develop students' ability to analyze and problem solve.
  - Recognize students' effort when solving challenging problems.

Demonstrate understanding by representing problems in multiple ways. Mathematicians who demonstrate understanding by representing problems in multiple ways:
- Build understanding through modeling and using manipulatives.
- Represent solutions to problems in multiple ways using objects, drawings, tables, graphs and equations.
- Progress from modeling problems with objects and drawings to using algorithms and equations.
- Express connections between concepts and representations.
- Choose a representation based on the given context or purpose.

Clarifications:
- Teachers who encourage students to demonstrate understanding by representing problems in multiple ways:
  - Help students make connections between concepts and representations.
  - Provide opportunities for students to use manipulatives when investigating concepts.
  - Guide students from concrete to pictorial to abstract representations as understanding progresses.
  - Show students that various representations can have different purposes and can be useful in different situations.

Complete tasks with mathematical fluency. Mathematicians who complete tasks with mathematical fluency:
- Select efficient and appropriate methods for solving problems within the given context.
- Maintain flexibility and accuracy while performing procedures and mental calculations.
- Complete tasks accurately and with confidence.
- Adapt procedures to apply them to a new context.
- Use feedback to improve efficiency when performing calculations.

Clarifications:
- Teachers who encourage students to complete tasks with mathematical fluency:
  - Provide students with the flexibility to solve problems by selecting a procedure that allows them to solve efficiently and accurately.
  - Offer multiple opportunities for students to practice efficient and generalizable methods.
  - Provide opportunities for students to reflect on the method they used and determine if a more efficient method could have been used.

Engage in discussions that reflect on the mathematical thinking of self and others. Mathematicians who engage in discussions that reflect on the mathematical thinking of self and others:
- Communicate mathematical ideas, vocabulary and methods effectively.
- Analyze the mathematical thinking of others.
- Compare the efficiency of a method to those expressed by others.
- Recognize errors and suggest how to correctly solve the task.
- Justify results by explaining methods and processes.
- Construct possible arguments based on evidence.

Clarifications:
- Teachers who encourage students to engage in discussions that reflect on the mathematical thinking of self and others:
  - Establish a culture in which students ask questions of the teacher and their peers, and error is an opportunity for learning.
  - Create opportunities for students to discuss their thinking with peers.
  - Select, sequence and present student work to advance and deepen understanding of correct and increasingly efficient methods.
  - Develop students' ability to justify methods and compare their responses to the responses of their peers.

Use patterns and structure to help understand and connect mathematical concepts. Mathematicians who use patterns and structure to help understand and connect mathematical concepts:
- Focus on relevant details within a problem.
- Create plans and procedures to logically order events, steps or ideas to solve problems.
- Decompose a complex problem into manageable parts.
- Relate previously learned concepts to new concepts.
- Look for similarities among problems.
- Connect solutions of problems to more complicated large-scale situations.

Clarifications:
- Teachers who encourage students to use patterns and structure to help understand and connect mathematical concepts:
- Help students recognize the patterns in the world around them and connect these patterns to mathematical concepts.
- Support students to develop generalizations based on the similarities found among problems.
- Provide opportunities for students to create plans and procedures to solve problems.
- Develop students' ability to construct relationships between their current understanding and more sophisticated ways of thinking.

<table>
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<tr>
<th>Standard</th>
<th>Clarifications</th>
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</table>
| **MA.K12.MTR.6.1:** | Teachers who encourage students to assess the reasonableness of solutions:  
- Have students estimate or predict solutions prior to solving.  
- Prompt students to continually ask, "Does this solution make sense? How do you know?"  
- Reinforce that students check their work as they progress within and after a task.  
- Strengthen students' ability to verify solutions through justifications. |

| **MA.K12.MTR.7.1:** | Teachers who encourage students to apply mathematics to real-world contexts:  
- Connect mathematical concepts to everyday experiences.  
- Use models and methods to understand, represent and solve problems.  
- Perform investigations to gather data or determine if a method is appropriate.  
- Redesign models and methods to improve accuracy or efficiency. |

| **ELA.K12.EE.1.1:** | **Clarifications:**  
K-1 Students include textual evidence in their oral communication with guidance and support from adults. The evidence can consist of details from the text without naming the text. During 1st grade, students learn how to incorporate the evidence in their writing.  
2-3 Students include relevant textual evidence in their written and oral communication. Students should name the text when they refer to it. In 3rd grade, students should use a combination of direct and indirect citations.  
4-5 Students continue with previous skills and reference comments made by speakers and peers. Students use textual evidence in their oral communication. Students do not have to name the text or reference comments made by peers.  
6-8 Students continue with previous skills and use a style guide to create a proper citation.  
9-12 Students continue with previous skills and should be aware of existing style guides and the ways in which they differ. |

| **ELA.K12.EE.2.1:** | **Clarifications:**  
Students should name the text when they refer to it. In 3rd grade and beyond. |

| **ELA.K12.EE.3.1:** | **Clarifications:**  
Students will make inferences before the words infer or inference are introduced. Kindergarten students will answer questions like "Why is the girl smiling?" or make predictions about what will happen based on the title page. Students will use the terms and apply them in 2nd grade and beyond. |

| **ELA.K12.EE.4.1:** | **Clarifications:**  
In kindergarten, students learn to listen to one another respectfully.  
In grades 1-2, students build upon these skills by justifying what they are thinking. For example: "I think ______ because ______." The collaborative conversations are becoming academic conversations.  
In grades 3-12, students engage in academic conversations discussing claims and justifying their reasoning, refining and applying skills. Students build on ideas, propel the conversation, and support claims and counterclaims with evidence. |

| **ELA.K12.EE.5.1:** | **Clarifications:**  
Students will incorporate skills learned into work products to produce quality work. For students to incorporate these skills appropriately, they must receive instruction. A 3rd grade student creating a poster board display must have instruction in how to effectively present information to do quality work. |

| **ELA.K12.EE.6.1:** | **Clarifications:**  
In kindergarten and 1st grade, students learn the difference between formal and informal language. For example, the way we talk to our friends differs from the way we speak to adults. In 2nd grade and beyond, students practice appropriate social and academic language to discuss texts. |
English language learners communicate information, ideas and concepts necessary for academic success in the content area of Science.

English language learners communicate for social and instructional purposes within the school setting.

General Course Information and Notes

General Notes

Laboratory investigations that include the use of scientific inquiry, research, measurement, problem solving, laboratory apparatus and technologies, experimental procedures, and safety procedures are an integral part of this course. The National Science Teachers Association (NSTA) recommends that at the high school level, all students should be in the science lab or field, collecting data every week. School laboratory investigations (labs) are defined by the National Research Council (NRC) as an experience in the laboratory, classroom, or the field that provides students with opportunities to interact directly with natural phenomena or with data collected by others using tools, materials, data collection techniques, and models (NRC, 2006, p. 3). Laboratory investigations in the high school classroom should help all students develop a growing understanding of the complexity and ambiguity of empirical work, as well as the skills to calibrate and troubleshoot equipment used to make observations. Learners should understand measurement error; and have the skills to aggregate, interpret, and present the resulting data (National Research Council, 2006, p.77; NSTA, 2007).

Special Notes:

Instructional Practices

Teaching from a range of complex text is optimized when teachers in all subject areas implement the following strategies on a routine basis:

1. Ensuring wide reading from complex text that varies in length.
2. Making close reading and rereading of texts central to lessons.
3. Emphasizing text-specific complex questions, and cognitively complex tasks, reinforce focus on the text and cultivate independence.
4. Emphasizing students supporting answers based upon evidence from the text.
5. Providing extensive research and writing opportunities (claims and evidence).


- Asking questions (for science) and defining problems (for engineering).
- Developing and using models.
- Planning and carrying out investigations.
- Analyzing and interpreting data.
- Using mathematics, information and computer technology, and computational thinking.
- Constructing explanations (for science) and designing solutions (for engineering).
- Engaging in argument from evidence.
- Obtaining, evaluating, and communicating information.

Florida's Benchmarks for Excellent Student Thinking (B.E.S.T.) Standards

This course includes Florida's B.E.S.T. ELA Expectations (EE) and Mathematical Thinking and Reasoning Standards (MTRs) for students. Florida educators should intentionally embed these standards within the content and their instruction as applicable. For guidance on the implementation of the EEs and MTRs, please visit https://www.cpalms.org/Standards/BEST_Standards.aspx and select the appropriate B.E.S.T. Standards package.

English Language Development ELD Standards Special Notes Section:

Teachers are required to provide listening, speaking, reading and writing instruction that allows English language learners (ELL) to communicate information, ideas and concepts for academic success in the content area of Science. For the given level of English language proficiency and with visual, graphic, or interactive support, students will interact with grade level words, expressions, sentences and discourse to process or produce language necessary for academic success. The ELD standard should specify a relevant content area concept or topic of study chosen by curriculum developers and teachers which maximizes an ELL’s need for communication and social skills. To access an ELL supporting document which delineates performance definitions and descriptors, please click on the following link: https://cpalmsmediaprod.blob.core.windows.net/uploads/docs/standards/eld/sc.pdf
## Course Standards

<table>
<thead>
<tr>
<th>Name</th>
<th>Description</th>
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<tbody>
<tr>
<td>LAFS.1112.RST.1.1:</td>
<td>Cite specific textual evidence to support analysis of science and technical texts, attending to important distinctions the author makes and to any gaps or inconsistencies in the account.</td>
</tr>
<tr>
<td>LAFS.1112.RST.1.2:</td>
<td>Determine the central ideas or conclusions of a text; summarize complex concepts, processes, or information presented in a text by paraphrasing them in simpler but still accurate terms.</td>
</tr>
<tr>
<td>LAFS.1112.RST.1.3:</td>
<td>Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks; analyze the specific results based on explanations in the text.</td>
</tr>
<tr>
<td>LAFS.1112.RST.2.4:</td>
<td>Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 11–12 texts and topics.</td>
</tr>
<tr>
<td>LAFS.1112.RST.2.5:</td>
<td>Analyze how the text structures information or ideas into categories or hierarchies, demonstrating understanding of the information or ideas.</td>
</tr>
<tr>
<td>LAFS.1112.RST.2.6:</td>
<td>Analyze the author’s purpose in providing an explanation, describing a procedure, or discussing an experiment in a text, identifying important issues that remain unresolved.</td>
</tr>
<tr>
<td>LAFS.1112.RST.3.7:</td>
<td>Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g., quantitative data, video, multimedia) in order to address a question or solve a problem.</td>
</tr>
<tr>
<td>LAFS.1112.RST.3.8:</td>
<td>Evaluate the hypotheses, data, analysis, and conclusions in a science or technical text, verifying the data when possible and corroborating or challenging conclusions with other sources of information.</td>
</tr>
<tr>
<td>LAFS.1112.RST.3.9:</td>
<td>Synthesize information from a range of sources (e.g., texts, experiments, simulations) into a coherent understanding of a process, phenomenon, or concept, resolving conflicting information when possible.</td>
</tr>
<tr>
<td>LAFS.1112.RST.4.10:</td>
<td>By the end of grade 12, read and comprehend science/technical texts in the grades 11–12 text complexity band independently and proficiently.</td>
</tr>
<tr>
<td>LAFS.1112.SL.1.1:</td>
<td>Initiate and participate effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grades 11–12 topics, texts, and issues, building on others' ideas and expressing their own clearly and persuasively.</td>
</tr>
<tr>
<td>LAFS.1112.SL.1.2:</td>
<td>Integrate multiple sources of information presented in diverse formats and media (e.g., visually, quantitatively, orally) in order to make informed decisions and solve problems, evaluating the credibility and accuracy of each source and noting any discrepancies among the data.</td>
</tr>
<tr>
<td>LAFS.1112.SL.1.3:</td>
<td>Evaluate a speaker's point of view, reasoning, and use of evidence and rhetoric, assessing the stance, premises, links among ideas, word choice, points of emphasis, and tone used.</td>
</tr>
<tr>
<td>LAFS.1112.SL.2.4:</td>
<td>Present information, findings, and supporting evidence, conveying a clear and distinct perspective, such that listeners can follow the line of reasoning, alternative or opposing perspectives are addressed, and the organization, development, substance, and style are appropriate to purpose, audience, and a range of formal and informal tasks.</td>
</tr>
<tr>
<td>LAFS.1112.SL.2.5:</td>
<td>Make strategic use of digital media (e.g., textual, graphical, audio, visual, and interactive elements) in presentations to enhance understanding of findings, reasoning, and evidence and to add interest.</td>
</tr>
<tr>
<td>LAFS.1112.WHST.1.1:</td>
<td>Write arguments focused on discipline-specific content.</td>
</tr>
<tr>
<td>LAFS.1112.WHST.1.2:</td>
<td>Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes.</td>
</tr>
<tr>
<td>LAFS.1112.WHST.2.4:</td>
<td>Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.</td>
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</table>
LAFS.1112.WHST.2.5: Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience.

LAFS.1112.WHST.2.6: Use technology, including the internet, to produce, publish, and update individual or shared writing products in response to ongoing feedback, including new arguments or information.

LAFS.1112.WHST.3.7: Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation.

LAFS.1112.WHST.3.8: Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the strengths and limitations of each source in terms of the specific task, purpose, and audience; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and overreliance on any one source and following a standard format for citation.

LAFS.1112.WHST.3.9: Draw evidence from informational texts to support analysis, reflection, and research.

LAFS.1112.WHST.4.10: Write routinely over extended time frames (time for reflection and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences.

LAFS.910.RST.1.1: Cite specific textual evidence to support analysis of science and technical texts, attending to the precise details of explanations or descriptions.

LAFS.910.RST.1.3: Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks, attending to special cases or exceptions defined in the text.

LAFS.910.RST.2.4: Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 9–10 texts and topics.

LAFS.910.RST.2.5: Analyze the structure of the relationships among concepts in a text, including relationships among key terms (e.g., force, friction, reaction force, energy).

LAFS.910.RST.3.7: Translate quantitative or technical information expressed in words in a text into visual form (e.g., a table or chart) and translate information expressed visually or mathematically (e.g., in an equation) into words.

LAFS.910.RST.4.10: By the end of grade 10, read and comprehend science/technical texts in the grades 9–10 text complexity band independently and proficiently.

LAFS.910.1.1.5: Integrate multiple sources of information presented in diverse media or formats (e.g., visually, quantitatively, orally) evaluating the credibility and accuracy of each source.

LAFS.910.1.1.3: Evaluate a speaker's point of view, reasoning, and use of evidence and rhetoric, identifying any fallacious reasoning or exaggerated or distorted evidence.

LAFS.910.2.4: Present information, findings, and supporting evidence clearly, concisely, and logically such that listeners can follow the line of reasoning and the organization, development, substance, and style are appropriate to purpose, audience, and task.

LAFS.910.2.5: Make strategic use of digital media (e.g., textual, graphical, audio, visual, and interactive elements) in presentations to enhance understanding of findings, reasoning, and evidence and to add interest.

LAFS.910.WHST.1.2: Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes.

LAFS.910.WHST.1.2.a: Introduce a topic and organize ideas, concepts, and information to make important connections and distinctions; include formatting (e.g., headings), graphics (e.g., figures, tables), and multimedia when useful to aiding comprehension.

LAFS.910.WHST.1.2.b: Develop the topic with well-chosen, relevant, and sufficient facts, extended definitions, concrete details, quotations, or other information and examples appropriate to the audience's knowledge of the topic.

LAFS.910.WHST.1.2.c: Use varied transitions and sentence structures to link the major sections of the text, create cohesion, and clarify the relationships among ideas.

LAFS.910.WHST.1.2.d: Use precise language and domain-specific vocabulary to manage the complexity of the topic and convey a style appropriate to the discipline and context as well as to the expertise of likely readers.

LAFS.910.WHST.1.2.e: Establish and maintain a formal style and objective tone while attending to the norms and conventions of the discipline in which they are writing.

LAFS.910.WHST.1.2.f: Provide a concluding statement or section that follows from and supports the information or explanation presented (e.g., articulating implications or the significance of the topic).

LAFS.910.WHST.3.9: Draw evidence from informational texts to support analysis, reflection, and research.

SC.912.L.14.5: Explain the evidence supporting the scientific theory of the origin of eukaryotic cells (endosymbiosis).

SC.912.L.14.12: Describe the anatomy and histology of bone tissue.

SC.912.L.14.26: Identify the major parts of the brain on diagrams or models.

SC.912.L.14.36: Describe the factors affecting blood flow through the cardiovascular system.

SC.912.L.14.44: Describe the physiology of the respiratory system including the mechanisms of ventilation, gas exchange, gas transport and the mechanisms that control the rate of ventilation.

SC.912.L.14.50: Describe the structure of vertebrate sensory organs. Relate structure to function in vertebrate sensory systems.

SC.912.L.14.51: Describe the function of the vertebrate integumentary system.

SC.912.L.15.1: Explain how the scientific theory of evolution is supported by the fossil record, comparative anatomy, comparative embryology, biogeography, molecular biology, and observed evolutionary change.

SC.912.L.15.3: Describe how biological diversity is increased by the origin of new species and how it is decreased by the natural process of extinction.

SC.912.L.15.4: Describe how and why organisms are hierarchically classified and based on evolutionary relationships.

SC.912.L.15.5: Explain the reasons for changes in how organisms are classified.

SC.912.L.15.6: Discuss distinguishing characteristics of the domains and kingdoms of living organisms.

SC.912.L.15.7: Discuss distinguishing characteristics of vertebrate and representative invertebrate phyla, and chordate classes using typical examples.

SC.912.L.15.11: Discuss specific fossil hominids and what they show about human evolution.
Describe the conditions required for natural selection, including: overproduction of offspring, inherited variation, and the struggle to survive, which result in differential reproductive success.

Discuss mechanisms of evolutionary change other than natural selection such as genetic drift and gene flow.

Describe how mutation and genetic recombination increase genetic variation.

Characterize the biotic and abiotic components that define freshwater systems, marine systems and terrestrial systems.

Recognize the consequences of the losses of biodiversity due to catastrophic events, climate changes, human activity, and the introduction of invasive, non-native species.

Use a food web to identify and distinguish producers, consumers, and decomposers. Explain the pathway of energy transfer through trophic levels and the reduction of available energy at successive trophic levels.

Describe the basic molecular structures and primary functions of the four major categories of biological macromolecules.

SC.912.L.15.13: Describe the conditions required for natural selection, including: overproduction of offspring, inherited variation, and the struggle to survive, which result in differential reproductive success.

SC.912.L.15.14: Discuss mechanisms of evolutionary change other than natural selection such as genetic drift and gene flow.

SC.912.L.15.15: Describe how mutation and genetic recombination increase genetic variation.

SC.912.L.17.7: Characterize the biotic and abiotic components that define freshwater systems, marine systems and terrestrial systems.

SC.912.L.17.8: Recognize the consequences of the losses of biodiversity due to catastrophic events, climate changes, human activity, and the introduction of invasive, non-native species.

SC.912.L.17.9: Use a food web to identify and distinguish producers, consumers, and decomposers. Explain the pathway of energy transfer through trophic levels and the reduction of available energy at successive trophic levels.

SC.912.L.18.1: Describe the basic molecular structures and primary functions of the four major categories of biological macromolecules.

SC.912.L.18.9: Explain the interrelated nature of photosynthesis and cellular respiration.

Define a problem based on a specific body of knowledge, for example: biology, chemistry, physics, and earth/space science, and do the following:

1. Pose questions about the natural world, (Articulate the purpose of the investigation and identify the relevant scientific concepts).
2. Conduct systematic observations, (Write procedures that are clear and replicable. Identify observables and examine relationships between test (independent) variable and outcome (dependent) variable. Employ appropriate methods for accurate and consistent observations; conduct and record measurements at appropriate levels of precision. Follow safety guidelines).
3. Examine books and other sources of information to see what is already known,
4. Review what is known in light of empirical evidence, (Examine whether available empirical evidence can be interpreted in terms of existing knowledge and models, and if not, modify or develop new models).
5. Plan investigations, (Design and evaluate a scientific investigation).
6. Use tools to gather, analyze, and interpret data (this includes the use of measurement in metric and other systems, and also the generation and interpretation of graphical representations of data, including data tables and graphs), (Collect data or evidence in an organized way. Properly use instruments, equipment, and materials (e.g., scales, probeware, meter sticks, microscopes, computers) including set-up, calibration, technique, maintenance, and storage).
7. Pose answers, explanations, or descriptions of events,
8. Generate explanations that explicate or describe natural phenomena (inferences),
9. Use appropriate evidence and reasoning to justify these explanations to others,
10. Communicate results of scientific investigations, and
11. Evaluate the merits of the explanations produced by others.

Describe what characterizes science and its methods.

Mathematically proficient students can explain correspondences between equations, verbal descriptions, tables, and graphs or draw diagrams of important features and relationships, graph data, and search for regularity or trends. They continually ask themselves, “Does this make sense?” They can use the relationships in problem situations. They bring two complementary representations to bear on problems involving quantitative relationships: the ability to decontextualize—to abstract a given situation and represent it symbolically and manipulate the representing symbols as if they have a life of their own, without necessarily attending to their referents—and the ability to contextualize, to pause as needed during the manipulation process in order to probe into the referents for the symbols involved. Quantitative reasoning entails habits of creating a coherent representation of the problem at hand; considering the units involved; attending to the meaning of quantities, not just how to compute them; and knowing and flexibly using different properties of operations and objects.

Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays.

Choose a level of accuracy appropriate to limitations on measurement when reporting quantities.

Mathematically proficient students start by explaining to themselves the meaning of a problem and looking for entry points to its solution. They analyze givens, constraints, relationships, and goals. They make conjectures about the form and meaning of the solution and plan a solution pathway rather than simply jumping into a solution attempt. They consider analogous problems, and try special cases and simpler forms of the original problem in order to gain insight into its solution. They monitor and evaluate their progress and change course if necessary. Older students might, depending on the context of the problem, transform algebraic expressions or change the viewing window on their graphing calculator to get the information they need. Mathematically proficient students can explain correspondences between equations, verbal descriptions, tables, and graphs or draw diagrams of important features and relationships, graph data, and search for regularity or trends. Younger students might rely on using concrete objects or pictures to help conceptualize and solve a problem. Mathematically proficient students check their answers to problems using a different method, and they continually ask themselves, “Does this make sense?” They can understand the approaches of others to solving complex problems and identify correspondences between different approaches.
English language learners communicate information, ideas and concepts for social and instructional purposes within the school setting. Students at all grades can listen or read the arguments of others, decide whether they make sense, and ask useful questions to clarify or improve the arguments.

**Standard Relation to Course: Supporting**

**Use appropriate tools strategically.**

Mathematically proficient students consider the available tools when solving a mathematical problem. These tools might include pencil and paper, concrete models, a ruler, a protractor, a calculator, a spreadsheet, a computer algebra system, a statistical package, or dynamic geometry software. Proficient students are sufficiently familiar with tools appropriate for their grade or course to make sound decisions about when each of these tools might be helpful, recognizing both the insight to be gained and their limitations. For example, mathematically proficient high school students analyze graphs of functions and solutions generated using a graphing calculator. They detect possible errors by strategcally using estimation and other mathematical knowledge. When making mathematical models, they know that technology can enable them to visualize the results of varying assumptions, explore consequences, and compare predictions with data. Mathematically proficient students at various grade levels are able to identify relevant external mathematical resources, such as digital content located on a website, and use them to pose or solve problems. They are able to use technological tools to explore and deepen their understanding of concepts.

**Standard Relation to Course: Supporting**

**Look for and make use of structure.**

Mathematically proficient students look closely to discern a pattern or structure. Young students, for example, might notice that three and seven more is the same amount as seven and three more, or they may sort a collection of shapes according to how many sides the shapes have. Later, students will see 7 × 8 equals the well remembered 7 × 5 + 7.

**Standard Relation to Course: Supporting**

**Attend to precision.**

Mathematically proficient students try to communicate precisely to others. They try to use clear definitions in discussion with others and in their own reasoning. They state the meaning of the symbols they choose, including using the equal sign consistently and appropriately. They are careful about specifying units of measure, and labeling axes to clarify the correspondence with quantities in a problem. They calculate accurately and efficiently, express numerical answers with a degree of precision appropriate for the problem context. In the elementary grades, students give carefully formulated explanations to each other. By the time they reach high school they have learned to examine claims and make explicit use of definitions.

**Standard Relation to Course: Supporting**

**Look for and express regularity in repeated reasoning.**

Mathematically proficient students notice if calculations are repeated, and look both for general methods and for shortcuts. Upper elementary students might notice when dividing 25 by 11 that they are repeating the same calculations over and over again, and conclude they have a repeating decimal. By paying attention to the calculation of slope as they repeatedly check whether points are on the line through (1, 2) with slope 3, middle school students might abstract the equation (y - 2)/(x - 1) = 3. Noticing the regularity in the way terms cancel when expanding (x - 1)(x + 1), (x - 1)(x² + x + 1), and (x - 1)(x³ + x² + x + 1) might lead them to the general formula for the sum of a geometric series. As they work to solve a problem, mathematically proficient students maintain oversight of the process, while attending to the details. They continually evaluate the reasonableness of their intermediate results.

**Standard Relation to Course: Supporting**

**General Course Information and Notes**

**GENERAL NOTES**

Laboratory investigations that include the use of scientific inquiry, research, measurement, problem solving, laboratory apparatus and technologies, experimental procedures, and safety procedures are an integral part of this course. The National Science Teachers Association (NSTA) recommends that at the high school level, all students should be in the science lab or field, collecting data every week. School laboratory investigations (labs) are defined by the National Research Council (NRC) as an experience in the laboratory, classroom, or the field that provides students with opportunities to interact directly with natural phenomena or with data collected by others using tools, materials, data collection techniques, and models (NRC, 2006, p. 3). Laboratory investigations in the high school classroom should help all students develop a
Special Notes:

Instructional Practices

Teaching from a range of complex text is optimized when teachers in all subject areas implement the following strategies on a routine basis:

1. Ensuring wide reading from complex text that varies in length.
2. Making close reading and rereading of texts central to lessons.
3. Emphasizing text-specific complex questions, and cognitively complex tasks, reinforce focus on the text and cultivate independence.
4. Emphasizing students supporting answers based upon evidence from the text.
5. Providing extensive research and writing opportunities (claims and evidence).


- Asking questions (for science) and defining problems (for engineering).
- Developing and using models.
- Planning and carrying out investigations.
- Analyzing and interpreting data.
- Using mathematics, information and computer technology, and computational thinking.
- Constructing explanations (for science) and designing solutions (for engineering).
- Engaging in argument from evidence.
- Obtaining, evaluating, and communicating information.

Literacy Standards in Science

Secondary science courses include reading standards for literacy in science and technical subjects 6-12 and writing standards for literacy in history/social studies, science, and technical subjects 6-12. The courses also include speaking and listening standards. For a complete list of standards required for this course click on the blue tile labeled course standards. You may also download the complete course including all required standards and notes sections using the export function located at the top of this page.

English Language Development ELD Standards Special Notes Section:

Teachers are required to provide listening, speaking, reading and writing instruction that allows English language learners (ELL) to communicate information, ideas and concepts for academic success in the content area of Science. For the given level of English language proficiency and with visual, graphic, or interactive support, students will interact with grade level words, expressions, sentences and discourse to process or produce language necessary for academic success The ELD standard should specify a relevant content area concept or topic of study chosen by curriculum developers and teachers which maximizes an ELL's need for communication and social skills.

To access an ELL supporting document which delineates performance definitions and descriptors, please click on the following link:

https://cpalmsmediaprod.blob.core.windows.net/uploads/docs/standards/eld/sc.pdf

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**GENERAL INFORMATION**

<table>
<thead>
<tr>
<th>Course Number: 2000410</th>
</tr>
</thead>
<tbody>
<tr>
<td>Course Path: Section: Grades PreK to 12 Education Courses &gt; Grade Group: Grades 9 to 12 and Adult Education Courses &gt; Subject: Science &gt; SubSubject: Biological Sciences &gt; Abbreviated Title: ZOOLOGY</td>
</tr>
<tr>
<td>Number of Credits: One (1) credit</td>
</tr>
<tr>
<td>Course Type: Elective Course</td>
</tr>
<tr>
<td>Course Status: Course Approved</td>
</tr>
<tr>
<td>Grade Level(s): 9,10,11,12</td>
</tr>
<tr>
<td>Course Length: Year (Y)</td>
</tr>
<tr>
<td>Course Level: 2</td>
</tr>
</tbody>
</table>

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Educator Certifications

| Science (Secondary Grades 7-12) |
| Biology (Grades 6-12) |
| Middle Grades General Science (Middle Grades 5-9) |
### Course Standards

<table>
<thead>
<tr>
<th>Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>SC.912.L.14.5</td>
<td>Explain the evidence supporting the scientific theory of the origin of eukaryotic cells (endosymbiosis).</td>
</tr>
<tr>
<td>SC.912.L.14.14</td>
<td>Describe the function of the vertebrate integumentary system.</td>
</tr>
<tr>
<td>SC.912.L.14.26</td>
<td>Describe the structure of vertebrate sensory organs. Relate structure to function in vertebrate sensory systems.</td>
</tr>
<tr>
<td>SC.912.L.14.36</td>
<td>Describe how the scientific theory of evolution is supported by the fossil record, comparative anatomy, comparative embryology, biogeography, molecular biology, and observed evolutionary change.</td>
</tr>
<tr>
<td>SC.912.L.14.44</td>
<td>Discuss distinguishing characteristics of vertebrate and representative invertebrate phyla, and chordate classes using typical examples.</td>
</tr>
<tr>
<td>SC.912.L.14.51</td>
<td>Explain the reasons for changes in how organisms are classified.</td>
</tr>
<tr>
<td>SC.912.L.15.2</td>
<td>Explain how and why organisms are hierarchically classified and based on evolutionary relationships.</td>
</tr>
<tr>
<td>SC.912.L.15.6</td>
<td>Discuss distinguishing characteristics of the domains and kingdoms of living organisms.</td>
</tr>
<tr>
<td>SC.912.L.15.7</td>
<td>Discuss distinguishing characteristics of vertebrate and representative invertebrate phyla, and chordate classes using typical examples.</td>
</tr>
<tr>
<td>SC.912.L.15.11</td>
<td>Discuss specific fossil hominids and what they show about human evolution.</td>
</tr>
<tr>
<td>SC.912.L.15.13</td>
<td>Discuss the conditions required for natural selection, including: overproduction of offspring, inherited variation, and the struggle to survive, which result in differential reproductive success.</td>
</tr>
<tr>
<td>SC.912.L.15.14</td>
<td>Discuss mechanisms of evolutionary change other than natural selection such as genetic drift and gene flow.</td>
</tr>
<tr>
<td>SC.912.L.15.15</td>
<td>Describe how mutation and genetic recombination increase genetic variation.</td>
</tr>
<tr>
<td>SC.912.L.17.7</td>
<td>Characterize the biotic and abiotic components that define freshwater systems, marine systems and terrestrial systems.</td>
</tr>
<tr>
<td>SC.912.L.17.8</td>
<td>Recognize the consequences of the losses of biodiversity due to catastrophic events, climate changes, human activity, and the introduction of invasive, non-native species.</td>
</tr>
<tr>
<td>SC.912.L.17.9</td>
<td>Use a food web to identify and distinguish producers, consumers, and decomposers. Explain the pathway of energy transfer through trophic levels and the reduction of available energy at successive trophic levels.</td>
</tr>
<tr>
<td>SC.912.L.18.1</td>
<td>Describe the basic molecular structures and primary functions of the four major categories of biological macromolecules.</td>
</tr>
<tr>
<td>SC.912.L.18.9</td>
<td>Explain the interrelated nature of photosynthesis and cellular respiration.</td>
</tr>
</tbody>
</table>

Define a problem based on a specific body of knowledge, for example: biology, chemistry, physics, and earth/space science, and do the following:

1. **Pose questions about the natural world.** (Articulate the purpose of the investigation and identify the relevant scientific concepts).
2. **Conduct systematic observations.** (Write procedures that are clear and replicable. Identify observables and examine relationships between test (independent) variable and outcome (dependent) variable. Employ appropriate methods for accurate and consistent observations; conduct and record measurements at appropriate levels of precision. Follow safety guidelines).
3. **Examine books and other sources of information to see what is already known.**
4. **Review what is known in light of empirical evidence.** (Examine whether available empirical evidence can be interpreted in terms of existing knowledge and models, and if not, modify or develop new models).
5. **Plan investigations.** (Design and evaluate a scientific investigation).
6. **Use tools to gather, analyze, and interpret data.** (This includes the use of measurement in metric and other systems, and also the generation and interpretation of graphical representations of data, including data tables and graphs). (Collect data or evidence in an organized way. Properly use instruments, equipment, and materials (e.g., scales, probeware, meter sticks, microscopes, computers) including set-up, calibration, technique, maintenance, and storage).
7. **Pose answers, explanations, or descriptions of events.**
8. **Generate explanations that explicate or describe natural phenomena (inferences).**
9. **Use appropriate evidence and reasoning to justify these explanations to others.**
10. **Communicate results of scientific investigations, and**
11. **Evaluate the merits of the explanations produced by others.**

### Clarifications:

Teachers who encourage students to participate actively in effortful learning both individually and with others:

- **Mathematicians who participate in effortful learning both individually and with others:**
  - Analyze the problem in a way that makes sense given the task.
  - Ask questions that will help with solving the task.
  - Build perseverance by modifying methods as needed while solving a challenging task.
  - Stay engaged and maintain a positive mindset when working to solve tasks.
  - Help and support each other when attempting a new method or approach.

Teachers who encourage students to participate actively in effortful learning both individually and with others:

- **Cultivate a community of growth mindset learners.**
- **Foster perseverance in students by choosing tasks that are challenging.**
- **Develop students’ ability to analyze and problem solve.**
### Recognize students' effort when solving challenging problems.

#### MA.K12.MTR.2.1:
Demstrate understanding by representing problems in multiple ways. Mathematicians who demonstrate understanding by representing problems in multiple ways:
- Build understanding through modeling and using manipulatives.
- Represent solutions to problems in multiple ways using objects, drawings, tables, graphs and equations.
- Progress from modeling problems with objects and drawings to using algorithms and equations.
- Express connections between concepts and representations.
- Choose a representation based on the given context or purpose.

**Clarifications:**
Teachers who encourage students to demonstrate understanding by representing problems in multiple ways:
- Help students make connections between concepts and representations.
- Provide opportunities for students to use manipulatives when investigating concepts.
- Guide students from concrete to pictorial to abstract representations as understanding progresses.
- Show students that various representations can have different purposes and can be useful in different situations.

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### Complete tasks with mathematical fluency.

#### MA.K12.MTR.3.1:
Complete tasks with mathematical fluency. Mathematicians who complete tasks with mathematical fluency:
- Select efficient and appropriate methods for solving problems within the given context.
- Maintain flexibility and accuracy while performing procedures and mental calculations.
- Complete tasks accurately and with confidence.
- Adapt procedures to apply them to a new context.
- Use feedback to improve efficiency when performing calculations.

**Clarifications:**
Teachers who encourage students to complete tasks with mathematical fluency:
- Provide students with the flexibility to solve problems by selecting a procedure that allows them to solve efficiently and accurately.
- Offer multiple opportunities for students to practice efficient and generalizable methods.
- Provide opportunities for students to reflect on the method they used and determine if a more efficient method could have been used.

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### Engage in discussions that reflect on the mathematical thinking of self and others.

#### MA.K12.MTR.4.1:
Engage in discussions that reflect on the mathematical thinking of self and others. Mathematicians who engage in discussions that reflect on the mathematical thinking of self and others:
- Communicate mathematical ideas, vocabulary and methods effectively.
- Analyze the mathematical thinking of others.
- Compare the efficiency of a method to those expressed by others.
- Recognize errors and suggest how to correctly solve the task.
- Justify results by explaining methods and processes.
- Construct possible arguments based on evidence.

**Clarifications:**
Teachers who encourage students to engage in discussions that reflect on the mathematical thinking of self and others:
- Establish a culture in which students ask questions of the teacher and their peers, and error is an opportunity for learning.
- Create opportunities for students to discuss their thinking with peers.
- Select, sequence and present student work to advance and deepen understanding of correct and increasingly efficient methods.
- Develop students' ability to justify methods and compare their responses to the responses of their peers.

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### Use patterns and structure to help understand and connect mathematical concepts.

#### MA.K12.MTR.5.1:
Use patterns and structure to help understand and connect mathematical concepts. Mathematicians who use patterns and structure to help understand and connect mathematical concepts:
- Focus on relevant details within a problem.
- Create plans and procedures to logically order events, steps or ideas to solve problems.
- Decompose a complex problem into manageable parts.
- Relate previously learned concepts to new concepts.
- Look for similarities among problems.
- Connect solutions of problems to more complicated large-scale situations.

**Clarifications:**
Teachers who encourage students to use patterns and structure to help understand and connect mathematical concepts:
- Help students recognize the patterns in the world around them and connect these patterns to mathematical concepts.
- Support students to develop generalizations based on the similarities found among problems.
- Provide opportunities for students to create plans and procedures to solve problems.
- Develop students' ability to construct relationships between their current understanding and more sophisticated ways of thinking.

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### Assess the reasonableness of solutions.

#### MA.K12.MTR.6.1:
Assess the reasonableness of solutions. Mathematicians who assess the reasonableness of solutions:
- Estimate to discover possible solutions.
- Use benchmark quantities to determine if a solution makes sense.
- Check calculations when solving problems.
- Verify possible solutions by explaining the methods used.
- Evaluate results based on the given context.

**Clarifications:**
Teachers who encourage students to assess the reasonableness of solutions:
- Have students estimate or predict solutions prior to solving.
- Prompt students to continually ask, "Does this solution make sense? How do you know?"
Apply mathematics to real-world contexts.
Mathematicians who apply mathematics to real-world contexts:
- Reinforce that students check their work as they progress within and after a task.
- Strengthen students’ ability to verify solutions through justifications.

MA.K12.MTR.7.1:

Clarifications:
Teachers who encourage students to apply mathematics to real-world contexts:
- Provide opportunities for students to create models, both concrete and abstract, and perform investigations.
- Challenge students to question the accuracy of their models and methods.
- Support students as they validate conclusions by comparing them to the given situation.
- Indicate how various concepts can be applied to other disciplines.

Cite evidence to explain and justify reasoning.

ELA.K12.EE.2.1:

Clarifications:
Read and comprehend grade-level complex texts proficiently.
- See Text Complexity for grade-level complexity bands and a text complexity rubric.

ELA.K12.EE.2.1:

Clarifications:
Make inferences to support comprehension.

ELA.K12.EE.2.1:

Clarifications:
Use appropriate collaborative techniques and active listening skills when engaging in discussions in a variety of situations.

ELA.K12.EE.2.1:

Clarifications:
Use the accepted rules governing a specific format to create quality work.

ELA.K12.EE.2.1:

Clarifications:
Use appropriate voice and tone when speaking or writing.

ELA.K12.EE.2.1:

Clarifications:
In kindergartens, students learn the difference between formal and informal language. For example, the way we talk to our friends differs from the way we speak to adults. In 2nd grade and beyond, students practice appropriate social and academic language to discuss texts.

ELD.K12.ELL.SC.1:

Clarifications:
English language learners communicate information, ideas, and concepts necessary for academic success in the content area of Science.

ELD.K12.ELL.SI.1:

Clarifications:
English language learners communicate for social and instructional purposes within the school setting.

General Course Information and Notes

GENERAL NOTES

Laboratory investigations that include the use of scientific inquiry, research, measurement, problem solving, laboratory apparatus and technologies, experimental procedures, and safety procedures are an integral part of this course. The National Science Teachers Association (NSTA) recommends that at the high school level, all students should be in the science lab or field, collecting data every week. School laboratory investigations (labs) are defined by the National Research Council (NRC) as an experience in the laboratory, classroom, or the field that provides students with opportunities to interact directly with natural phenomena or with data collected by others using tools, materials, data collection techniques, and models (NRC, 2006, p. 3). Laboratory investigations in the high school classroom should help all students develop a growing understanding of the complexity and ambiguity of empirical work, as well as the skills to calibrate and troubleshoot equipment used to make observations. Learners should understand measurement error; and have the skills to aggregate, interpret, and present the resulting data (National Research Council, 2006, p.77; NSTA, 2007).
Special Notes:

Instructional Practices
Teaching from a range of complex text is optimized when teachers in all subject areas implement the following strategies on a routine basis:

1. Ensuring wide reading from complex text that varies in length.
2. Making close reading and rereading of texts central to lessons.
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- Asking questions (for science) and defining problems (for engineering).
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- Analyzing and interpreting data.
- Using mathematics, information and computer technology, and computational thinking.
- Constructing explanations (for science) and designing solutions (for engineering).
- Engaging in argument from evidence.
- Obtaining, evaluating, and communicating information.

Florida's Benchmarks for Excellent Student Thinking (B.E.S.T.) Standards
This course includes Florida's B.E.S.T. ELA Expectations (EE) and Mathematical Thinking and Reasoning Standards (MTRs) for students. Florida educators should intentionally embed these standards within the content and their instruction as applicable. For guidance on the implementation of the EEs and MTRs, please visit https://www.cpalms.org/Standards/BEST_Standards.aspx and select the appropriate B.E.S.T. Standards package.

English Language Development ELD Standards Special Notes Section:
Teachers are required to provide listening, speaking, reading and writing instruction that allows English language learners (ELL) to communicate information, ideas and concepts for academic success in the content area of Science. For the given level of English language proficiency and with visual, graphic, or interactive support, students will interact with grade level words, expressions, sentences and discourse to process or produce language necessary for academic success. The ELD standard should specify a relevant content area concept or topic of study chosen by curriculum developers and teachers which maximizes an ELL's need for communication and social skills. To access an ELL supporting document which delineates performance definitions and descriptors, please click on the following link: https://cpalmsmediaprod.blob.core.windows.net/uploads/docs/standards/eld/sc.pdf

GENERAL INFORMATION

Course Number: 2000410
Course Path: Section: Grades PreK to 12 Education
Courses > Grade Group: Grades 9 to 12 and Adult Education Courses > Subject: Science > SubSubject: Biological Sciences >
Abbreviated Title: ZOOLOGY
Course Length: Year (Y)
Course Level: 2
Grade Level(s): 9,10,11,12

Educator Certifications
Science (Secondary Grades 7-12)
Biology (Grades 6-12)
Middle Grades General Science (Middle Grades 5-9)
### Course Standards

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<th>Name</th>
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<tbody>
<tr>
<td>SC.912.L.14.2:</td>
<td>Relate structure to function for the components of plant and animal cells. Explain the role of cell membranes as a highly selective barrier (passive and active transport).</td>
</tr>
<tr>
<td>SC.912.L.14.3:</td>
<td>Compare and contrast the general structures of plant and animal cells. Compare and contrast the general structures of prokaryotic and eukaryotic cells.</td>
</tr>
<tr>
<td>SC.912.L.14.4:</td>
<td>Compare and contrast structure and function of various types of microscopes.</td>
</tr>
<tr>
<td>SC.912.L.14.6:</td>
<td>Explain the significance of genetic factors, environmental factors, and pathogenic agents to health from the perspectives of both individual and public health.</td>
</tr>
<tr>
<td>SC.912.L.14.7:</td>
<td>Relate the structure of each of the major plant organs and tissues to physiological processes.</td>
</tr>
<tr>
<td>SC.912.L.14.26:</td>
<td>Identify the major parts of the brain on diagrams or models.</td>
</tr>
<tr>
<td>SC.912.L.14.36:</td>
<td>Describe the factors affecting blood flow through the cardiovascular system.</td>
</tr>
<tr>
<td>SC.912.L.14.52:</td>
<td>Explain the basic functions of the human immune system, including specific and nonspecific immune response, vaccines, and antibiotics.</td>
</tr>
<tr>
<td>SC.912.L.15.1:</td>
<td>Explain how the scientific theory of evolution is supported by the fossil record, comparative anatomy, comparative embryology, biogeography, molecular biology, and observed evolutionary change.</td>
</tr>
<tr>
<td>SC.912.L.15.4:</td>
<td>Describe how and why organisms are hierarchically classified and based on evolutionary relationships.</td>
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<tr>
<td>SC.912.L.15.5:</td>
<td>Explain the reasons for changes in how organisms are classified.</td>
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<tr>
<td>SC.912.L.15.6:</td>
<td>Discuss distinguishing characteristics of the domains and kingdoms of living organisms.</td>
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<tr>
<td>SC.912.L.15.8:</td>
<td>Describe the scientific explanations of the origin of life on Earth.</td>
</tr>
<tr>
<td>SC.912.L.15.10:</td>
<td>Identify basic trends in hominid evolution from early ancestors six million years ago to modern humans, including brain size, jaw size, language, and manufacture of tools.</td>
</tr>
<tr>
<td>SC.912.L.15.13:</td>
<td>Describe the conditions required for natural selection, including: overproduction of offspring, inherited variation, and the struggle to survive, which result in differential reproductive success.</td>
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<tr>
<td>SC.912.L.15.14:</td>
<td>Discuss mechanisms of evolutionary change other than natural selection.</td>
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<td>SC.912.L.15.15:</td>
<td>Describe how mutation and genetic recombination increase genetic variation.</td>
</tr>
<tr>
<td>SC.912.L.16.2:</td>
<td>Discuss observed inheritance patterns caused by various modes of inheritance, including dominant, recessive, codominant, sex-linked, polygenic, and multiple alleles.</td>
</tr>
<tr>
<td>SC.912.L.16.3:</td>
<td>Describe the basic process of DNA replication and how it relates to the transmission and conservation of the genetic information.</td>
</tr>
<tr>
<td>SC.912.L.16.4:</td>
<td>Explain how mutations in the DNA sequence may or may not result in phenotypic change. Explain how mutations in gametes may result in phenotypic changes in offspring.</td>
</tr>
<tr>
<td>SC.912.L.16.5:</td>
<td>Explain the basic processes of transcription and translation, and how they result in the expression of genes.</td>
</tr>
<tr>
<td>SC.912.L.16.6:</td>
<td>Discuss the mechanisms for regulation of gene expression in prokaryotes and eukaryotes at transcription and translation level.</td>
</tr>
<tr>
<td>SC.912.L.16.7:</td>
<td>Describe how viruses and bacteria transfer genetic material between cells and the role of this process in biotechnology.</td>
</tr>
<tr>
<td>SC.912.L.16.8:</td>
<td>Explain the relationship between mutation, cell cycle, and uncontrolled cell growth potentially resulting in cancer.</td>
</tr>
<tr>
<td>SC.912.L.16.9:</td>
<td>Explain how and why the genetic code is universal and is common to almost all organisms.</td>
</tr>
<tr>
<td>SC.912.L.16.10:</td>
<td>Evaluate the impact of biotechnology on the individual, society and the environment, including medical and ethical issues.</td>
</tr>
<tr>
<td>SC.912.L.16.11:</td>
<td>Discuss the technologies associated with forensic medicine and DNA identification, including restriction fragment length polymorphism (RFLP) analysis.</td>
</tr>
<tr>
<td>SC.912.L.16.12:</td>
<td>Describe how basic DNA technology (restriction digestion by endonucleases, gel electrophoresis, polymerase chain reaction, ligation, and transformation) is used to construct recombinant DNA molecules (DNA cloning).</td>
</tr>
<tr>
<td>SC.912.L.16.13:</td>
<td>Describe the basic anatomy and physiology of the human reproductive system. Describe the process of human development from fertilization to birth and major changes that occur in each trimester of pregnancy.</td>
</tr>
<tr>
<td>SC.912.L.16.14:</td>
<td>Describe the cell cycle, including the process of mitosis. Explain the role of mitosis in the formation of new cells and its importance in maintaining chromosome number during asexual reproduction.</td>
</tr>
<tr>
<td>SC.912.L.16.16:</td>
<td>Describe the process of meiosis, including independent assortment and crossing over. Explain how reduction division results in the formation of haploid gametes or spores.</td>
</tr>
<tr>
<td>SC.912.L.16.17:</td>
<td>Compare and contrast mitosis and meiosis and relate to the processes of sexual and asexual reproduction and their consequences for genetic variation.</td>
</tr>
<tr>
<td>SC.912.L.17.2:</td>
<td>Explain the general distribution of life in aquatic systems as a function of chemistry, geography, light, depth, salinity, and temperature.</td>
</tr>
<tr>
<td>SC.912.L.17.4:</td>
<td>Describe changes in ecosystems resulting from seasonal variations, climate change and succession.</td>
</tr>
<tr>
<td>SC.912.L.17.5:</td>
<td>Analyze how population size is determined by births, deaths, immigration, emigration, and limiting factors (biotic and abiotic) that determine carrying capacity.</td>
</tr>
<tr>
<td>SC.912.L.17.7:</td>
<td>Identify the components and function of specific immune responses in the human body, including recognition, production, identification, and elimination of pathogens.</td>
</tr>
<tr>
<td>SC.912.L.17.8:</td>
<td>Explain the concept of genetic drift in populations and its role in population dynamics.</td>
</tr>
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<td>SC.912.L.17.9:</td>
<td>Discuss the mechanisms of genetic variation, including point mutation, gene conversion, gene flow, genetic drift, and natural selection.</td>
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<td>SC.912.L.17.11:</td>
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Identify the reactants, products, and basic functions of aerobic and anaerobic cellular respiration.

Explain the interrelated nature of photosynthesis and cellular respiration.

Connect the role of adenosine triphosphate (ATP) to energy transfers within a cell.

Explain the role of enzymes as catalysts that lower the activation energy of biochemical reactions. Identify factors, such as pH and temperature, and their effect on enzyme activity.

Discuss the special properties of water that contribute to Earth’s suitability as an environment for life: cohesive behavior, ability to moderate temperature, expansion upon freezing, and versatility as a solvent.

Define a problem based on a specific body of knowledge, for example: biology, chemistry, physics, and earth/space science, and do the following:

1. Pose questions about the natural world. (Articulate the purpose of the investigation and identify the relevant scientific concepts).
2. Conduct systematic observations. (Write procedures that are clear and replicable. Identify observables and examine relationships between test (independent) variable and outcome (dependent) variable. Employ appropriate methods for accurate and consistent observations; conduct and record measurements at appropriate levels of precision. Follow safety guidelines).
3. Examine books and other sources of information to see what is already known.
4. Review what is known in light of empirical evidence. (Examine whether available empirical evidence can be interpreted in terms of existing knowledge and models, and if not, modify or develop new models).
5. Plan investigations. (Design and evaluate a scientific investigation).
6. Use tools to gather, analyze, and interpret data (this includes the use of measurement in metric and other systems, and also the generation and interpretation of graphical representations of data, including data tables and graphs). (Collect data or evidence in an organized way. Properly use instruments, equipment, and materials (e.g., scales, probeware, meter sticks, microscopes, computers) including set-up, calibration, technique, maintenance, and storage).
7. Pose answers, explanations, or descriptions of events.
8. Generate explanations that explicate or describe natural phenomena (inferences).
9. Use appropriate evidence and reasoning to justify these explanations to others.
10. Communicate results of scientific investigations, and
11. Evaluate the merits of the explanations produced by others.

Recognize that the strength or usefulness of a scientific claim is evaluated through scientific argumentation, which depends on critical and logical thinking, and the active consideration of alternative scientific explanations to explain the data presented.

Identify sources of information and assess their reliability according to the strict standards of scientific investigation.

Describe how scientific inferences are drawn from scientific observations and provide examples from the content being studied.

Identify what is science, what clearly is not science, and what superficially resembles science (but fails to meet the criteria for science).

Identify which questions can be answered through scientific observations and which are outside the boundaries of scientific investigation, such as questions addressed by other ways of knowing, such as art, philosophy, and religion.

Explain that a scientific theory is the culmination of many scientific investigations drawing together all the current evidence concerning a substantial range of phenomena; thus, a scientific theory represents the most powerful explanation scientists have to offer.

Recognize that theories do not become laws, nor do laws become theories; theories are well supported explanations and laws are well supported descriptions.

Explain how scientific knowledge and reasoning provide an empirically-based perspective to inform society’s decision making.

Weigh the merits of alternative strategies for solving a specific societal problem by comparing a number of different costs and benefits, such as human, economic, and environmental.

Explain how various factors, such as concentration, temperature, and presence of a catalyst affect the rate of a chemical reaction.

Cite specific textual evidence to support analysis of science and technical texts, attending to important distinctions the author makes and to any gaps or inconsistencies in the account.

Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks; analyze the specific results based on explanations in the text.

Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 11–12 texts and topics.

Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g., quantitative data, video, multimedia) in order to address a question or solve a problem.

Write informative/explanatory texts, including the narration of processes. Properly use instruments, equipment, and materials (e.g., scales, probeware, meter sticks, microscopes, computers) including set-up, calibration, technique, maintenance, and storage.

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Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g., quantitative data, video, multimedia) in order to address a question or solve a problem.
**Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes.**

a. Introduce a topic and organize ideas, concepts, and information to make important connections and distinctions; include formatting (e.g., headings), graphics (e.g., figures, tables), and multimedia when useful to aiding comprehension.

b. Develop the topic with well-chosen, relevant, and sufficient facts, extended definitions, concrete details, quotations, or other information and examples appropriate to the audience's knowledge of the topic.

c. Use varied transitions and sentence structures to link the major sections of the text, create cohesion, and clarify the relationships among ideas and concepts.

d. Use precise language and domain-specific vocabulary to manage the complexity of the topic and convey a style appropriate to the discipline and context as well as to the expertise of likely readers.

e. Establish and maintain a formal style and objective tone while attending to the norms and conventions of the discipline in which they are writing.

f. Provide a concluding statement or section that follows from and supports the information or explanation presented (e.g., articulating implications or the significance of the topic).

**MAFS.K12.F-IF.3.7:** Mathematically proficient students can apply the mathematics they know to solve problems arising in everyday life, society, and the workplace. In early grades, this might be as simple as writing an addition equation to describe a situation. In middle grades, a student might apply proportional reasoning to plan a school event or analyze a problem in the community. By high school, a student might use geometry to solve a design problem or use a function to describe how one quantity of interest depends on another. Mathematically proficient students who can apply what they know are comfortable making assumptions and approximations to simplify a complicated situation, realizing that these may need revision later. They are able to identify important quantities in a practical situation and map their relationships using such tools as diagrams, two-way tables, graphs, flowcharts and formulas. They can analyze those relationships mathematically to draw conclusions. They routinely interpret their mathematical results in the context of the situation and reflect on whether the results make sense, possibly improving the model if it has not served its purpose.

**MAFS.K12.MP.1.1:** Make sense of problems and persevere in solving them.

Mathematically proficient students start by explaining to themselves the meaning of a problem and looking for entry points to its solution. They analyze givens, constraints, relationships, and goals. They make conjectures about the form and meaning of the solution and plan a solution pathway rather than simply jumping into a solution attempt. They consider analogous problems, and try special cases and simpler forms of the original problem in order to gain insight into its solution. They monitor and evaluate their progress and change course if necessary. Older students might, depending on the context of the problem, transform algebraic expressions or change the viewing window on their graphing calculator to get insights into the function they are analyzing.

**MAFS.K12.MP.2.1:** Reason abstractly and quantitatively.

Mathematically proficient students make sense of quantities and their relationships in problem situations. They bring two complementary abilities to bear on problems involving quantitative relationships: the ability to decontextualize—to abstract a given situation and represent it symbolically and manipulate the representing symbols as if they have a life of their own, without necessarily attending to their referents—and the ability to contextualize, to pause as needed during the manipulation process in order to probe into the referents for the symbols involved. Quantitative reasoning entails habits of creating a coherent representation of the problem at hand; considering the units involved; attending to the meaning of quantities, not just how to compute them; and knowing and flexibly using different properties of operations and objects.

**MAFS.K12.MP.3.1:** Construct viable arguments and critique the reasoning of others.

Mathematically proficient students understand and use stated assumptions, definitions, and previously established results in constructing arguments. They make conjectures and build a logical progression of statements to explore the truth of their conjectures. They are able to analyze situations by breaking them into cases, and can recognize and use counterexamples. They justify their conclusions, communicate them to others, and respond to the arguments of others. They reason inductively about data, making plausible arguments that take into account the context from which the data arose. Mathematically proficient students are also able to compare the effectiveness of two plausible arguments, distinguish correct logic or reasoning from that which is flawed, and—if there is a flaw in an argument—explain what it is. Elementary students can construct arguments using concrete referents such as objects, drawings, diagrams, and actions. Such arguments can make sense and be correct, even though they are not generalized or made formal until later grades. Later, students learn to determine domains to which an argument applies. Students at all grades can listen or read arguments using concrete referents in everyday life, society, and the workplace, and be able to compare the arguments of others, decide whether they make sense, and ask useful questions to clarify or improve the arguments.

**MAFS.K12.MP.4.1:** Model with mathematics.

Mathematically proficient students can apply the mathematics they know to solve problems arising in everyday life, society, and the workplace. In early grades, this might be as simple as writing an addition equation to describe a situation. In middle grades, a student might apply proportional reasoning to plan a school event or analyze a problem in the community. By high school, a student might use geometry to solve a design problem or use a function to describe how one quantity of interest depends on another. Mathematically proficient students who can apply what they know are comfortable making assumptions and approximations to simplify a complicated situation, realizing that these may need revision later. They are able to identify important quantities in a practical situation and map their relationships using such tools as diagrams, two-way tables, graphs, flowcharts and formulas. They can analyze those relationships mathematically to draw conclusions. They routinely interpret their mathematical results in the context of the situation and reflect on whether the results make sense, possibly improving the model if it has not served its purpose.

**MAFS.K12.MP.4.1:** Use appropriate tools strategically.
Mathematically proficient students consider the available tools when solving a mathematical problem. These tools might include pencil and paper, concrete models, a ruler, a protractor, a calculator, a spreadsheet, a computer algebra system, a statistical package, or dynamic geometry software. Proficient students are sufficiently familiar with tools appropriate for their grade or course to make sound decisions about when each of these tools might be helpful, recognizing both the insight to be gained and their limitations. For example, mathematically proficient high school students analyze graphs of functions and solutions generated using a graphing calculator. They detect possible errors by strategically using estimation and other mathematical knowledge. When making mathematical models, they know that technology can enable them to visualize the results of varying assumptions, explore consequences, and compare predictions with data. Mathematically proficient students at various grade levels are able to identify relevant external mathematical resources, such as digital content located on a website, and use them to pose or solve problems. They are able to use technological tools to explore and deepen their understanding of concepts.

**Standard Relation to Course: Supporting**

**MAFS.K12.MP.5.1:** Attend to precision.

Mathematically proficient students try to communicate precisely to others. They try to use clear definitions in discussion with others and in their own reasoning. They state the meaning of the symbols they choose, including using the equal sign consistently and appropriately. They are careful about specifying units of measure, and labeling axes to clarify the correspondence with quantities in a problem. They calculate accurately and efficiently, express numerical answers with a degree of precision appropriate for the problem context. In the elementary grades, students give carefully formulated explanations to each other. By the time they reach high school they have learned to examine claims and make explicit use of definitions.

**Standard Relation to Course: Supporting**

**MAFS.K12.MP.6.1:** Look for and make use of structure.

Mathematically proficient students look closely to discern a pattern or structure. Young students, for example, might notice that three and seven more is the same amount as seven and three more, or they may sort a collection of shapes according to how many sides the shapes have. Later, students will see 7 × 8 equals the well remembered 7 × 5 + 7 × 3, in preparation for learning about the distributive property. In the expression x² + 9x + 14, older students can see the 14 as 2 × 7 and the 9 as 2 + 7. They recognize the significance of an existing line in a geometric figure and can use the strategy of drawing an auxiliary line for solving problems. They also can step back for an overview and shift perspective. They can see complicated things, such as some algebraic expressions, as single objects or as being composed of several objects. For example, they can see 5 – 3(x – y²) as 5 minus a positive number times a square and use that to realize that its value cannot be more than 5 for any real numbers x and y.

**Standard Relation to Course: Supporting**

**MAFS.K12.MP.7.1:** Look for and express regularity in repeated reasoning.

Mathematically proficient students notice if calculations are repeated, and look both for general methods and for shortcuts. Upper elementary students might notice when dividing 25 by 11 that they are repeating the same calculations over and over again, and conclude they have a repeating decimal. By paying attention to the calculation of slope as they repeatedly check whether points are on the line through (1, 2) with slope 3, middle school students might abstract the equation (y – 2)/(x – 1) = 3. Noticing the regularity in the way terms cancel when expanding (x – 1)(x + 1), (x – 1)(x² + x + 1), and (x – 1)(x⁶ + x⁵ + x⁴ + x³ + x² + x + 1) might lead them to the general formula for the sum of a geometric series. As they work to solve a problem, mathematically proficient students maintain oversight of the process, while attending to the details. They continually evaluate the reasonableness of their intermediate results.

**Standard Relation to Course: Supporting**

**HE.912.C.1.3:** Evaluate how environment and personal health are interrelated.

**Clarifications:**
- Food options within a community; prenatal-care services; availability of recreational facilities; air quality; weather-safety awareness; and weather, air, and water conditions.

**HE.912.C.1.6:** Evaluate the relationship between access to health care and health status.

**Clarifications:**
- Early detection and treatment of cancer, HIV, diabetes, bipolar disorder, schizophrenia, childhood disease or illness, and first-responder care.

**HE.912.C.1.8:** Assess the degree of susceptibility to injury, illness, or death if engaging in unhealthy/risky behaviors.

**Clarifications:**
- Risks associated with alcohol abuse, including poison, date rape, and death; cancer and chronic lung disease related to tobacco use; overdose from drug use; child abuse or neglect; and dating violence.

**ELD.K12.ELL.SI.1:** English language learners communicate information, ideas and concepts necessary for academic success in the content area of Science.

**ELD.K12.ELL.SC.1:** English language learners communicate for social and instructional purposes within the school setting.

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**General Course Information and Notes**

**GENERAL NOTES**

**Special Notes:**

**Instructional Practices**

Teaching from a range of complex text is optimized when teachers in all subject areas implement the following strategies on a routine basis:

1. Ensuring wide reading from complex text that varies in length.
2. Making close reading and rereading of texts central to lessons.
3. Emphasizing text-specific complex questions, and cognitively complex tasks, reinforce focus on the text and cultivate independence.
4. Making close reading and rereading of texts central to lessons.
5. Providing extensive research and writing opportunities (claims and evidence).

**Science and Engineering Practices** *(NRC Framework for K-12 Science Education, 2010)*

- Asking questions (for science) and defining problems (for engineering).
Educator Certifications
Science (Secondary Grades 7-12)
Biology (Grades 6-12)

Equivalent Courses
2000310-Biology 1

Educational Language Development ELD Standards Special Notes Section:
Teachers are required to provide listening, speaking, reading and writing instruction that allows English language learners (ELL) to communicate information, ideas and concepts for academic success in the content area of Science. For the given level of English language proficiency and with visual, graphic, or interactive support, students will interact with grade level words, expressions, sentences and discourse to process or produce language necessary for academic success. The ELD standard should specify a relevant content area concept or topic of study chosen by curriculum developers and teachers which maximizes an ELL's need for communication and social skills.

To access an ELL supporting document which delineates performance definitions and descriptors, please click on the following link:
https://cpalmsmediaprod.blob.core.windows.net/uploads/docs/standards/eld/sc.pdf
## Course Standards

<table>
<thead>
<tr>
<th>Name</th>
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<tbody>
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<td>SC.912.L.14.2:</td>
<td>Relate structure to function for the components of plant and animal cells. Explain the role of cell membranes as a highly selective barrier (passive and active transport).</td>
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<td>SC.912.L.14.3:</td>
<td>Compare and contrast the general structures of plant and animal cells. Compare and contrast the general structures of prokaryotic and eukaryotic cells.</td>
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<tr>
<td>SC.912.L.14.4:</td>
<td>Compare and contrast structure and function of various types of microscopes.</td>
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<td>SC.912.L.14.6:</td>
<td>Explain the significance of genetic factors, environmental factors, and pathogenic agents to health from the perspectives of both individual and public health.</td>
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<td>SC.912.L.14.7:</td>
<td>Relate the structure of each of the major plant organs and tissues to physiological processes.</td>
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<tr>
<td>SC.912.L.14.26:</td>
<td>Identify the major parts of the brain on diagrams or models.</td>
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<td>SC.912.L.14.36:</td>
<td>Describe the factors affecting blood flow through the cardiovascular system.</td>
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<td>SC.912.L.14.52:</td>
<td>Explain the basic functions of the human immune system, including specific and nonspecific immune response, vaccines, and antibiotics.</td>
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<td>SC.912.L.15.1:</td>
<td>Explain how the scientific theory of evolution is supported by the fossil record, comparative anatomy, comparative embryology, biogeography, molecular biology, and observed evolutionary change.</td>
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<td>SC.912.L.15.4:</td>
<td>Describe how and why organisms are hierarchically classified and based on evolutionary relationships.</td>
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<td>SC.912.L.15.5:</td>
<td>Explain the reasons for changes in how organisms are classified.</td>
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<td>SC.912.L.15.6:</td>
<td>Discuss distinguishing characteristics of the domains and kingdoms of living organisms.</td>
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<td>SC.912.L.15.8:</td>
<td>Describe the scientific explanations of the origin of life on Earth.</td>
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<td>SC.912.L.15.10:</td>
<td>Identify basic trends in hominid evolution from early ancestors six million years ago to modern humans, including brain size, jaw size, language, and manufacture of tools.</td>
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<td>SC.912.L.15.13:</td>
<td>Describe the conditions required for natural selection, including: overproduction of offspring, inherited variation, and the struggle to survive, which result in differential reproductive success.</td>
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<td>SC.912.L.15.14:</td>
<td>Discuss mechanisms of evolutionary change other than natural selection such as genetic drift and gene flow.</td>
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<td>SC.912.L.15.15:</td>
<td>Describe how mutation and genetic recombination increase genetic variation.</td>
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<td>SC.912.L.16.2:</td>
<td>Discuss observed inheritance patterns caused by various modes of inheritance, including dominant, recessive, codominant, sex-linked, polygenic, and multiple alleles.</td>
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<td>SC.912.L.16.3:</td>
<td>Describe the basic process of DNA replication and how it relates to the transmission and conservation of the genetic information.</td>
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<td>SC.912.L.16.4:</td>
<td>Explain how mutations in the DNA sequence may or may not result in phenotypic change. Explain how mutations in gametes may result in phenotypic changes in offspring.</td>
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<td>SC.912.L.16.5:</td>
<td>Explain the basic processes of transcription and translation, and how they result in the expression of genes.</td>
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<td>SC.912.L.16.6:</td>
<td>Discuss the mechanisms for regulation of gene expression in prokaryotes and eukaryotes at transcription and translation level.</td>
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<td>SC.912.L.16.7:</td>
<td>Describe how viruses and bacteria transfer genetic material between cells and the role of this process in biotechnology.</td>
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<td>SC.912.L.16.8:</td>
<td>Explain the relationship between mutation, cell cycle, and uncontrolled cell growth potentially resulting in cancer.</td>
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<td>SC.912.L.16.9:</td>
<td>Explain how and why the genetic code is universal and is common to almost all organisms.</td>
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<td>SC.912.L.16.10:</td>
<td>Evaluate the impact of biotechnology on the individual, society and the environment, including medical and ethical issues.</td>
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<td>SC.912.L.16.11:</td>
<td>Discuss the technologies associated with forensic medicine and DNA identification, including restriction fragment length polymorphism (RFLP) analysis.</td>
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<td>SC.912.L.16.12:</td>
<td>Describe how basic DNA technology (restriction digestion byendonucleases, gel electrophoresis, polymerase chain reaction, ligation, and transformation) is used to construct recombinant DNA molecules (DNA cloning).</td>
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<td>SC.912.L.16.13:</td>
<td>Describe the basic anatomy and physiology of the human reproductive system. Describe the process of human development from fertilization to birth and major changes that occur in each trimester of pregnancy.</td>
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<td>SC.912.L.16.14:</td>
<td>Describe the cell cycle, including the process of mitosis. Explain the role of mitosis in the formation of new cells and its importance in maintaining chromosome number during asexual reproduction.</td>
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<td>SC.912.L.16.16:</td>
<td>Describe the process of meiosis, including independent assortment and crossing over. Explain how reduction division results in the formation of haploid gametes or spores.</td>
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<td>Compare and contrast mitosis and meiosis and relate to the processes of sexual and asexual reproduction and their consequences for genetic variation.</td>
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<td>Explain the general distribution of life in aquatic systems as a function of chemistry, geography, light, depth, salinity, and temperature.</td>
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<td>Describe changes in ecosystems resulting from seasonal variations, climate change and succession.</td>
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<td>Analyze how population size is determined by births, deaths, immigration, emigration, and limiting factors (biotic and abiotic) that determine carrying capacity.</td>
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<td>SC.912.L.17.8:</td>
<td>Recognize the consequences of the losses of biodiversity due to catastrophic events, climate changes, human activity, and the introduction of invasive, non-native species.</td>
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<td>SC.912.L.17.9:</td>
<td>Use a food web to identify and distinguish producers, consumers, and decomposers. Explain the pathway of energy transfer through trophic levels and the reduction of available energy at successive trophic levels.</td>
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<td>SC.912.L.17.11:</td>
<td>Evaluate the costs and benefits of renewable and nonrenewable resources, such as water, energy, fossil fuels, wildlife, and forests.</td>
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SC.912.L.18.12: Discuss the special properties of water that contribute to Earth's suitability as an environment for life: cohesive behavior, ability to moderate temperature, expansion upon freezing, and versatility as a solvent.

SC.912.N.1.3: Recognize that the strength or usefulness of a scientific claim is evaluated through scientific argumentation, which depends on critical and logical thinking, and the active consideration of alternative scientific explanations to explain the data presented.

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SC.912.P.12.12: Explain how various factors, such as concentration, temperature, and presence of a catalyst affect the rate of a chemical reaction.

Mathematicians who participate in effortful learning both individually and with others:
- Analyze the problem in a way that makes sense given the task.
- Ask questions that will help with solving the task.
- Build perseverance by modifying methods as needed while solving a challenging task.
- Stay engaged and maintain a positive mindset when working to solve tasks.
- Help and support each other when attempting a new method or approach.

Mathematicians who demonstrate understanding by representing problems in multiple ways:
- Build understanding through modeling and using manipulatives.
- Represent solutions to problems in multiple ways using objects, drawings, tables, graphs and equations.
- Progress from modeling problems with objects and drawings to using algorithms and equations.
- Express connections between concepts and representations.
- Choose a representation based on the given context or purpose.

Teachers who encourage students to demonstrate understanding by representing problems in multiple ways:
- Help students make connections between concepts and representations.
- Provide opportunities for students to use manipulatives when investigating concepts.
- Guide students from concrete to pictorial to abstract representations as understanding progresses.
- Show students that various representations can have different purposes and can be useful in different situations.

Clarifications:

Mathematicians who complete tasks with mathematical fluency:
- Select efficient and appropriate methods for solving problems within the given context.
| MA.K12.MTR.3.1: Maintain flexibility and accuracy while performing procedures and mental calculations. | **Clarifications:** Teachers who encourage students to complete tasks with mathematical fluency:
- Provide students with the flexibility to solve problems by selecting a procedure that allows them to solve efficiently and accurately.
- Offer multiple opportunities for students to practice efficient and generalizable methods.
- Provide opportunities for students to reflect on the method they used and determine if a more efficient method could have been used.
| **Clarifications:** Engage in discussions that reflect on the mathematical thinking of self and others. Mathematicians who engage in discussions that reflect on the mathematical thinking of self and others:
- Communicate mathematical ideas, vocabulary and methods effectively.
- Analyze the mathematical thinking of others.
- Compare the efficiency of a method to those expressed by others.
- Recognize errors and suggest how to correctly solve the task.
- Justify results by explaining methods and processes.
- Construct possible arguments based on evidence.
| MA.K12.MTR.5.1: Use patterns and structure to help understand and connect mathematical concepts. Mathematicians who use patterns and structure to help understand and connect mathematical concepts:
- Focus on relevant details within a problem.
- Create plans and procedures to logically order events, steps or ideas to solve problems.
- Decompose a complex problem into manageable parts.
- Relate previously learned concepts to new concepts.
- Look for similarities among problems.
- Connect solutions of problems to more complicated large-scale situations.
| **Clarifications:** Teachers who encourage students to use patterns and structure to help understand and connect mathematical concepts:
- Help students recognize the patterns in the world around them and connect these patterns to mathematical concepts.
- Support students to develop generalizations based on the similarities found among problems.
- Provide opportunities for students to create plans and procedures to solve problems.
- Develop students' ability to construct relationships between their current understanding and more sophisticated ways of thinking.
| MA.K12.MTR.6.1: Assess the reasonableness of solutions. Mathematicians who assess the reasonableness of solutions:
- Estimate to discover possible solutions.
- Use benchmark quantities to determine if a solution makes sense.
- Check calculations when solving problems.
- Verify possible solutions by explaining the methods used.
- Evaluate results based on the given context.
| **Clarifications:** Teachers who encourage students to assess the reasonableness of solutions:
- Have students estimate or predict solutions prior to solving.
- Prompt students to continually ask, “Does this solution make sense? How do you know?”
- Reinforce that students check their work as they progress within and after a task.
- Strengthen students' ability to verify solutions through justifications.
| MA.K12.MTR.7.1: Apply mathematics to real-world contexts. Mathematicians who apply mathematics to real-world contexts:
- Connect mathematical concepts to everyday experiences.
- Use models and methods to understand, represent and solve problems.
- Perform investigations to gather data or determine if a method is appropriate.
- Redesign models and methods to improve accuracy or efficiency.
| **Clarifications:** Teachers who encourage students to apply mathematics to real-world contexts:
- Provide opportunities for students to create models, both concrete and abstract, and perform investigations.
- Challenge students to question the accuracy of their models and methods.
- Support students as they validate conclusions by comparing them to the given situation.
- Indicate how various concepts can be applied to other disciplines.
| Cite evidence to explain and justify reasoning. | **Clarifications:** K-1 Students include textual evidence in their oral communication with guidance and support from adults. The evidence can consist of details from the text without naming the text. During 1st grade, students learn how to incorporate the evidence in their writing. |
2-3 Students include relevant textual evidence in their written and oral communication. Students should name the text when they refer to it. In 3rd grade, students should use a combination of direct and indirect citations.

4-5 Students continue with previous skills and reference comments made by speakers and peers. Students cite texts that they’ve directly quoted, paraphrased, or used for information. When writing, students will use the form of citation dictated by the instructor or the style guide referenced by the instructor.

6-8 Students continue with previous skills and use a style guide to create a proper citation.

9-12 Students continue with previous skills and should be aware of existing style guides and the ways in which they differ.

Read and comprehend grade-level complex texts proficiently.

Clarifications:
See Text Complexity for grade-level complexity bands and a text complexity rubric.

Make inferences to support comprehension.

Clarifications:
Students will make inferences before the words infer or inference are introduced. Kindergarten students will answer questions like “Why is the girl smiling?” or make predictions about what will happen based on the title page. Students will use the terms and apply them in 2nd grade and beyond.

Use appropriate collaborative techniques and active listening skills when engaging in discussions in a variety of situations.

Clarifications:
In kindergarten, students learn to listen to one another respectfully. In grades 1-2, students build upon these skills by justifying what they are thinking. For example: “I think _____ because _____” The collaborative conversations are becoming academic conversations.

In grades 3-12, students engage in academic conversations discussing claims and justifying their reasoning, refining and applying skills. Students build on ideas, propel the conversation, and support claims and counterclaims with evidence.

Use the accepted rules governing a specific format to create quality work.

Clarifications:
Students will incorporate skills learned into work products to produce quality work. For students to incorporate these skills appropriately, they must receive instruction. A 3rd grade student creating a poster board display must have instruction in how to effectively present information to do quality work.

Use appropriate voice and tone when speaking or writing.

Clarifications:
In kindergarten and 1st grade, students learn the difference between formal and informal language. For example, the way we talk to our friends differs from the way we speak to adults. In 2nd grade and beyond, students practice appropriate social and academic language to discuss texts.

Evaluate how environment and personal health are interrelated.

Clarifications:
Food options within a community; prenatal-care services; availability of recreational facilities; air quality; weather-safety awareness; and weather, air, and water conditions.

Evaluate the relationship between access to health care and health status.

Clarifications:
Early detection and treatment of cancer, HIV, diabetes, bipolar disorder, schizophrenia, childhood disease or illness, and first-responder care.

Assess the degree of susceptibility to injury, illness, or death if engaging in unhealthy/risky behaviors.

Clarifications:
Risks associated with alcohol abuse, including poison, date rape, and death; cancer and chronic lung disease related to tobacco use; overdose from drug use; child abuse or neglect; and dating violence.

English language learners communicate information, ideas and concepts necessary for academic success in the content area of Science.

English language learners communicate for social and instructional purposes within the school setting.

General Course Information and Notes

GENERAL NOTES

Special Notes:

Instructional Practices
Teaching from a range of complex text is optimized when teachers in all subject areas implement the following strategies on a routine basis:

1. Ensuring wide reading from complex text that varies in length.
2. Making close reading and rereading of texts central to lessons.
3. Emphasizing text-specific complex questions, and cognitively complex tasks, reinforce focus on the text and cultivate independence.
4. Emphasizing students supporting answers based upon evidence from the text.
5. Providing extensive research and writing opportunities (claims and evidence).

- Asking questions (for science) and defining problems (for engineering).
- Developing and using models.
Planning and carrying out investigations.
Analyzing and interpreting data.
Using mathematics, information and computer technology, and computational thinking.
Constructing explanations (for science) and designing solutions (for engineering).
Engaging in argument from evidence.
Obtaining, evaluating, and communicating information.

Florida's Benchmarks for Excellent Student Thinking (B.E.S.T.) Standards
This course includes Florida's B.E.S.T. ELA Expectations (EE) and Mathematical Thinking and Reasoning Standards (MTRs) for students. Florida educators should intentionally embed these standards within the content and their instruction as applicable. For guidance on the implementation of the EEs and MTRs, please visit https://www.cpalms.org/Standards/BEST_Standards.aspx and select the appropriate B.E.S.T. Standards package.

English Language Development ELD Standards Special Notes Section:
Teachers are required to provide listening, speaking, reading and writing instruction that allows English language learners (ELL) to communicate information, ideas and concepts for academic success in the content area of Science. For the given level of English language proficiency and with visual, graphic, or interactive support, students will interact with grade level words, expressions, sentences and discourse to process or produce language necessary for academic success. The ELD standard should specify a relevant content area concept or topic of study chosen by curriculum developers and teachers which maximizes an ELL's need for communication and social skills. To access an ELL supporting document which delineates performance definitions and descriptors, please click on the following link: https://cpalmsmediaprod.blob.core.windows.net/uploads/docs/standards/eld/sc.pdf

GENERAL INFORMATION

Course Number: 2000430
Course Path: Section: Grades PreK to 12 Education
Courses > Grade Group: Grades 9 to 12 and Adult Education Courses > Subject: Science > SubSubject: Biological Sciences
Abbreviated Title: BIO TECH
Course Length: Year (Y)
Course Attributes:
- Class Size Core Required
Course Level: 2

Grade Level(s): 9,10,11,12
Graduation Requirement: Biology

Educator Certifications

<table>
<thead>
<tr>
<th>Science (Secondary Grades 7-12)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Biology (Grades 6-12)</td>
</tr>
</tbody>
</table>

Equivalent Courses

| 2000310-Biology 1             |
## Course Standards

<table>
<thead>
<tr>
<th>Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>SC.912.L.15.8:</td>
<td>Describe the scientific explanations of the origin of life on Earth.</td>
</tr>
<tr>
<td>SC.912.L.15.9:</td>
<td>Explain the role of reproductive isolation in the process of speciation.</td>
</tr>
<tr>
<td>SC.912.L.15.12:</td>
<td>List the conditions for Hardy-Weinberg equilibrium in a population and why these conditions are not likely to appear in nature. Use the Hardy-Weinberg equation to predict genotypes in a population from observed phenotypes.</td>
</tr>
<tr>
<td>SC.912.L.15.13:</td>
<td>Describe the conditions required for natural selection, including: overproduction of offspring, inherited variation, and the struggle to survive, which result in differential reproductive success.</td>
</tr>
<tr>
<td>SC.912.L.15.14:</td>
<td>Discuss mechanisms of evolutionary change other than natural selection such as genetic drift and gene flow.</td>
</tr>
<tr>
<td>SC.912.L.15.15:</td>
<td>Describe how mutation and genetic recombination increase genetic variation.</td>
</tr>
<tr>
<td>SC.912.L.16.2:</td>
<td>Discuss observed inheritance patterns caused by various modes of inheritance, including dominant, recessive, codominant, sex-linked, polygenic, and multiple alleles.</td>
</tr>
<tr>
<td>SC.912.L.16.3:</td>
<td>Describe the basic process of DNA replication and how it relates to the transmission and conservation of the genetic information.</td>
</tr>
<tr>
<td>SC.912.L.16.4:</td>
<td>Explain how mutations in the DNA sequence may or may not result in phenotypic change. Explain how mutations in gametes may result in phenotypic changes in offspring.</td>
</tr>
<tr>
<td>SC.912.L.16.5:</td>
<td>Explain the basic processes of transcription and translation, and how they result in the expression of genes.</td>
</tr>
<tr>
<td>SC.912.L.16.6:</td>
<td>Discuss the mechanisms for regulation of gene expression in prokaryotes and eukaryotes at transcription and translation level.</td>
</tr>
<tr>
<td>SC.912.L.16.7:</td>
<td>Describe how viruses and bacteria transfer genetic material between cells and the role of this process in biotechnology.</td>
</tr>
<tr>
<td>SC.912.L.16.8:</td>
<td>Explain the relationship between mutation, cell cycle, and uncontrolled cell growth potentially resulting in cancer.</td>
</tr>
<tr>
<td>SC.912.L.16.9:</td>
<td>Explain how and why the genetic code is universal and is common to almost all organisms.</td>
</tr>
<tr>
<td>SC.912.L.16.10:</td>
<td>Evaluate the impact of biotechnology on the individual, society and the environment, including medical and ethical issues.</td>
</tr>
<tr>
<td>SC.912.L.16.11:</td>
<td>Discuss the technologies associated with forensic medicine and DNA identification, including restriction fragment length polymorphism (RFLP) analysis.</td>
</tr>
<tr>
<td>SC.912.L.16.12:</td>
<td>Describe how basic DNA technology (restriction digestion by endonucleases, gel electrophoresis, polymerase chain reaction, ligation, and transformation) is used to construct recombinant DNA molecules (DNA cloning).</td>
</tr>
<tr>
<td>SC.912.L.16.14:</td>
<td>Describe the cell cycle, including the process of mitosis. Explain the role of mitosis in the formation of new cells and its importance in maintaining chromosome number during asexual reproduction.</td>
</tr>
<tr>
<td>SC.912.L.16.16:</td>
<td>Describe the process of meiosis, including independent assortment and crossing over. Explain how reduction division results in the formation of haploid gametes or spores.</td>
</tr>
<tr>
<td>SC.912.L.16.17:</td>
<td>Compare and contrast mitosis and meiosis and relate to the processes of sexual and asexual reproduction and their consequences for genetic variation.</td>
</tr>
<tr>
<td>SC.912.L.17.1:</td>
<td>Discuss the characteristics of populations, such as number of individuals, age structure, density, and pattern of distribution.</td>
</tr>
<tr>
<td>SC.912.L.17.8:</td>
<td>Recognize the consequences of the losses of biodiversity due to catastrophic events, climate changes, human activity, and the introduction of invasive, non-native species.</td>
</tr>
<tr>
<td>SC.912.L.18.1:</td>
<td>Describe the basic molecular structures and primary functions of the four major categories of biological macromolecules.</td>
</tr>
<tr>
<td>SC.912.L.18.11:</td>
<td>Explain the role of enzymes as catalysts that lower the activation energy of biochemical reactions. Identify factors, such as pH and temperature, and their effect on enzyme activity.</td>
</tr>
</tbody>
</table>

### SC.912.N.1.1:

- Define a problem based on a specific body of knowledge, for example: biology, chemistry, physics, and earth/space science, and do the following:
  1. Pose questions about the natural world (Articulate the purpose of the investigation and identify the relevant scientific concepts).
  2. Conduct systematic observations (Write procedures that are clear and replicable. Identify observables and examine relationships between test (independent) variable and outcome (dependent) variable. Employ appropriate methods for accurate and consistent observations; conduct and record measurements at appropriate levels of precision. Follow safety guidelines).
  3. Examine books and other sources of information to see what is already known.
  4. Review what is known in light of empirical evidence (Examine whether available empirical evidence can be interpreted in terms of existing knowledge and models, and if not, modify or develop new models).
  5. Plan investigations (Design and evaluate a scientific investigation).
  6. Use tools to gather, analyze, and interpret data (this includes the use of measurement in metric and other systems, and also the generation and interpretation of graphical representations of data, including data tables and graphs). Collect data or evidence in an organized way. Properly use instruments, equipment, and materials (e.g., scales, probeware, meter sticks, microscopes, computers) including set-up, calibration, technique, maintenance, and storage).
  7. Pose answers, explanations, or descriptions of events.
  8. Generate explanations that explicate or describe natural phenomena (inferences).
  9. Use appropriate evidence and reasoning to justify these explanations to others.
  10. Communicate results of scientific investigations, and
  11. Evaluate the merit of the explanations produced by others.

### SC.912.N.1.2:

- Describe and explain what characterizes science and its methods.

### SC.912.N.2.1:

- Identify what is science, what clearly is not science, and what superficially resembles science (but fails to meet the criteria for science).

### SC.912.N.2.2:

- Identify which questions can be answered through science and which questions are outside the boundaries of scientific investigation, such as questions addressed by other ways of knowing, such as art, philosophy, and religion.

### SC.912.P.3.5:

- Describe the function of models in science, and identify the wide range of models used in science.

### SC.912.P.12.12:

- Explain how various factors, such as concentration, temperature, and presence of a catalyst affect the rate of a chemical reaction.
LAFS.1112.RST.1.1: Cite specific textual evidence to support analysis of science and technical texts, attending to important distinctions the author makes and to any gaps or inconsistencies in the account.

LAFS.1112.RST.1.2: Determine the central ideas or conclusions of a text; summarize complex concepts, processes, or information presented in a text by paraphrasing them in simpler but still accurate terms.

LAFS.1112.RST.1.3: Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks; analyze the specific results based on explanations in the text.

LAFS.1112.RST.2.4: Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 11–12 texts and topics.

LAFS.1112.RST.2.5: Analyze how the text structures information or ideas into categories or hierarchies, demonstrating understanding of the information or ideas.

LAFS.1112.RST.2.6: Analyze the author's purpose in providing an explanation, describing a procedure, or discussing an experiment in a text, identifying important issues that remain unresolved.

LAFS.1112.RST.3.7: Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g., quantitative data, video, multimedia) in order to address a question or solve a problem.

LAFS.1112.RST.3.8: Evaluate the hypotheses, data, analysis, and conclusions in a science or technical text, verifying the data when possible and corroborating or challenging conclusions with other sources of information.

LAFS.1112.RST.3.9: Synthesize information from a range of sources (e.g., texts, experiments, simulations) into a coherent understanding of a process, phenomenon, or concept, resolving conflicting information when possible.

LAFS.1112.RST.4.10: By the end of grade 12, read and comprehend science/technical texts in the grades 11–12 text complexity band independently and proficiently, initiate and participate effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grades 11–12 topics, texts, and issues, building on others' ideas and expressing their own clearly and persuasively.

a. Come to discussions prepared, having read and researched material under study; explicitly draw on that preparation by referring to evidence from texts and other research on the topic or issue to stimulate a thoughtful, well-reasoned exchange of ideas.

b. Work with peers to promote civil, democratic discussions and decision-making, set clear goals and deadlines, and establish individual roles as needed.

c. Propose conversations by posing and responding to questions that probe reasoning and evidence; ensure a hearing for a full range of positions on a topic or issue; clarify, verify, or challenge ideas and conclusions; and promote divergent and creative perspectives.

d. Respond thoughtfully to diverse perspectives; synthesize comments, claims, and evidence made on all sides of an issue; resolve contradictions when possible; and determine what additional information or research is required to deepen the investigation or complete the task.

LAFS.1112.SL.1.1: Integrate multiple sources of information presented in diverse formats and media (e.g., visually, quantitatively, orally) in order to make informed decisions and solve problems, evaluating the credibility and accuracy of each source and noting any discrepancies among the data.

LAFS.1112.SL.1.2: Evaluate a speaker's point of view, reasoning, and use of evidence and rhetoric, assessing the stance, premises, links among ideas, word choice, points of emphasis, and tone used.

LAFS.1112.SL.1.3: Present information, findings, and supporting evidence, conveying a clear and distinct perspective, such that listeners can follow the line of reasoning, alternative or opposing perspectives are addressed, and the organization, development, substance, and style are appropriate to purpose, audience, and a range of formal and informal tasks.

LAFS.1112.SL.2.4: Make strategic use of digital media (e.g., textual, graphical, audio, visual, and interactive elements) in presentations to enhance understanding of findings, reasoning, and evidence and to add interest.

LAFS.1112.SL.2.5: Write arguments focused on discipline-specific content.

a. Introduce precise, knowledgeable claim(s), establish the significance of the claim(s), distinguish the claim(s) from alternate or opposing claims, and create an organization that logically sequences the claim(s), counterclaims, reasons, and evidence.

b. Develop claim(s) and counterclaims fairly and thoroughly, supplying the most relevant data and evidence for each while pointing out the strengths and limitations of both claim(s) and counterclaims in a discipline-appropriate form that anticipates the audience's knowledge level, concerns, values, and possible biases.

c. Use words, phrases, and clauses as well as varied syntax to link the major sections of the text, create cohesion, and clarify the relationships between claim(s) and reasons, between reasons and evidence, and between claim(s) and counterclaims.

d. Establish and maintain a formal style and objective tone while attending to the norms and conventions of the discipline in which they are writing.

e. Provide a concluding statement or section that follows from or supports the argument presented.

LAFS.1112.WHST.1.1: Write informative/explanatory texts, including the narration of historical events, scientific procedures/experiments, or technical processes.

a. Introduce a topic and organize complex ideas, concepts, and information so that each new build on that which precedes it to create a unified whole; include formatting (e.g., headings), graphics (e.g., figures, tables), and multimedia when useful to aiding comprehension.

b. Develop the topic thoroughly by selecting the most significant and relevant facts, extended definitions, concrete details, quotations, or other information and examples appropriate to the audience's knowledge of the topic.

c. Use varied transitions and sentence structures to link the major sections of the text, create cohesion, and clarify the relationships among complex ideas and concepts.

d. Use precise language, domain-specific vocabulary and techniques such as metaphor, simile, and analogy to manage the complexity of the topic; convey a knowledgeable stance in a style that responds to the discipline and context as well as to the expertise of likely readers.

e. Provide a concluding statement or section that follows from and supports the information or explanation provided (e.g., articulating implications or the significance of the topic).

LAFS.1112.WHST.1.2: Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.

LAFS.1112.WHST.2.4: Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience.

LAFS.1112.WHST.2.5: Use technology, including the Internet, to produce, publish, and update individual or shared writing products in response to ongoing feedback, including new arguments or information.

LAFS.1112.WHST.2.6: Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation.

LAFS.1112.WHST.3.7: Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the strengths and limitations of each source in terms of the specific task, purpose, and audience; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and overreliance on any one source and following a standard format for citation.

LAFS.1112.WHST.3.9: Draw evidence from informational texts to support analysis, reflection, and research.
LAFS.1112.WHST.4.10: Write routinely over extended time frames (time for reflection and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences.

MAFS.912.F-IF.2.4: For a function that models a relationship between two quantities, interpret key features of graphs and tables in terms of the quantities, and sketch graphs showing key features given a verbal description of the relationship. Key features include: intercepts; intervals where the function is increasing, decreasing, positive, or negative; relative maximums and minimums; symmetries; end behavior; and periodicity. ★

MAFS.912.F-IF.3.7: Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases. ★
   a. Graph linear and quadratic functions and show intercepts, maxima, and minima.
   b. Graph square root, cube root, and piecewise-defined functions, including step functions and absolute value functions.
   c. Graph polynomial functions, identifying zeros when suitable factorizations are available, and showing end behavior.
   d. Graph rational functions, identifying zeros and asymptotes when suitable factorizations are available, and showing end behavior.
   e. Graph exponential and logarithmic functions, showing intercepts and end behavior, and trigonometric functions, showing period, midline, and amplitude, and using phase shift.

MAFS.912.G-MG.1.2: Apply concepts of density based on area and volume in modeling situations (e.g., persons per square mile, BTUs per cubic foot). ★

MAFS.912.N-Q.1.1: Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays. ★

MAFS.912.N-Q.1.3: Choose a level of accuracy appropriate to limitations on measurement when reporting quantities. ★

MAFS.912.S-ID.2.6: Evaluate reports based on data. ★

   Clarifications:
   Represent data with plots on the real number line (dot plots, histograms, and box plots). ★

MAFS.912.S-ID.1.1: Use statistics appropriate to the shape of the data distribution to compare center (median, mean) and spread (interquartile range, standard deviation) of two or more different data sets. ★

   Clarifications:
   In grades 6 – 8, students describe center and spread in a data distribution. Here they choose a summary statistic appropriate to the characteristics of the data distribution, such as the shape of the distribution or the existence of extreme data points.

MAFS.912.S-ID.1.2: Interpret differences in shape, center, and spread in the context of the data sets, accounting for possible effects of extreme data points (outliers). ★

   Clarifications:
   In grades 6 – 8, students describe center and spread in a data distribution. Here they choose a summary statistic appropriate to the characteristics of the data distribution, such as the shape of the distribution or the existence of extreme data points.

MAFS.912.S-ID.1.3: Use the mean and standard deviation of a data set to fit it to a normal distribution and to estimate population percentages. Recognize that there are data sets for which such a procedure is not appropriate. Use calculators, spreadsheets, and tables to estimate areas under the normal curve. ★

MAFS.912.S-ID.2.5: Summarize categorical data for two categories in two-way frequency tables. Interpret relative frequencies in the context of the data (including joint, marginal, and conditional relative frequencies). Recognize possible associations and trends in the data. ★

   a. Fit a function to the data; use functions fitted to data to solve problems in the context of the data. Use given functions or choose a function suggested by the context. Emphasize linear, and exponential models.
   b. Informally assess the fit of a function by plotting and analyzing residuals.
   c. Fit a linear function for a scatter plot that suggests a linear association.

   Clarifications:
   Students take a more sophisticated look at using a linear function to model the relationship between two numerical variables. In addition to fitting a line to data, students assess how well the model fits by analyzing residuals.

Make sense of problems and persevere in solving them.

Mathematically proficient students start by explaining to themselves the meaning of a problem and looking for entry points to its solution. They analyze givens, constraints, relationships, and goals. They make conjectures about the form and meaning of the solution and plan a solution pathway rather than simply jumping into a solution attempt. They consider analogous problems, and try special cases and simpler forms of the original problem in order to gain insight into its solution. They monitor and evaluate their progress and change course if necessary. Older students might depend on the context of the problem, transform algebraic expressions or change the viewing window on their graphing calculator to get the information they need. Mathematically proficient students can explain correspondences between equations, verbal descriptions, tables, and graphs or draw diagrams of important features and relationships; graph data, and search for regularity or trends. Younger students might rely on using concrete objects or pictures to help conceptualize and solve a problem. Mathematically proficient students check their answers to problems using a different method, and they continually ask themselves, “Does this make sense?” They can understand the approaches of others to solving complex problems and identify correspondences between different approaches.

Standard Relation to Course: Supporting

Reason abstractly and quantitatively.

Mathematically proficient students make sense of quantities and their relationships in problem situations. They bring two complementary abilities to bear on problems involving quantitative relationships: the ability to decontextualize—to abstract a given situation and represent it symbolically and manipulate the representing symbols as if they have a life of their own, without necessarily attending to their referents—and the ability to contextualize, to pause as needed during the manipulation process in order to probe into the referents for the symbols involved. Quantitative reasoning entails habits of creating a coherent representation of the problem at hand; considering the units involved; attending to the meaning of quantities, not just how to compute them; and knowing and flexibly using different properties of operations and objects.

Standard Relation to Course: Supporting

Construct viable arguments and critique the reasoning of others.

Mathematically proficient students understand and use stated assumptions, definitions, and previously established results in constructing
arguments. They make conjectures and build a logical progression of statements to explore the truth of their conjectures. They are able to analyze situations by breaking them into cases, and can recognize and use counterexamples. They justify their conclusions, communicate them to others, and respond to the arguments of others. They reason inductively about data, making plausible arguments that take into account the context from which the data arose. Mathematically proficient students are also able to compare the effectiveness of two plausible arguments, distinguish correct logic or reasoning from that which is flawed, and—if there is a flaw in an argument—explain what it is. Elementary students can construct arguments using concrete referents such as objects, drawings, diagrams, and actions. Such arguments can make sense and be correct, even though they are not generalized or made formal until later grades. Later, students learn to determine domains to which an argument applies. Students at all grades can listen or read the arguments of others, decide whether they make sense, and ask useful questions to clarify or improve the arguments.

Standard Relation to Course: Supporting

Model with mathematics.

Mathematically proficient students can apply the mathematics they know to solve problems arising in everyday life, society, and the workplace. In early grades, this might be as simple as writing an addition equation to describe a situation. In middle grades, a student might apply proportional reasoning to plan a school event or analyze a problem in the community. By high school, a student might use geometry to solve a design problem or use a function to describe how one quantity of interest depends on another. Mathematically proficient students who can apply what they know are comfortable making assumptions and approximations to simplify a complicated situation, realizing that these may need revision later. They are able to identify important quantities in a practical situation and map their relationships using such tools as diagrams, two-way tables, graphs, flowcharts and formulas. They can analyze those relationships mathematically to draw conclusions. They routinely interpret their mathematical results in the context of the situation and reflect on whether the results make sense, possibly improving the model if it has not served its purpose.

Standard Relation to Course: Supporting

Use appropriate tools strategically.

Mathematically proficient students consider the available tools when solving a mathematical problem. These tools might include pencil and paper, concrete models, a ruler, a protractor, a calculator, a spreadsheet, a computer algebra system, a statistical package, or dynamic geometry software. Proficient students are sufficiently familiar with tools appropriate for their grade or course to make sound decisions about when each of these tools might be helpful, recognizing both the insight to be gained and their limitations. For example, mathematically proficient high school students analyze graphs of functions and solutions generated using a graphing calculator. They detect possible errors by strategically using estimation and other mathematical knowledge. When making mathematical models, they know that technology can enable them to visualize the results of varying assumptions, explore consequences, and compare predictions with data. Mathematically proficient students at various grade levels are able to identify relevant external mathematical resources, such as digital content located on a website, and use them to pose or solve problems. They are able to use technological tools to explore and deepen their understanding of concepts.

Standard Relation to Course: Supporting

Attend to precision.

Mathematically proficient students try to communicate precisely to others. They try to use clear definitions in discussion with others and in their own reasoning. They state the meaning of the symbols they choose, including using the equal sign consistently and appropriately. They are careful about specifying units of measurement, and labeling axes to clarify the correspondence with quantities in a problem. They calculate accurately and efficiently, express numerical answers with a degree of precision appropriate for the problem context. In the elementary grades, students give carefully formulated explanations to each other. By the time they reach high school they have learned to examine claims and make explicit use of definitions.

Standard Relation to Course: Supporting

Look for and make use of structure.

Mathematically proficient students look closely to discern a pattern or structure. Young students, for example, might notice that three and seven more is the same amount as seven and three more, or they may sort a collection of shapes according to how many sides the shapes have. Later, students will see 7 × 8 equals the well remembered 7 × 5 + 7. They recognize the significance of an existing line in a geometric figure and can use the strategy of drawing an auxiliary line to solve problems. They also can step back for an overview and shift perspective. They can see complicated things, such as some algebraic expressions, as single objects or as being composed of several objects. For example, they can see 5 – 3(x – y)² as 5 minus a positive number times a square and use that to realize that its value cannot be more than 5 for any real numbers x and y.

Standard Relation to Course: Supporting

Look for and express regularity in repeated reasoning.

Mathematically proficient students notice if calculations are repeated, and look both for general methods and for shortcuts. Upper elementary students might notice when dividing 25 by 11 that they are repeating the same calculations over and over again, and conclude they have a repeating decimal. By paying attention to the calculation of slope as they repeatedly check whether points are on the line through (1, 2) with slope 3, middle school students might abstract the equation (y – 2) = 3(x – 1). Noticing the regularity in the way terms cancel when expanding (x – 1)(x + 1), (x – 1)(x² + x + 1), and (x – 1)(x⁸ + x² + x + 1) might lead them to the general formula for the sum of a geometric series. As they work to solve a problem, mathematically proficient students maintain oversight of the process, while attending to the details. They continually evaluate the reasonableness of their intermediate results.

Standard Relation to Course: Supporting

ELD.K12.ELL.SC.1: English language learners communicate information, ideas and concepts necessary for academic success in the content area of Science.

ELD.K12.ELL.SI.1: English language learners communicate for social and instructional purposes within the school setting.

HE.912.C.1.3: Evaluate how environment and personal health are interrelated.

Clarifications:

- Food options within a community; prenatal-care services; availability of recreational facilities; air quality; weather-safety awareness; and weather, air, and water conditions.

HE.912.C.1.7: Analyze how heredity and family history can impact personal health.

Clarifications:

- Drug use, family obesity, heart disease, mental health, and non-communicable illness or disease.
GENERAL NOTES

Honors and Advanced Level Course Note: Advanced courses require a greater demand on students through increased academic rigor. Academic rigor is obtained through the application, analysis, evaluation, and creation of complex ideas that are often abstract and multi-faceted. Students are challenged to think and collaborate critically on the content they are learning. Honors level rigor will be achieved by increasing text complexity through text selection, focus on high-level qualitative measures, and complexity of task. Instruction will be structured to give students a deeper understanding of conceptual themes and organization within and across disciplines. Academic rigor is more than simply assigning to students a greater quantity of work.

English Language Development ELD Standards Special Notes Section:
Teachers are required to provide listening, speaking, reading and writing instruction that allows English language learners (ELL) to communicate information, ideas and concepts for academic success in the content area of Science. For the given level of English language proficiency and with visual, graphic, or interactive support, students will interact with grade level words, expressions, sentences and discourse to process or produce language necessary for academic success. The ELD standard should specify a relevant content area concept or topic of study chosen by curriculum developers and teachers which maximizes an ELL's need for communication and social skills. To access an ELL supporting document which delineates performance definitions and descriptors, please click on the following link:
https://cpalmsmediaprod.blob.core.windows.net/uploads/docs/standards/eld/sc.pdf

GENERAL INFORMATION

<table>
<thead>
<tr>
<th>Course Number:</th>
<th>2000440</th>
</tr>
</thead>
<tbody>
<tr>
<td>Course Path:</td>
<td>Section: Grades PreK to 12 Education Courses &gt; Grade Group: Grades 9 to 12 and Adult Education Courses &gt; Subject: Science &gt; SubSubject: Biological Sciences &gt;</td>
</tr>
<tr>
<td>Abbreviated Title:</td>
<td>GENETICS HON</td>
</tr>
<tr>
<td>Number of Credits:</td>
<td>One (1) credit</td>
</tr>
<tr>
<td>Course Length:</td>
<td>Year (Y)</td>
</tr>
<tr>
<td>Course Attributes:</td>
<td>Honors</td>
</tr>
<tr>
<td>Course Level:</td>
<td>3</td>
</tr>
<tr>
<td>Grade Level(s):</td>
<td>9,10,11,12</td>
</tr>
<tr>
<td>Graduation Requirement:</td>
<td>Equally Rigorous Science</td>
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</tbody>
</table>

Educator Certifications

| Science (Secondary Grades 7-12) |
| Biology (Grades 6-12) |
Course Standards

<table>
<thead>
<tr>
<th>Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>SC.912.L.15.8</td>
<td>Describe the scientific explanations of the origin of life on Earth.</td>
</tr>
<tr>
<td>SC.912.L.15.9</td>
<td>Explain the role of reproductive isolation in the process of speciation.</td>
</tr>
<tr>
<td>SC.912.L.15.12</td>
<td>List the conditions for Hardy-Weinberg equilibrium in a population and why these conditions are not likely to appear in nature. Use the Hardy-Weinberg equation to predict genotypes in a population from observed phenotypes.</td>
</tr>
<tr>
<td>SC.912.L.15.13</td>
<td>Describe the conditions required for natural selection, including: overproduction of offspring, inherited variation, and the struggle to survive, which result in differential reproductive success.</td>
</tr>
<tr>
<td>SC.912.L.15.14</td>
<td>Discuss mechanisms of evolutionary change other than natural selection such as genetic drift and gene flow.</td>
</tr>
<tr>
<td>SC.912.L.15.15</td>
<td>Describe how mutation and genetic recombination increase genetic variation.</td>
</tr>
<tr>
<td>SC.912.L.16.1</td>
<td>Use Mendel's laws of segregation and independent assortment to analyze patterns of inheritance.</td>
</tr>
<tr>
<td>SC.912.L.16.2</td>
<td>Discuss observed inheritance patterns caused by various modes of inheritance, including dominant, recessive, codominant, sex-linked, polygenic, and multiple alleles.</td>
</tr>
<tr>
<td>SC.912.L.16.3</td>
<td>Describe the basic process of DNA replication and how it relates to the transmission and conservation of the genetic information.</td>
</tr>
<tr>
<td>SC.912.L.16.4</td>
<td>Explain how mutations in the DNA sequence may or may not result in phenotypic change. Explain how mutations in gametes may result in phenotypic changes in offspring.</td>
</tr>
<tr>
<td>SC.912.L.16.5</td>
<td>Explain the basic processes of transcription and translation, and how they result in the expression of genes.</td>
</tr>
<tr>
<td>SC.912.L.16.6</td>
<td>Discuss the mechanisms for regulation of gene expression in prokaryotes and eukaryotes at transcription and translation level.</td>
</tr>
<tr>
<td>SC.912.L.16.7</td>
<td>Describe how viruses and bacteria transfer genetic material between cells and the role of this process in biotechnology.</td>
</tr>
<tr>
<td>SC.912.L.16.8</td>
<td>Explain the relationship between mutation, cell cycle, and uncontrolled cell growth potentially resulting in cancer.</td>
</tr>
<tr>
<td>SC.912.L.16.9</td>
<td>Explain how and why the genetic code is universal and is common to almost all organisms.</td>
</tr>
<tr>
<td>SC.912.L.16.10</td>
<td>Evaluate the impact of biotechnology on the individual, society and the environment, including medical and ethical issues.</td>
</tr>
<tr>
<td>SC.912.L.16.11</td>
<td>Discuss the technologies associated with forensic medicine and DNA identification, including restriction fragment length polymorphism (RFLP) analysis.</td>
</tr>
<tr>
<td>SC.912.L.16.12</td>
<td>Describe how basic DNA technology (restriction digestion by endonucleases, gel electrophoresis, polymerase chain reaction, ligation, and transformation) is used to construct recombinant DNA molecules (DNA cloning).</td>
</tr>
<tr>
<td>SC.912.L.16.14</td>
<td>Describe the cell cycle, including the process of mitosis. Explain the role of mitosis in the formation of new cells and its importance in maintaining chromosome number during asexual reproduction.</td>
</tr>
<tr>
<td>SC.912.L.16.16</td>
<td>Describe the process of meiosis, including independent assortment and crossing over. Explain how reduction division results in the formation of haploid gametes or spores.</td>
</tr>
<tr>
<td>SC.912.L.16.17</td>
<td>Compare and contrast mitosis and meiosis and relate to the processes of sexual and asexual reproduction and their consequences for genetic variation.</td>
</tr>
<tr>
<td>SC.912.L.17.1</td>
<td>Discuss the characteristics of populations, such as number of individuals, age structure, density, and pattern of distribution.</td>
</tr>
<tr>
<td>SC.912.L.17.8</td>
<td>Recognize the consequences of the losses of biodiversity due to catastrophic events, climate changes, human activity, and the introduction of invasive, non-native species.</td>
</tr>
<tr>
<td>SC.912.L.18.1</td>
<td>Describe the basic molecular structures and primary functions of the four major categories of biological macromolecules.</td>
</tr>
<tr>
<td>SC.912.L.18.11</td>
<td>Explain the role of enzymes as catalysts that lower the activation energy of biochemical reactions. Identify factors, such as pH and temperature, and their effect on enzyme activity.</td>
</tr>
</tbody>
</table>

SC.912.N.1.1: Define a problem based on a specific body of knowledge, for example: biology, chemistry, physics, and earth/space science, and do the following: 1. Pose questions about the natural world, (Articulate the purpose of the investigation and identify the relevant scientific concepts). 2. Conduct systematic observations, (Write procedures that are clear and replicable. Identify observables and examine relationships between test (independent) variable and outcome (dependent) variable. Employ appropriate methods for accurate and consistent observations; conduct and record measurements at appropriate levels of precision. Follow safety guidelines). 3. Examine books and other sources of information to see what is already known, 4. Review what is known in light of empirical evidence, (Examine whether available empirical evidence can be interpreted in terms of existing knowledge and models, and if not, modify or develop new models). 5. Plan investigations, (Design and evaluate a scientific investigation). 6. Use tools to gather, analyze, and interpret data (this includes the use of measurement in metric and other systems, and also the generation and interpretation of graphical representations of data, including data tables and graphs), (Collect data or evidence in an organized way. Properly use instruments, equipment, and materials (e.g., scales, probeware, meter sticks, microscopes, computers) including set-up, calibration, technique, maintenance, and storage). 7. Pose answers, explanations, or descriptions of events, 8. Generate explanations that explicate or describe natural phenomena (inferences), 9. Use appropriate evidence and reasoning to justify these explanations to others, 10. Communicate results of scientific investigations, and 11. Evaluate the merits of the explanations produced by others.

SC.912.N.1.2: Describe and explain what characterizes science and its methods.  
SC.912.N.2.1: Identify what is science, what clearly is not science, and what superficially resembles science (but fails to meet the criteria for science).  
SC.912.N.2.2: Identify which questions can be answered through science and which questions are outside the boundaries of scientific investigation, such as questions addressed by other ways of knowing, such as art, philosophy, and religion.  
SC.912.N.3.5: Describe the function of models in science, and identify the wide range of models used in science.  
SC.912.P.12.12: Explain how various factors, such as concentration, temperature, and presence of a catalyst affect the rate of a chemical reaction.
<table>
<thead>
<tr>
<th><strong>Mathematicians who participate in effortful learning both individually and with others:</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>- Analyze the problem in a way that makes sense given the task.</td>
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<tr>
<td>- Ask questions that will help with solving the task.</td>
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<tr>
<td>- Build perseverance by modifying methods as needed while solving a challenging task.</td>
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<tr>
<td>- Stay engaged and maintain a positive mindset when working to solve tasks.</td>
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<tr>
<td>- Help and support each other when attempting a new method or approach.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Clarifications:</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Teachers who encourage students to participate actively in effortful learning both individually and with others:</td>
</tr>
<tr>
<td>- Cultivate a community of growth mindset learners.</td>
</tr>
<tr>
<td>- Foster perseverance in students by choosing tasks that are challenging.</td>
</tr>
<tr>
<td>- Develop students' ability to analyze and problem solve.</td>
</tr>
<tr>
<td>- Recognize students' effort when solving challenging problems.</td>
</tr>
</tbody>
</table>

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<tr>
<th><strong>Mathematicians who demonstrate understanding by representing problems in multiple ways:</strong></th>
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<tr>
<td>- Build understanding through modeling and using manipulatives.</td>
</tr>
<tr>
<td>- Represent solutions to problems in multiple ways using objects, drawings, tables, graphs and equations.</td>
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<tr>
<td>- Progress from modeling problems with objects and drawings to using algorithms and equations.</td>
</tr>
<tr>
<td>- Express connections between concepts and representations.</td>
</tr>
<tr>
<td>- Choose a representation based on the given context or purpose.</td>
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</tbody>
</table>

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<tbody>
<tr>
<td>Teachers who encourage students to demonstrate understanding by representing problems in multiple ways:</td>
</tr>
<tr>
<td>- Help students make connections between concepts and representations.</td>
</tr>
<tr>
<td>- Provide opportunities for students to use manipulatives when investigating concepts.</td>
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<tr>
<td>- Guide students from concrete to pictorial to abstract representations as understanding progresses.</td>
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<tr>
<td>- Show students that various representations can have different purposes and can be useful in different situations.</td>
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<thead>
<tr>
<th><strong>Mathematicians who complete tasks with mathematical fluency:</strong></th>
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<tr>
<td>- Select efficient and appropriate methods for solving problems within the given context.</td>
</tr>
<tr>
<td>- Maintain flexibility and accuracy while performing procedures and mental calculations.</td>
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<tr>
<td>- Complete tasks accurately and with confidence.</td>
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<tr>
<td>- Adapt procedures to apply them to a new context.</td>
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<tr>
<td>- Use feedback to improve efficiency when performing calculations.</td>
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<tbody>
<tr>
<td>Teachers who encourage students to complete tasks with mathematical fluency:</td>
</tr>
<tr>
<td>- Provide students with the flexibility to solve problems by selecting a procedure that allows them to solve efficiently and accurately.</td>
</tr>
<tr>
<td>- Offer multiple opportunities for students to practice efficient and generalizable methods.</td>
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<tr>
<td>- Provide opportunities for students to reflect on the method they used and determine if a more efficient method could have been used.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Mathematicians who engage in discussions that reflect on the mathematical thinking of self and others:</strong></th>
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</thead>
<tbody>
<tr>
<td>- Communicate mathematical ideas, vocabulary and methods effectively.</td>
</tr>
<tr>
<td>- Analyze the mathematical thinking of others.</td>
</tr>
<tr>
<td>- Compare the efficiency of a method to those expressed by others.</td>
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<tr>
<td>- Recognize errors and suggest how to correctly solve the task.</td>
</tr>
<tr>
<td>- Justify results by explaining methods and processes.</td>
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<tr>
<td>- Construct possible arguments based on evidence.</td>
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<td>Teachers who encourage students to engage in discussions that reflect on the mathematical thinking of self and others:</td>
</tr>
<tr>
<td>- Establish a culture in which students ask questions of the teacher and their peers, and error is an opportunity for learning.</td>
</tr>
<tr>
<td>- Create opportunities for students to discuss their thinking with peers.</td>
</tr>
<tr>
<td>- Select, sequence and present student work to advance and deepen understanding of correct and increasingly efficient methods.</td>
</tr>
<tr>
<td>- Develop students' ability to justify methods and compare their responses to the responses of their peers.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Mathematicians who use patterns and structure to help understand and connect mathematical concepts:</strong></th>
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</thead>
<tbody>
<tr>
<td>- Focus on relevant details within a problem.</td>
</tr>
<tr>
<td>- Create plans and procedures to logically order events, steps or ideas to solve problems.</td>
</tr>
<tr>
<td>- Decompose a complex problem into manageable parts.</td>
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<tr>
<td>- Relate previously learned concepts to new concepts.</td>
</tr>
<tr>
<td>- Look for similarities among problems.</td>
</tr>
<tr>
<td>- Connect solutions of problems to more complicated large-scale situations.</td>
</tr>
</tbody>
</table>

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<tr>
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<tbody>
<tr>
<td>Teachers who encourage students to use patterns and structure to help understand and connect mathematical concepts:</td>
</tr>
<tr>
<td>- Help students recognize the patterns in the world around them and connect these patterns to mathematical concepts.</td>
</tr>
<tr>
<td>- Support students to develop generalizations based on the similarities found among problems.</td>
</tr>
<tr>
<td>- Provide opportunities for students to create plans and procedures to solve problems.</td>
</tr>
<tr>
<td>- Develop students' ability to construct relationships between their current understanding and more sophisticated ways of thinking.</td>
</tr>
</tbody>
</table>

Assess the reasonableness of solutions.
Mathematicians who assess the reasonableness of solutions:
- Estimate to discover possible solutions.
- Use benchmark quantities to determine if a solution makes sense.
- Check calculations when solving problems.
- Verify possible solutions by explaining the methods used.
- Evaluate results based on the given context.

**Clarifications:**
Teachers who encourage students to assess the reasonableness of solutions:
- Have students estimate or predict solutions prior to solving.
- Prompt students to continually ask, “Does this solution make sense? How do you know?”
- Reinforce that students check their work as they progress within and after a task.
- Strengthen students’ ability to verify solutions through justifications.

Apply mathematics to real-world contexts.
Mathematicians who apply mathematics to real-world contexts:
- Connect mathematical concepts to everyday experiences.
- Use models and methods to understand, represent and solve problems.
- Perform investigations to gather data or determine if a method is appropriate. • Redesign models and methods to improve accuracy or efficiency.

**Clarifications:**
Teachers who encourage students to apply mathematics to real-world contexts:
- Provide opportunities for students to create models, both concrete and abstract, and perform investigations.
- Challenge students to question the accuracy of their models and methods.
- Support students as they validate conclusions by comparing them to the given situation.
- Indicate how various concepts can be applied to other disciplines.

Cite evidence to explain and justify reasoning.

**Clarifications:**
K-1 Students include textual evidence in their oral communication with guidance and support from adults. The evidence can consist of details from the text without naming the text. During 1st grade, students learn how to incorporate the evidence in their writing.
2-3 Students include relevant textual evidence in their written and oral communication. Students should name the text when they refer to it. In 3rd grade, students should use a combination of direct and indirect citations.
4-5 Students continue with previous skills and reference comments made by speakers and peers. Students cite texts that they’ve directly quoted, paraphrased, or used for information. When writing, students will use the form of citation dictated by the instructor or the style guide referenced by the instructor.
6-8 Students continue with previous skills and use a style guide to create a proper citation.
9-12 Students continue with previous skills and should be aware of existing style guides and the ways in which they differ.

Read and comprehend grade-level complex texts proficiently.

**Clarifications:**
See Text Complexity for grade-level complexity bands and a text complexity rubric.

Make inferences to support comprehension.

**Clarifications:**
Students will make inferences before the words infer or inference are introduced. Kindergarten students will answer questions like “Why is the girl smiling?” or make predictions about what will happen based on the title page. Students will use the terms and apply them in 2nd grade and beyond.

Use appropriate collaborative techniques and active listening skills when engaging in discussions in a variety of situations.

**Clarifications:**
In kindergarten, students learn to listen to one another respectfully. In grades 1-2, students build upon these skills by justifying what they are thinking. For example: “I think ________ because _______. “ The collaborative conversations are becoming academic conversations.
In grades 3-12, students engage in academic conversations discussing claims and justifying their reasoning, refining and applying skills. Students build on ideas, propel the conversation, and support claims and counterclaims with evidence.

Use the accepted rules governing a specific format to create quality work.

**Clarifications:**
Students will incorporate skills learned into work products to produce quality work. For students to incorporate these skills appropriately, they must receive instruction. A 3rd grade student creating a poster board display must have instruction in how to effectively present information to do quality work.

Use appropriate voice and tone when speaking or writing.

**Clarifications:**
In kindergarten and 1st grade, students learn the difference between formal and informal language. For example, the way we talk to our friends differs from the way we speak to adults. In 2nd grade and beyond, students practice appropriate social and academic language to discuss texts.

English language learners communicate information, ideas and concepts necessary for academic success in the content area of Science.

**Clarifications:**
Evaluate how environment and personal health are interrelated.

Food options within a community; prenatal-care services; availability of recreational facilities; air quality; weather-safety awareness; and
### General Course Information and Notes

**GENERAL NOTES**

**Honors and Advanced Level Course Note:** Advanced courses require a greater demand on students through increased academic rigor. Academic rigor is obtained through the application, analysis, evaluation, and creation of complex ideas that are often abstract and multi-faceted. Students are challenged to think and collaborate critically on the content they are learning. Honors level rigor will be achieved by increasing text complexity through text selection, focus on high-level qualitative measures, and complexity of task. Instruction will be structured to give students a deeper understanding of conceptual themes and organization within and across disciplines. Academic rigor is more than simply assigning to students a greater quantity of work.

**Florida’s Benchmarks for Excellent Student Thinking (B.E.S.T.) Standards**

This course includes Florida’s B.E.S.T. ELA Expectations (EE) and Mathematical Thinking and Reasoning Standards (MTRs) for students. Florida educators should intentionally embed these standards within the content and their instruction as applicable. For guidance on the implementation of the EE and MTRs, please visit https://www.cpalms.org/Standards/BEST_Standards.aspx and select the appropriate B.E.S.T. Standards package.

**English Language Development ELD Standards Special Notes Section:**

Teachers are required to provide listening, speaking, reading and writing instruction that allows English language learners (ELL) to communicate information, ideas and concepts for academic success in the content area of Science. For the given level of English language proficiency and with visual, graphic, or interactive support, students will interact with grade level words, expressions, sentences and discourse to process or produce language necessary for academic success. The ELD standard should specify a relevant content area concept or topic of study chosen by curriculum developers and teachers which maximizes an ELL’s need for communication and social skills. To access an ELL supporting document which delineates performance definitions and descriptors, please click on the following link: https://cpalmsmediaprod.blob.core.windows.net/uploads/docs/standards/eld/sc.pdf

**Course Number:** 2000440
**Number of Credits:** One (1) credit

**Course Attributes:** Honors
**Course Status:** State Board Approved
**Grade Level(s):** 9,10,11,12
**Graduation Requirement:** Equally Rigorous Science

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**HE.912.C.1.7:**
Analyze how heredity and family history can impact personal health.

**Clarifications:**
Drug use, family obesity, heart disease, mental health, and non-communicable illness or disease.
Recognize the role of creativity in constructing scientific questions, methods and explanations.

Discuss observed inheritance patterns caused by various modes of inheritance, including dominant, recessive, codominant, sex-linked, polygenic, and multiple alleles.

Describe how mutation and genetic recombination increase genetic variation.

Identify examples of pseudoscience (such as astrology, phrenology) in society.

Identify which questions can be answered through science and which are not.

Describe the important structural characteristics of monosaccharides, disaccharides, and polysaccharides and explain the functions of carbohydrates in living things.

Explain the relationship between mutation, cell cycle, and uncontrolled cell growth potentially resulting in cancer.

Explain how mutations in the DNA sequence may or may not result in phenotypic change. Explain how mutations in gametes may result in phenotypic changes in offspring.

Explain the basic processes of transcription and translation, and how they result in the expression of genes.

Discuss the mechanisms for regulation of gene expression in prokaryotes and eukaryotes at transcription and translation level.

Communicate results of scientific investigations, and use appropriate evidence and reasoning to justify these explanations to others, organized generation and measurement in metric and other systems, and also the appropriate methods for accurate and consistent observations; conduct and record measurements at appropriate levels of precision. Follow safety guidelines.

Communicate results of scientific investigations, and use appropriate evidence and reasoning to justify these explanations to others, organized generation and measurement in metric and other systems, and also the appropriate methods for accurate and consistent observations; conduct and record measurements at appropriate levels of precision. Follow safety guidelines.
SC.912.N.3.2: Explain that a scientific theory is the culmination of many scientific investigations drawing together all the current evidence concerning a substantial range of phenomena; thus, a scientific theory represents the most powerful explanation scientists have to offer.

SC.912.N.3.4: Recognize that theories do not become laws, nor do laws become theories; theories are well supported explanations and laws are well supported descriptions.

SC.912.N.3.5: Describe the function of models in science, and identify the wide range of models used in science.

SC.912.N.3.6: Explain how scientific knowledge and reasoning provide an empirically-based perspective to inform society's decision making.

SC.912.N.4.1: Weigh the merits of alternative strategies for solving a specific societal problem by comparing a number of different costs and benefits, such as human, economic, and environmental.

SC.912.P.8.11: Relate acidity and basicity to hydronium and hydroxyl ion concentration and pH.

SC.912.P.8.12: Describe the properties of the carbon atom that make the diversity of carbon compounds possible.

SC.912.P.8.13: Identify selected functional groups and relate how they contribute to properties of carbon compounds.

LAFS.910.WHST.1.2: Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes.

LAFS.910.WHST.1.1: Write arguments focused on discipline-specific content.

LAFS.910.SL.1.1: Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes.

LAFS.910.SL.2.1: Write arguments focused on discipline-specific content.

LAFS.910.SL.2.2: Provide a concluding statement or section that follows from or supports the argument presented.

LAFS.910.SL.2.5: Make strategic use of digital media (e.g., textual, graphical, audio, visual, and interactive elements) in presentations to enhance understanding of findings, reasoning, and evidence to add interest.

LAFS.910.SL.1.2: Integrate multiple sources of information presented in diverse media or formats (e.g., visually, quantitatively, orally) evaluating the credibility and accuracy of each source.

LAFS.910.SL.1.3: Evaluate a speaker's point of view, reasoning, and use of evidence and rhetoric, identifying any fallacious reasoning or exaggerated or distorted evidence.

LAFS.910.SL.2.4: Present information, findings, and supporting evidence clearly, concisely, and logically such that listeners can follow the line of reasoning and the organization, development, substance, and style are appropriate to purpose, audience, and task.

LAFS.910.SL.2.5: Make strategic use of digital media (e.g., textual, graphical, audio, visual, and interactive elements) in presentations to enhance understanding of findings, reasoning, and evidence to add interest.

LAFS.910.WHST.1.2: Provide a concluding statement or section that follows from or supports the argument presented.

LAFS.910.WHST.1.1: Write arguments focused on discipline-specific content.

LAFS.910.WHST.1.2: Provide a concluding statement or section that follows from or supports the argument presented.

LAFS.910.RST.4.10: By the end of grade 10, read and comprehend science/technical texts in the grades 9–10 text complexity band independently and proficiently.

LAFS.910.RST.2.5: Analyze the structure of the relationships among concepts in a text, including relationships among key terms (e.g., force, friction, reaction force, energy).

LAFS.910.RST.2.6: Analyze the author's purpose in providing an explanation, describing a procedure, or discussing an experiment in a text, defining the question the author seeks to address.

LAFS.910.RST.3.7: Translate quantitative or technical information expressed in words in a text into visual form (e.g., a table or chart) and translate information expressed visually or mathematically (e.g., in an equation) into words.

LAFS.910.RST.3.8: Assess the extent to which the reasoning and evidence in a text support the author's claim or a recommendation for solving a scientific or technical problem.

LAFS.910.RST.3.9: Compare and contrast findings presented in a text to those from other sources (including their own experiments), noting when the findings support or contradict previous explanations or accounts.

LAFS.910.RST.2.5: Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 9–10 texts and topics.

LAFS.910.RST.1.1: Establish and maintain a formal style and objective tone while attending to the norms and conventions of the discipline in which they are writing.

LAFS.910.RST.2.4: Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 9–10 texts and topics.

LAFS.910.RST.2.5: Identify the author's purpose in providing an explanation, describing a procedure, or discussing an experiment in a text, defining the question the author seeks to address.

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LAFS.910.RST.2.6: Analyze the author's purpose in providing an explanation, describing a procedure, or discussing an experiment in a text, defining the question the author seeks to address.
Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.

Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience.

Use technology, including the Internet, to produce, publish, and update individual or shared writing products, taking advantage of technology's capacity to link to other information and to display information flexibly and dynamically.

Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation.

Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the usefulness of each source in answering the research question; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and following a standard format for citation.

Draw evidence from informational texts to support analysis, reflection, and research.

Write routinely over extended time frames (time for reflection and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences.

Rearrange formulas to highlight a quantity of interest, using the same reasoning as in solving equations. For example, rearrange Ohm's law \( V = IR \) to highlight resistance \( R \).

For a function that models a relationship between two quantities, interpret key features of graphs and tables in terms of the quantities, and sketch graphs showing key features given a verbal description of the relationship. Key features include: intercepts; intervals where the function is increasing, decreasing, positive, or negative; relative maximums and minimums; symmetries; end behavior; and periodicity.

Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases.

- Graph linear and quadratic functions and show intercepts, maxima, and minima.
- Graph square root, cube root, and piecewise-defined functions, including step functions and absolute value functions.
- Graph polynomial functions, identifying zeros when suitable factorizations are available, and showing end behavior.
- Graph rational functions, identifying zeros and asymptotes when suitable factorizations are available, and showing end behavior.
- Graph exponential and logarithmic functions, showing intercepts and end behavior, and trigonometric functions, showing period, midline, and amplitude, and using phase shift.

Distinguish between situations that can be modeled with linear functions and with exponential functions.

- Prove that linear functions grow by equal differences over equal intervals, and that exponential functions grow by equal factors over equal intervals.
- Recognize situations in which one quantity changes at a constant rate per unit interval relative to another.
- Recognize situations in which a quantity grows or decays by a constant percent rate per unit interval relative to another.

Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays.

Define appropriate quantities for the purpose of descriptive modeling.

Working with quantities and the relationships between them provides grounding for work with expressions, equations, and functions.

Choose a level of accuracy appropriate to limitations on measurement when reporting quantities.

Represent data with plots on the real number line (dot plots, histograms, and box plots).

Interpret differences in shape, center, and spread in the context of the data sets, accounting for possible effects of extreme data points (outliers).

Represent data on two quantitative variables on a scatter plot, and describe how the variables are related.

a. Fit a function to the data; use functions fitted to data to solve problems in the context of the data. Use given functions or choose a function suggested by the context. Emphasize linear, and exponential models.

b. Informally assess the fit of a function by plotting and analyzing residuals.

c. Fit a linear function for a scatter plot that suggests a linear association.

Make sense of problems and persevere in solving them.

Mathematically proficient students start by explaining to themselves the meaning of a problem and looking for entry points to its solution. They analyze givens, constraints, relationships, and goals. They make conjectures about the form and meaning of the solution and plan a solution pathway rather than simply jumping into a solution attempt. They consider analogous problems, and try special cases and simpler forms of the original problem in order to gain insight into its solution. They monitor and evaluate their progress and change course if necessary. Older students might, depending on the context of the problem, transform algebraic expressions or change the viewing window on their graphing calculator to get the information they need. Mathematically proficient students can explain correspondences between equations, verbal descriptions, tables, and graphs or draw diagrams of important features and relationships, graph data, and search for regularity or trends. Younger students might rely on using concrete objects or pictures to help conceptualize and solve a problem. Mathematically proficient students check their answers to problems in various ways, improving the precision of their statements as they work. For example, they can use technology to help them generate precision byiran on a grid or by fitting lines to data; they draw graphs of equations or inequalities, plot data, use tables to compare values and look for patterns; they check their answers using sets of numbers in the problem that were not already used; they compare their solution strategies to those of others. They avoid the trap of looking for a pattern in the data if one doesn't exist. They ensure that their response addresses the problem's requirements.
using a different method, and they continually ask themselves, “Does this make sense?” They can understand the approaches of others to solving complex problems and identify correspondences between different approaches.

**Reason abstractly and quantitatively.**

Mathematically proficient students make sense of quantities and their relationships in problem situations. They bring two complementary abilities to bear on problems involving quantitative relationships: the ability to decontextualize—to abstract a given situation and represent it symbolically and manipulate the representing symbols as if they have a life of their own, without necessarily attending to their referents—and the ability to contextualize, to pause as needed during the manipulation process in order to probe into the referents for the symbols involved. Quantitative reasoning entails habits of creating a coherent representation of the problem at hand; considering the units involved; attending to the meaning of quantities, not just how to compute them; and knowing and flexibly using different properties of operations and objects.

**Construct viable arguments and critique the reasoning of others.**

Mathematically proficient students understand and use stated assumptions, definitions, and previously established results in constructing arguments. They make conjectures and build a logical progression of statements to explore the truth of their conjectures. They are able to analyze situations by breaking them into cases, and can recognize and use counterexamples. They justify their conclusions, communicate them to others, and respond to the arguments of others. They reason inductively about data, making plausible arguments that take into account the context from which the data arose. Mathematically proficient students are also able to compare the effectiveness of two plausible arguments, distinguish correct logic or reasoning from that which is flawed, and—if there is a flaw in an argument—explain what it is. Elementary students can construct arguments using concrete referents such as objects, drawings, diagrams, and actions. Such arguments can make sense and be correct, even though they are not generalized or made formal until later grades. Later, students learn to determine domains to which an argument applies. Students at all grades can listen or read the arguments of others, decide whether they make sense, and ask useful questions to clarify or improve the arguments.

**Model with mathematics.**

Mathematically proficient students consider the available tools when solving a mathematical problem. These tools might include pencil and paper, concrete models, a ruler, a protractor, a calculator, a spreadsheet, a computer algebra system, a statistical package, or dynamic geometry software. Proficient students are sufficiently familiar with tools appropriate for their grade or course to make sound decisions about when each of these tools might be helpful, recognizing both the insight to be gained and their limitations. For example, mathematically proficient high school students analyze graphs of functions and solutions generated using a graphing calculator. They detect possible errors by strategically using estimation and other mathematical knowledge. When making mathematical models, they know that technology can enable them to visualize the results of varying assumptions, explore consequences, and compare predictions with data. Mathematically proficient students at various grade levels are able to identify relevant external mathematical resources, such as digital content located on a website, and use them to pose or solve problems. They are able to use technological tools to explore and deepen their understanding of concepts.

**Use appropriate tools strategically.**

Mathematically proficient students try to communicate precisely to others. They try to use clear definitions in discussion with others and in their own reasoning. They state the meaning of the symbols they choose, including using the equal sign consistently and appropriately. They are careful about specifying units of measure, and labeling axes to clarify the correspondence with quantities in a problem. They calculate accurately and efficiently, express numerical answers with a degree of precision appropriate for the problem context. In the elementary grades, students give carefully formulated explanations to each other. By the time they reach high school they have learned to examine claims and make explicit use of definitions.

**Attend to precision.**

Mathematically proficient students look closely to discern a pattern or structure. Young students, for example, might notice that three and seven more is the same amount as seven and three more, or they may sort a collection of shapes according to how many sides the shapes have. Later, students will see 7 \times 8 equals the well remembered 7 \times 5 + 7, in preparation for learning about the distributive property. In the expression x^2 + 9x + 14, older students can see the 14 as 2 \times 7 and the 9 as 2 + 7. They recognize the significance of an existing line in a geometric figure and use the strategy of drawing an auxiliary line for solving problems. They also can step back for an overview and shift perspective. They can see complicated things, such as some algebraic expressions, as single objects or as being composed of several objects. For example, they can see 5 – 3(x – y)^2 as 5 minus a positive number times a square and use that to realize that its value cannot be more than 5 for any real numbers x and y.

**Look for and make use of structure.**

Mathematically proficient students notice if calculations are repeated, and look both for general methods and for shortcuts. Upper elementary students might notice when dividing 25 by 11 that they are repeating the same calculations over and over again, and conclude they have a repeating decimal. By paying attention to the calculation of slope as they repeatedly check whether points are on the line through (1, 2) with slope 3, middle school students might abstract the equation \( y = 23(x – 1) = 3 \). Noticing the regularity in the way terms cancel when expanding \( (x – 1)(x + 1) \), \((x – 1)x^2 + x + 1\), and \((x – 1)x^2 + x^2 + x + 1\) might lead them to the general formula for the sum of a geometric series. As they work to solve a problem, mathematically proficient students maintain oversight of the process, while attending to the details. They continually evaluate the reasonableness of their intermediate results.
<table>
<thead>
<tr>
<th>Standard Relation to Course: Supporting</th>
</tr>
</thead>
<tbody>
<tr>
<td>HE.912.C.1.4:</td>
</tr>
<tr>
<td><strong>Clarifications:</strong> Mandatory passenger-restraint/helmet laws, refusal skills, mandatory immunizations, healthy relationship skills, and improved inspection of food sources.</td>
</tr>
<tr>
<td>HE.912.C.1.5:</td>
</tr>
<tr>
<td><strong>Clarifications:</strong> Health prevention, detection, and treatment of breast and testicular cancer, suicide, obesity, and industrial-related chronic disease.</td>
</tr>
<tr>
<td>HE.912.C.1.8:</td>
</tr>
<tr>
<td><strong>Clarifications:</strong> Risks associated with alcohol abuse, including poison, date rape, and death; cancer and chronic lung disease related to tobacco use; overdose from drug use; child abuse or neglect; and dating violence.</td>
</tr>
<tr>
<td>SS.912.C.2.4:</td>
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<tr>
<td><strong>Clarifications:</strong> Analyze the impact of citizen participation as a means of achieving political and social change.</td>
</tr>
<tr>
<td>SS.912.C.2.8:</td>
</tr>
<tr>
<td><strong>Clarifications:</strong> Examples are e-mail campaigns, boycotts, blogs, podcasts, protests, demonstrations, letters to editors.</td>
</tr>
<tr>
<td>SS.912.C.2.13:</td>
</tr>
<tr>
<td><strong>Clarifications:</strong> Examples are political cartoons, propaganda, campaign advertisements, political speeches, electronic bumper stickers, blogs, media.</td>
</tr>
<tr>
<td>ELD.K12.ELL.SC.1:</td>
</tr>
<tr>
<td><strong>Clarifications:</strong> English language learners communicate information, ideas and concepts necessary for academic success in the content area of Science.</td>
</tr>
<tr>
<td>ELD.K12.ELL.SI.1:</td>
</tr>
<tr>
<td><strong>Clarifications:</strong> English language learners communicate for social and instructional purposes within the school setting.</td>
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</tbody>
</table>

### General Course Information and Notes

**GENERAL NOTES**

Laboratory investigations that include the use of scientific inquiry, research, measurement, problem solving, laboratory apparatus and technologies, experimental procedures, and safety procedures are an integral part of this course. The National Science Teachers Association (NSTA) recommends that at the high school level, all subject areas implement the following strategies on a routine basis:

- Sterilizing, handling and safety requirements according to standard operating procedures;
- The preparation of buffer solutions and agarose gels for horizontal electrophoresis;
- The preparation of solutions for spectroscopy;
- Use a spectrophotometer to measure solution concentrations and graph standard curves;
- Bacterial transformation and ligation using the Green fluorescent protein gene;
- Extraction of DNA;
- Quantitative analysis of DNA molecular weights;
- Polymerase chain reactions using given primers;
- Simulate DNA fingerprinting techniques used in crime scene analysis using given gene sequences.

**Honors and Advanced Level Course Note:** Advanced courses require a greater demand on students through increased academic rigor. Academic rigor is obtained through the application, analysis, evaluation, and creation of complex ideas that are often abstract and multi-faceted. Students are challenged to think and collaborate critically on the content they are learning. Honors level rigor will be achieved by increasing text complexity through text selection, focus on high-level qualitative measures, and complexity of task. Instruction will be structured to give students a deeper understanding of conceptual themes and organization within and across disciplines. Academic rigor is more than simply assigning to students a greater quantity of work.

**Instructional Practices**

Teaching from a range of complex text is optimized when teachers in all subject areas implement the following strategies on a routine basis:

1. Ensuring wide reading from complex text that varies in length.
2. Making close reading and rereading of texts central to lessons.
3. Emphasizing text-specific complex questions, and cognitively complex tasks, reinforce focus on the text and cultivate independence.
4. Emphasizing students supporting answers based upon evidence from the text.
5. Providing extensive research and writing opportunities (claims and evidence).

- Asking questions (for science) and defining problems (for engineering).
- Developing and using models.
- Planning and carrying out investigations.
- Analyzing and interpreting data.
- Using mathematics, information and computer technology, and computational thinking.
- Constructing explanations (for science) and designing solutions (for engineering).
- Engaging in argument from evidence.
- Obtaining, evaluating, and communicating information.

Literacy Standards in Science

Secondary science courses include reading standards for literacy in science and technical subjects 6-12 and writing standards for literacy in history/social studies, science, and technical subjects 6-12. The courses also include speaking and listening standards. For a complete list of standards required for this course click on the blue tile labeled course standards. You may also download the complete course including all required standards and notes sections using the export function located at the top of this page.

English Language Development ELD Standards Special Notes Section:

Teachers are required to provide listening, speaking, reading and writing instruction that allows English language learners (ELL) to communicate information, ideas and concepts for academic success in the content area of Science. For the given level of English language proficiency and with visual, graphic, or interactive support, students will interact with grade level words, expressions, sentences and discourse to process or produce language necessary for academic success. The ELD standard should specify a relevant content area concept or topic of study chosen by curriculum developers and teachers which maximizes an ELL's need for communication and social skills. To access an ELL supporting document which delineates performance definitions and descriptors, please click on the following link: https://cpalmsmediaprod.blob.core.windows.net/uploads/docs/standards/eld/sc.pdf

GENERAL INFORMATION

Course Number: 2000500
Course Path: Section: Grades PreK to 12 Education
Courses > Grade Group: Grades 9 to 12 and Adult
Education Courses > Subject: Science
Science > SubSubject: Biological Sciences
Abbreviated Title: BIOSCIENCE 1 HON
Course Length: Year (Y)
Course Attributes: Honors
Class Size Core Required
Course Level: 3
Grade Level(s): 9,10,11,12
Graduation Requirement: Equally Rigorous Science

Educator Certifications

Biology (Grades 6-12)
Chemistry (Grades 6-12)
Describe how viruses and bacteria transfer genetic material between cells and the role of this process in biotechnology.

Describe the scientific theory of cells (cell theory) and relate the history of its discovery to the process of science.

Explain the significance of genetic factors, environmental factors, and the role of metabolic processes in the development of living organisms.

Describe the important structural characteristics of monosaccharides, disaccharides, and polysaccharides and explain the functions of carbohydrates in living things.

Describe the basic process of DNA replication and how it relates to the transmission and conservation of the genetic information.

Explain how mutations in the DNA sequence may or may not result in phenotypic change. Explain how mutations in gametes may result in phenotypic changes in offspring.

Explain the basic processes of transcription and translation, and how they result in the expression of genes.

Discuss the mechanisms for regulation of gene expression in prokaryotes and eukaryotes at transcription and translation levels.

Describe how viruses and bacteria transfer genetic material between cells and the role of this process in biotechnology.

Explain the relationship between mutation, cell cycle, and uncontrolled cell growth potentially resulting in cancer.

Explain how and why the genetic code is universal and is common to almost all organisms.

Relate structure to function for the components of plant and animal cell membranes.

Describe how mutation and genetic recombination increase genetic variation.

Evaluate the impact of biotechnology on the individual, society and the environment, including medical and ethical issues.

Describe instances in which scientists’ varied backgrounds, talents, interests, and goals influence the inferences and thus the explanations that they make about observations of natural phenomena and describe that competing interpretations (explanations) of scientists are a strength of science as they are a source of new, testable ideas that have the potential to add new evidence to support one or another of the explanations.

Recognize that the strength or usefulness of a scientific claim is evaluated through scientific argumentation, which depends on critical and logical thinking, and the active consideration of alternative scientific explanations to explain the data presented.

Evaluate the merits of the explanations produced by others.

Pose answers, explanations, or descriptions of events, generate explanations that explicate or describe natural phenomena (inferences), use appropriate evidence and reasoning to justify these explanations to others, communicate results of scientific investigations, and evaluate the merits of the explanations produced by others.

Describe and provide examples of how similar investigations conducted in many parts of the world result in the same outcome.

Recognize the role of creativity in constructing scientific questions, methods and explanations.

Identify examples of pseudoscience (such as astrology, phrenology) in society.

Describe instances in which scientists’ varied backgrounds, talents, interests, and goals influence the inferences and thus the explanations that they make about observations of natural phenomena and describe that competing interpretations (explanations) of scientists are a strength of science as they are a source of new, testable ideas that have the potential to add new evidence to support one or another of the explanations.

Describe how basic DNA technology (restriction digestion by restriction endonucleases, gel electrophoresis, polymerase chain reaction, ligation, and transformation) is used to construct recombinant DNA molecules (DNA cloning).

Describe the basic molecular structures and primary functions of the four major categories of biological macromolecules.

Identify which questions can be answered through science and which questions are outside the boundaries of scientific investigation, such as questions addressed by other ways of knowing, such as art, literature, and public policy.

Recognize the role of creativity in constructing scientific questions, methods and explanations.

Describe how mutation and genetic recombination increase genetic variation.

Describe the basic processes of transcription and translation, and how they result in the expression of genes.

Discuss the mechanisms for regulation of gene expression in prokaryotes and eukaryotes at transcription and translation levels.

Describe how viruses and bacteria transfer genetic material between cells and the role of this process in biotechnology.

Explain the relationship between mutation, cell cycle, and uncontrolled cell growth potentially resulting in cancer.

Explain how and why the genetic code is universal and is common to almost all organisms.

Relate structure to function for the components of plant and animal cell membranes.

Describe how mutation and genetic recombination increase genetic variation.

Evaluate the impact of biotechnology on the individual, society and the environment, including medical and ethical issues.

Describe instances in which scientists’ varied backgrounds, talents, interests, and goals influence the inferences and thus the explanations that they make about observations of natural phenomena and describe that competing interpretations (explanations) of scientists are a strength of science as they are a source of new, testable ideas that have the potential to add new evidence to support one or another of the explanations.
Explain that a scientific theory is the culmination of many scientific investigations drawing together all the current evidence concerning a substantial range of phenomena; thus, a scientific theory represents the most powerful explanation scientists have to offer.

SC.912.N.3.2: Describe the role consensus plays in the historical development of a theory in any one of the disciplines of science.

SC.912.N.3.3: Explain that scientific laws are descriptions of specific relationships under given conditions in nature, but do not offer explanations for those relationships.

SC.912.N.3.4: Recognize that theories do not become laws, nor do laws become theories; theories are well supported explanations and laws are well supported descriptions.

SC.912.N.3.5: Describe the function of models in science, and identify the wide range of models used in science.

SC.912.N.4.1: Explain how scientific knowledge and reasoning provide an empirically-based perspective to inform society's decision making.

SC.912.N.4.2: Weigh the merits of alternative strategies for solving a specific societal problem by comparing a number of different costs and benefits, such as human, economic, and environmental.

SC.912.P.8.11: Relate acidity and basicity to hydronium and hydroxyl ion concentration and pH.

SC.912.P.8.12: Describe the properties of the carbon atom that make the diversity of carbon compounds possible.

SC.912.P.8.13: Identify selected functional groups and relate how they contribute to properties of carbon compounds.

Mathematicians who participate in effortful learning both individually and with others:
- Analyze the problem in a way that makes sense given the task.
- Ask questions that will help with solving the task.
- Build perseverance by modifying methods as needed while solving a challenging task.
- Stay engaged and maintain a positive mindset when working to solve tasks.
- Help and support each other when attempting a new method or approach.

Clarifications:
Teachers who encourage students to participate actively in effortful learning both individually and with others:
- Cultivate a community of growth mindset learners.
- Foster perseverance in students by choosing tasks that are challenging.
- Develop students' ability to analyze and solve problems.
- Recognize students' effort when solving challenging problems.

Mathematicians who demonstrate understanding by representing problems in multiple ways:
- Build understanding through modeling and using manipulatives.
- Represent solutions to problems in multiple ways using objects, drawings, tables, graphs and equations.
- Progress from modeling problems with objects and drawings to using algorithms and equations.
- Express connections between concepts and representations.
- Choose a representation based on the given context or purpose.

Clarifications:
Teachers who encourage students to demonstrate understanding by representing problems in multiple ways:
- Help students make connections between concepts and representations.
- Provide opportunities for students to use manipulatives when investigating concepts.
- Guide students from concrete to pictorial to abstract representations as understanding progresses.
- Show students that various representations can have different purposes and can be useful in different situations.

Complete tasks with mathematical fluency.
Mathematicians who complete tasks with mathematical fluency:
- Select efficient and appropriate methods for solving problems within the given context.
- Maintain flexibility and accuracy while performing procedures and mental calculations.
- Complete tasks accurately and with confidence.
- Adapt procedures to apply them to a new context.
- Use feedback to improve efficiency when performing calculations.

Clarifications:
Teachers who encourage students to complete tasks with mathematical fluency:
- Provide students with the flexibility to solve problems by selecting a procedure that allows them to solve efficiently and accurately.
- Offer multiple opportunities for students to practice efficient and generalizable methods.
- Provide opportunities for students to reflect on the method they used and determine if a more efficient method could have been used.

Engage in discussions that reflect on the mathematical thinking of self and others.
Mathematicians who engage in discussions that reflect on the mathematical thinking of self and others:
- Communicate mathematical ideas, vocabulary and methods effectively.
- Analyze the mathematical thinking of others.
- Compare the efficiency of a method to those expressed by others.
- Recognize errors and suggest how to correctly solve the task.
- Justify results by explaining methods and processes.
- Construct possible arguments based on evidence.

Clarifications:
Teachers who encourage students to engage in discussions that reflect on the mathematical thinking of self and others:
- Establish a culture in which students ask questions of the teacher and their peers, and error is an opportunity for learning.
- Create opportunities for students to discuss their thinking with peers.
- Select, sequence and present student work to advance and deepen understanding of correct and increasingly efficient methods.
- Develop students' ability to justify methods and compare their responses to the responses of their peers.

Use patterns and structure to help understand and connect mathematical concepts.
Mathematicians who use patterns and structure to help understand and connect mathematical concepts:
Focus on relevant details within a problem.
Create plans and procedures to logically order events, steps or ideas to solve problems.
Decompose a complex problem into manageable parts.
Relate previously learned concepts to new concepts.
Look for similarities among problems.
Connect solutions of problems to more complicated large-scale situations.

Clarifications:
Teachers who encourage students to use patterns and structure to help understand and connect mathematical concepts:
- Help students recognize the patterns in the world around them and connect these patterns to mathematical concepts.
- Support students to develop generalizations based on the similarities found among problems.
- Provide opportunities for students to create plans and procedures to solve problems.
- Develop students' ability to construct relationships between their current understanding and more sophisticated ways of thinking.

Assess the reasonableness of solutions.
Mathematicians who assess the reasonableness of solutions:
- Estimate to discover possible solutions.
- Use benchmark quantities to determine if a solution makes sense.
- Check calculations when solving problems.
- Verify possible solutions by explaining the methods used.
- Evaluate results based on the given context.

Clarifications:
Teachers who encourage students to assess the reasonableness of solutions:
- Have students estimate or predict solutions prior to solving.
- Prompt students to continually ask, "Does this solution make sense? How do you know?"
- Reinforce that students check their work as they progress within and after a task.
- Strengthen students' ability to verify solutions through justifications.

Apply mathematics to real-world contexts.
Mathematicians who apply mathematics to real-world contexts:
- Connect mathematical concepts to everyday experiences.
- Use models and methods to understand, represent and solve problems.
- Perform investigations to gather data or determine if a method is appropriate. • Redesign models and methods to improve accuracy or efficiency.

Clarifications:
Teachers who encourage students to apply mathematics to real-world contexts:
- Provide opportunities for students to create models, both concrete and abstract, and perform investigations.
- Challenge students to question the accuracy of their models and methods.
- Support students as they validate conclusions by comparing them to the given situation.
- Indicate how various concepts can be applied to other disciplines.

Cite evidence to explain and justify reasoning.

Clarifications:
K-1 Students include textual evidence in their oral communication with guidance and support from adults. The evidence can consist of details from the text without naming the text. During 1st grade, students learn how to incorporate the evidence in their writing.
2-3 Students include relevant textual evidence in their written and oral communication. Students should name the text when they refer to it. In 3rd grade, students should use a combination of direct and indirect citations.
4-5 Students continue with previous skills and reference comments made by speakers and peers. Students cite texts that they've directly quoted, paraphrased, or used for information. When writing, students will use the form of citation dictated by the instructor or the style guide referenced by the instructor.
6-8 Students continue with previous skills and use a style guide to create a proper citation.
9-12 Students continue with previous skills and should be aware of existing style guides and the ways in which they differ.

Read and comprehend grade-level complex texts proficiently.

Clarifications:
See Text Complexity for grade-level complexity bands and a text complexity rubric.

Make inferences to support comprehension.

Clarifications:
Students will make inferences before the words infer or inference are introduced. Kindergarten students will answer questions like "Why is the girl smiling?" or make predictions about what will happen based on the title page. Students will use the terms and apply them in 2nd grade and beyond.

Use appropriate collaborative techniques and active listening skills when engaging in discussions in a variety of situations.

Clarifications:
In kindergarten, students learn to listen to one another respectfully.
In grades 1-2, students build upon these skills by justifying what they are thinking. For example: "I think ______ because ______." The collaborative conversations are becoming academic conversations.
In grades 3-12, students engage in academic conversations discussing claims and justifying their reasoning, refining and applying skills. Students build on ideas, propel the conversation, and support claims and counterclaims with evidence.

Use the accepted rules governing a specific format to create quality work.
Evaluate, take, and defend positions on issues that cause the English language learners to communicate for social and instructional purposes within the school setting.

**ELA.K12.EE.5.1:**

- **Clarifications:** Students will incorporate skills learned into work products to produce quality work. For students to incorporate these skills appropriately, they must receive instruction. A 3rd grade student creating a poster board display must have instruction in how to effectively present information to do quality work.

Use appropriate voice and tone when speaking or writing.

**ELA.K12.EE.6.1:**

- **Clarifications:** In kindergarten and 1st grade, students learn the difference between formal and informal language. For example, the way we talk to our friends differs from the way we speak to adults. In 2nd grade and beyond, students practice appropriate social and academic language to discuss texts.

Propose strategies to reduce or prevent injuries and health problems.

**HE.912.C.1.4:**

- **Clarifications:** Mandatory passenger-restraint/helmet laws, refusal skills, mandatory immunizations, healthy relationship skills, and improved inspection of food sources.

Analyze strategies for prevention, detection, and treatment of communicable and chronic diseases.

**HE.912.C.1.5:**

- **Clarifications:** Health prevention, detection, and treatment of: breast and testicular cancer, suicide, obesity, and industrial-related chronic disease.

Assess the degree of susceptibility to injury, illness, or death if engaging in unhealthy/risky behaviors.

**HE.912.C.1.8:**

- **Clarifications:** Risks associated with alcohol abuse, including poison, date rape, and death; cancer and chronic lung disease related to tobacco use; overdose from drug use; child abuse or neglect; and dating violence.

Evaluate, take, and defend positions on issues that cause the government to balance the interests of individuals with the public good.

**SS.912.C.2.4:**

Analyze the impact of citizen participation as a means of achieving political and social change.

**SS.912.C.2.8:**

Analyze various forms of political communication and evaluate for bias, factual accuracy, omission, and emotional appeal.

**SS.912.C.2.13:**

Examples are political cartoons, propaganda, campaign advertisements, political speeches, electronic bumper stickers, blogs, media.

English language learners communicate information, ideas, and concepts necessary for academic success in the content area of Science.

**ELD.K12.ELL.SI.1:**

English language learners communicate for social and instructional purposes within the school setting.

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**General Course Information and Notes**

**GENERAL NOTES**

Laboratory investigations that include the use of scientific inquiry, research, measurement, problem solving, laboratory apparatus and technologies, experimental procedures, and safety procedures are an integral part of this course. The National Science Teachers Association (NSTA) recommends that at the high school level, all students should be in the science lab or field, collecting data every week. School laboratory investigations (labs) are defined by the National Research Council (NRC) as an experience in the laboratory, classroom, or the field that provides students with opportunities to interact directly with natural phenomena or with data collected by others using tools, materials, data collection techniques, and models (NRC, 2006, p. 3). Laboratory investigations in the high school classroom should help all students develop a growing understanding of the complexity and ambiguity of empirical work, as well as the skills to calibrate and troubleshoot equipment used to make observations. Learners should understand measurement error; and have the skills to aggregate, interpret, and present the resulting data (National Research Council, 2006, p.77; NSTA, 2007).

Bioscience I is a laboratory based course that focuses on introducing students to the basic lab techniques, equipment, critical thinking, work ethics, and communication skills currently used in the medical, agricultural, marine and industrial bioscience fields. Students will gain an understanding of basic DNA and molecular biology, epigenetics, genetically modified foods, bacterial plasmids, and forensics. Students will learn the principles, methodologies, and applications of equipment such as thermocyclers, horizontal gel electrophoresis apparatus, micropipettes, spectrophotometers, centrifuges, etc. Students will gain proficiency in calculating, preparing, and pH control of common lab reagents, solutions, buffers, and agarose gels. Students will learn the principles of qualitative and quantitative analysis using biomolecular indicators, spectrophotometry, and standard curves. Topics covered will include the genetics of cancer, epigenetics, emerging and re-emerging infectious diseases that affect plants and animals, ethics of bioscience, and careers in bioscience.

Laboratory activities should include but not be limited to:

- Sterilization, handling and safety requirements according to standard operating procedures;
- The preparation of buffer solutions and agarose gels for horizontal electrophoresis;
- The preparation of solutions for spectrophotometry;
- Use a spectrophotometer to measure solution concentrations and graph standard curves;
- Bacterial transformation and ligation using the Green fluorescent protein gene;
- Extraction of DNA;
- Quantitative analysis of DNA molecular weights;
- Polymerase chain reactions using given primers;
- Simulate DNA fingerprinting techniques used in crime scene analysis using given gene sequences.

**Honors and Advanced Level Course Note:** Advanced courses require a greater demand on students through increased academic rigor. Academic rigor is obtained through the application, analysis, evaluation, and creation of complex ideas that are often abstract and multi-faceted. Students are challenged to think and collaborate critically on the content they are learning. Honors level rigor will be achieved by increasing text complexity through text selection, focus on high-level qualitative measures, and complexity of task. Instruction will be structured to give students a deeper understanding of conceptual themes and organization within and across disciplines. Academic rigor is more than simply assigning to students a greater quantity of work.

**Special Notes:**

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**Instructional Practices**
Teaching from a range of complex text is optimized when teachers in all subject areas implement the following strategies on a routine basis:

1. Ensuring wide reading from complex text that varies in length.
2. Making close reading and rereading of texts central to lessons.
3. Emphasizing text-specific complex questions, and cognitively complex tasks, reinforce focus on the text and cultivate independence.
4. Emphasizing students supporting answers based upon evidence from the text
5. Providing extensive research and writing opportunities (claims and evidence).

Prerequisite: Honors Biology
Corequisite: Honors Chemistry

- Asking questions (for science) and defining problems (for engineering).
- Developing and using models.
- Planning and carrying out investigations.
- Analyzing and interpreting data.
- Using mathematics, information and computer technology, and computational thinking.
- Constructing explanations (for science) and designing solutions (for engineering).
- Engaging in argument from evidence.
- Obtaining, evaluating, and communicating information.

Florida's Benchmarks for Excellent Student Thinking (B.E.S.T.) Standards

This course includes Florida's B.E.S.T. ELA Expectations (EE) and Mathematical Thinking and Reasoning Standards (MTRs) for students. Florida educators should intentionally embed these standards within the content and their instruction as applicable. For guidance on the implementation of the EEs and MTRs, please visit https://www.cpalms.org/Standards/BEST_Standards.aspx and select the appropriate B.E.S.T. Standards package.

English Language Development ELD Standards Special Notes Section:
Teachers are required to provide listening, speaking, reading and writing instruction that allows English language learners (ELL) to communicate information, ideas and concepts for academic success in the content area of Science. For the given level of English language proficiency and with visual, graphic, or interactive support, students will interact with grade level words, expressions, sentences and discourse to process or produce language necessary for academic success. The ELD standard should specify a relevant content area concept or topic of study chosen by curriculum developers and teachers which maximizes an ELL's need for communication and social skills. To access an ELL supporting document which delineates performance definitions and descriptors, please click on the following link: https://cpalmsmediaprod.blob.core.windows.net/uploads/docs/standards/eld/sc.pdf

GENERAL INFORMATION

Course Number: 2000500
Number of Credits: One (1) credit
Course Type: Core Academic Course
Course Status: State Board Approved
Grade Level(s): 9,10,11,12
Graduation Requirement: Equally Rigorous Science

Course Path: Section: Grades PreK to 12 Education
Courses: > Grade Group: Grades 9 to 12 and Adult Education Courses: > Subject: Science
> SubSubject: Biological Sciences
Abbreviated Title: BIOSCIENCE 1 HON
Course Length: Year (Y)
Course Attributes:
- Honors
- Class Size Core Required
Course Level: 3

Educator Certifications
- Biology (Grades 6-12)
- Chemistry (Grades 6-12)
Explain how mutations in the DNA sequence may or may not result in phenotypic change. Explain how mutations in gametes may result in phenotypic changes in offspring.

Discuss the mechanisms for regulation of gene expression in prokaryotes and eukaryotes at transcription and translation level.

Explain how and why the genetic code is universal and is common to almost all organisms.

Describe the structures of fatty acids, triglycerides, phospholipids, and steroids. Explain the functions of lipids in living organisms. Identify some reactions that fatty acids undergo. Relate the structure and function of cell membranes.

Define a problem based on a specific body of knowledge, for example: biology, chemistry, physics, and earth/space science, and do the following:
1. Pose questions about the natural world, (Articulate the purpose of the investigation and identify the relevant scientific concepts).
2. Conduct systematic observations, (Write procedures that are clear and replicable. Identify observables and examine relationships between test (independent) variable and outcome (dependent) variable. Employ appropriate methods for accurate and consistent observations; conduct and record measurements at appropriate levels of precision. Follow safety guidelines).
3. Examine books and other sources of information to see what is already known,
4. Review what is known in light of empirical evidence, (Examine whether available empirical evidence can be interpreted in terms of existing knowledge and models, and if not, modify or develop new models).
5. Plan investigations, (Design and evaluate a scientific investigation).
6. Use tools to gather, analyze, and interpret data (this includes the use of measurement in metric and other systems, and also the generation and interpretation of graphical representations of data, including data tables and graphs), (Collect data or evidence in an organized way. Properly use instruments, equipment, and materials (e.g., scales, probeware, meter sticks, microscopes, computers) including set-up, calibration, technique, maintenance, and storage).
7. Pose answers, explanations, or descriptions of events,
8. Generate explanations that explicate or describe natural phenomena (inferences),
9. Use appropriate evidence and reasoning to justify these explanations to others,
10. Communicate results of scientific investigations, and
11. Evaluate the merits of the explanations produced by others.

Describe the processes of inheritance, including dominant, recessive, codominant, sex-linked, polygenic, and multiple alleles.

Describe how mutation and genetic recombination increase genetic variation.

Describe the basic process of DNA replication and how it relates to the transmission and conservation of the genetic information.

Explain how and why the genetic code is universal and is common to almost all organisms.

Discuss the scientific theory of cells (cell theory) and relate the history of its discovery to the process of science.

Describe the basic molecular structures and primary functions of the four major categories of biological macromolecules.

Discuss observed inheritance patterns caused by various modes of inheritance, including dominant, recessive, codominant, sex-linked, polygenic, and multiple alleles.

Describe how viruses and bacteria transfer genetic material between cells and the role of this process in biotechnology.

Describe and explain what characterizes science and its methods.

Identify examples of pseudoscience (such as astrology, phrenology) in society.
SC.912.N.3.1: Explain that a scientific theory is the culmination of many scientific investigations drawing together all the current evidence concerning a substantial range of phenomena; thus, a scientific theory represents the most powerful explanation scientists have to offer.

SC.912.N.3.2: Describe the role consensus plays in the historical development of a theory in any one of the disciplines of science.

SC.912.N.3.3: Explain that scientific laws are descriptions of specific relationships under given conditions in nature, but do not offer explanations for those relationships.

SC.912.N.3.4: Recognize that theories do not become laws, nor do laws become theories; theories are well supported explanations and laws are well supported descriptions.

SC.912.N.3.5: Describe the function of models in science, and identify the wide range of models used in science.

SC.912.N.4.1: Explain how scientific knowledge and reasoning provide an empirically-based perspective to inform society's decision making.

SC.912.N.4.2: Weigh the merits of alternative strategies for solving a specific societal problem by comparing a number of different costs and benefits, such as human, economic, and environmental.

SC.912.P.8.11: Relate acidity and basicity to hydronium and hydroxyl ion concentration and pH.

SC.912.P.8.12: Describe the properties of the carbon atom that make the diversity of carbon compounds possible.

SC.912.P.8.13: Identify selected functional groups and relate how they contribute to properties of carbon compounds.

**MA.K12.MTR.1.1:** Mathematicians who participate in effortful learning both individually and with others:
- Analyze the problem in a way that makes sense given the task.
- Ask questions that will help with solving the task.
- Build perseverance by modifying methods as needed while solving a challenging task.
- Stay engaged and maintain a positive mindset when working to solve tasks.
- Help and support each other when attempting a new method or approach.

**Clarifications:**
Teachers who encourage students to participate actively in effortful learning both individually and with others:
- Cultivate a community of growth mindset learners.
- Foster perseverance in students by choosing tasks that are challenging.
- Develop students' ability to analyze and problem solve.
- Recognize students' effort when solving challenging problems.

**MA.K12.MTR.2.1:** Demonstrate understanding by representing problems in multiple ways. Mathematicians who demonstrate understanding by representing problems in multiple ways:
- Build understanding through modeling and using manipulatives.
- Represent solutions to problems in multiple ways using objects, drawings, tables, graphs and equations.
- Progress from modeling problems with objects and drawings to using algorithms and equations.
- Express connections between concepts and representations.
- Choose a representation based on the given context or purpose.

**Clarifications:**
Teachers who encourage students to demonstrate understanding by representing problems in multiple ways:
- Help students make connections between concepts and representations.
- Provide opportunities for students to use manipulatives when investigating concepts.
- Guide students from concrete to pictorial to abstract representations as understanding progresses.
- Show students that various representations can have different purposes and can be useful in different situations.

**MA.K12.MTR.3.1:** Complete tasks with mathematical fluency. Mathematicians who complete tasks with mathematical fluency:
- Select efficient and appropriate methods for solving problems within the given context.
- Maintain flexibility and accuracy while performing procedures and mental calculations.
- Complete tasks accurately and with confidence.
- Adapt procedures to apply them to a new context.
- Use feedback to improve efficiency when performing calculations.

**Clarifications:**
Teachers who encourage students to complete tasks with mathematical fluency:
- Provide students with the flexibility to solve problems by selecting a procedure that allows them to solve efficiently and accurately.
- Offer multiple opportunities for students to practice efficient and generalizable methods.
- Provide opportunities for students to reflect on the method they used and determine if a more efficient method could have been used.

**MA.K12.MTR.4.1:** Engage in discussions that reflect on the mathematical thinking of self and others. Mathematicians who engage in discussions that reflect on the mathematical thinking of self and others:
- Communicate mathematical ideas, vocabulary and methods effectively.
- Analyze the mathematical thinking of others.
- Compare the efficiency of a method to those expressed by others.
- Recognize errors and suggest how to correctly solve the task.
- Justify results by explaining methods and processes.
- Construct possible arguments based on evidence.

**Clarifications:**
Teachers who encourage students to engage in discussions that reflect on the mathematical thinking of self and others:
- Establish a culture in which students ask questions of the teacher and their peers, and error is an opportunity for learning.
- Create opportunities for students to discuss their thinking with peers.
- Select, sequence and present student work to advance and deepen understanding of correct and increasingly efficient methods.
- Develop students' ability to justify methods and compare their responses to the responses of their peers.

Use patterns and structure to help understand and connect mathematical concepts. Mathematicians who use patterns and structure to help understand and connect mathematical concepts:
- Focus on relevant details within a problem.
- Create plans and procedures to logically order events, steps or ideas to solve problems.
- Decompose a complex problem into manageable parts.
- Relate previously learned concepts to new concepts.
- Look for similarities among problems.
- Connect solutions of problems to more complicated large-scale situations.

**Clarifications:**
Teachers who encourage students to use patterns and structure to help understand and connect mathematical concepts:
- Help students recognize the patterns in the world around them and connect these patterns to mathematical concepts.
- Support students to develop generalizations based on the similarities found among problems.
- Provide opportunities for students to create plans and procedures to solve problems.
- Develop students' ability to construct relationships between their current understanding and more sophisticated ways of thinking.

**MA.K12.MTR.5.1:**

- Assess the reasonableness of solutions.

**Clarifications:**
Mathematicians who assess the reasonableness of solutions:
- Estimate to discover possible solutions.
- Use benchmark quantities to determine if a solution makes sense.
- Check calculations when solving problems.
- Verify possible solutions by explaining the methods used.
- Evaluate results based on the given context.

**MA.K12.MTR.6.1:**

- Apply mathematics to real-world contexts.

**Clarifications:**
Mathematicians who apply mathematics to real-world contexts:
- Connect mathematical concepts to everyday experiences.
- Use models and methods to understand, represent and solve problems.
- Perform investigations to gather data or determine if a method is appropriate. • Redesign models and methods to improve accuracy or efficiency.

**MA.K12.MTR.7.1:**

- Cite evidence to explain and justify reasoning.

**Clarifications:**
K-1 Students include textual evidence in their oral communication with guidance and support from adults. The evidence can consist of details from the text without naming the text. During 1st grade, students learn how to incorporate the evidence in their writing.
2-3 Students include relevant textual evidence in their written and oral communication. Students should name the text when they refer to it. In 3rd grade, students should use a combination of direct and indirect citations.
4-5 Students continue with previous skills and reference comments made by speakers and peers. Students cite texts that they've directly quoted, paraphrased, or used for information. When writing, students will use the form of citation dictated by the instructor or the style guide referenced by the instructor.
6-8 Students continue with previous skills and use a style guide to create a proper citation.
9-12 Students continue with previous skills and should be aware of existing style guides and the ways in which they differ.

**ELA.K12.EE.1.1:**

- Read and comprehend grade-level complex texts proficiently.

**Clarifications:**
See Text Complexity for grade-level complexity bands and a text complexity rubric.

**ELA.K12.EE.2.1:**

- Make inferences to support comprehension.

**Clarifications:**
Students will make inferences before the words infer or inference are introduced. Kindergarten students will answer questions like "Why is the girl smiling?" or make predictions about what will happen based on the title page. Students will use the terms and apply them in 2nd grade and beyond.

**ELA.K12.EE.3.1:**

- Use appropriate collaborative techniques and active listening skills when engaging in discussions in a variety of situations.

**Clarifications:**
In kindergarten, students learn to listen to one another respectfully.
In grades 1-2, students build upon these skills by justifying what they are thinking. For example: "I think _____ because _____." The collaborative conversations are becoming academic conversations.
In grades 3-12, students engage in academic conversations discussing claims and justifying their reasoning, refining and applying skills. Students build on ideas, propel the conversation, and support claims and counterclaims with evidence.

**ELA.K12.EE.4.1:**

- Use the accepted rules governing a specific format to create quality work.
General Course Information and Notes

GENERAL NOTES

Laboratory investigations that include the use of scientific inquiry, research, measurement, problem solving, laboratory apparatus and technologies, experimental procedures, and safety procedures are an integral part of this course. The National Science Teachers Association (NSTA) recommends that at the high school level, all students should be in the science lab or field, collecting data every week. School laboratory investigations (labs) are defined by the National Research Council (NRC) as an experience in the laboratory, classroom, or the field that provides students with opportunities to interact directly with natural phenomena or with data collected by others using tools, materials, data collection techniques, and models (NRC, 2006, p. 3). Laboratory investigations in the high school classroom should help all students develop a growing understanding of the complexity and ambiguity of empirical work, as well as the skills to calibrate and troubleshoot equipment used to make observations. Learners should understand measurement error; and have the skills to aggregate, interpret, and present the resulting data (National Research Council, 2006, p.77; NSTA, 2007).

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Laboratory activities should include but not be limited to:

- Sterilization, handling and safety requirements according to standard operating procedures;
- The preparation of buffer solutions and agarose gels for horizontal electrophoresis;
- The preparation of solutions for spectroscopy;
- Use a spectrophotometer to measure solution concentrations and graph standard curves;
- Bacterial transformation and ligation using the Green fluorescent protein gene;
- Extraction of DNA;
- Quantitative analysis of DNA molecular weights;

- Use appropriate voice and tone when speaking or writing.
- Students will incorporate skills learned into work products to produce quality work. Students will also perform experiments to determine the effects of modified conditions on a given phenomenon. Experimental design allows students to formulate a hypothesis and test it through data collection and analysis. Students are encouraged to analyze their data critically and to determine conclusions.

- English language learners communicate information, ideas and concepts for social and instructional purposes within the school setting.

- Propose strategies to reduce or prevent injuries and health problems.

- Analyze strategies for prevention, detection, and treatment of communicable and chronic diseases.

- Assess the degree of susceptibility to injury, illness, or death if engaging in unhealthy/risky behaviors.

- Evaluate, take and defend objective, evidence-based positions on issues that cause the government to balance the interests of individuals with the public good.

- Identify legal methods that citizens can use to promote social and political change (e.g., voting, peaceful protests, petitioning, demonstrations, contacting government offices).

- Identify historical examples of citizens achieving or preventing political and social change through civic engagement (e.g., the Abolitionist Movement).

- Analyze the impact of civic engagement as a means of preserving or reforming institutions.

- Evaluate political communication for bias, factual accuracy, omission and emotional appeal.

- Students will examine situations when individuals' rights have been restricted for the public good (e.g., limits on speech or rationing of goods during wartime, enactment of the Patriot Act).

- Students will analyze how environmental and financial policies place limitations on citizens and private industry for the public good.

- Students will explain different services provided by local, state and national governments to citizens to ensure their rights are protected (e.g., social services, law enforcement, defense, emergency response).

- Students will compare the reporting on the same political event or issue from multiple perspectives.

- Students will identify various forms of propaganda (e.g., plain folks, glittering generalities, testimonial, fear, logical fallacies).

- Students will discuss the historical impact of political communication on American political process and public opinion.

- Examples of political communication may include, but are not limited to, political cartoons, propaganda, campaign advertisements, political speeches, bumper stickers, blogs, press and social media.

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Educator Certifications
Biology (Grades 6-12)
Chemistry (Grades 6-12)

Polymerase chain reactions using given primers;
Simulate DNA fingerprinting techniques used in crime scene analysis using given gene sequences.

Honors and Advanced Level Course Note: Advanced courses require a greater demand on students through increased academic rigor. Academic rigor is obtained through the application, analysis, evaluation, and creation of complex ideas that are often abstract and multi-faceted. Students are challenged to think and collaborate critically on the content they are learning. Honors level rigor will be achieved by increasing text complexity through text selection, focus on high-level qualitative measures, and complexity of task. Instruction will be structured to give students a deeper understanding of conceptual themes and organization within and across disciplines. Academic rigor is more than simply assigning to students a greater quantity of work.

Special Notes:

Instructional Practices
Teaching from a range of complex text is optimized when teachers in all subject areas implement the following strategies on a routine basis:

1. Ensuring wide reading from complex text that varies in length.
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4. Emphasizing students supporting answers based upon evidence from the text.
5. Providing extensive research and writing opportunities (claims and evidence).

Prerequisite: Honors Biology
Corequisite: Honors Chemistry


- Asking questions (for science) and defining problems (for engineering).
- Developing and using models.
- Planning and carrying out investigations.
- Analyzing and interpreting data.
- Using mathematics, information and computer technology, and computational thinking.
- Constructing explanations (for science) and designing solutions (for engineering).
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English Language Development ELD Standards Special Notes Section:

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GENERAL INFORMATION

Course Number: 2000500
Course Path: Grades PreK to 12 Education
Courses > Grade Group: Grades 9 to 12 and Adult Education Courses > Subject: Science > SubSubject: Biological Sciences
Abbreviated Title: BIOSCIENCE 1 HON

Number of Credits: One (1) credit
Course Length: Year (Y)

Course Type: Core Academic Course
Course Status: Draft - Course Pending Approval
Grade Level(s): 9,10,11,12
Graduation Requirement: Equally Rigorous Science

Educator Certifications

Biology (Grades 6-12)
Chemistry (Grades 6-12)
### Course Standards

<table>
<thead>
<tr>
<th>Name</th>
<th>Description</th>
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<tbody>
<tr>
<td>SC.912.L.14.6:</td>
<td>Explain the significance of genetic factors, environmental factors, and pathogenic agents to health from the perspectives of both individual and public health.</td>
</tr>
<tr>
<td>SC.912.L.14.52:</td>
<td>Explain the basic functions of the human immune system, including specific and nonspecific immune response, vaccines, and antibiotics.</td>
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<tr>
<td>SC.912.L.15.15:</td>
<td>Describe how mutation and genetic recombination increase genetic variation.</td>
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<tr>
<td>SC.912.L.16.4:</td>
<td>Explain how mutations in the DNA sequence may or may not result in phenotypic change. Explain how mutations in gametes may result in phenotypic changes in offspring.</td>
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<tr>
<td>SC.912.L.16.5:</td>
<td>Explain the basic processes of transcription and translation, and how they result in the expression of genes.</td>
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<tr>
<td>SC.912.L.16.6:</td>
<td>Discuss the mechanisms for regulation of gene expression in prokaryotes and eukaryotes at transcription and translation level.</td>
</tr>
<tr>
<td>SC.912.L.16.7:</td>
<td>Describe how viruses and bacteria transfer genetic material between cells and the role of this process in biotechnology.</td>
</tr>
<tr>
<td>SC.912.L.16.9:</td>
<td>Explain how and why the genetic code is universal and is common to almost all organisms.</td>
</tr>
<tr>
<td>SC.912.L.16.10:</td>
<td>Evaluate the impact of biotechnology on the individual, society, and the environment, including medical and ethical issues.</td>
</tr>
<tr>
<td>SC.912.L.16.12:</td>
<td>Describe how basic DNA technology (restriction digestion by endonucleases, gel electrophoresis, polymerase chain reaction, ligation, and transformation) is used to construct recombinant DNA molecules (DNA cloning).</td>
</tr>
<tr>
<td>SC.912.L.18.4:</td>
<td>Describe the structures of proteins and amino acids. Explain the functions of proteins in living organisms. Identify some reactions that amino acids undergo. Relate the structure and function of enzymes.</td>
</tr>
<tr>
<td>SC.912.N.1.1:</td>
<td>Define a problem based on a specific body of knowledge, for example: biology, chemistry, physics, and earth/space science, and do the following: 1. Pose questions about the natural world, (articulate the purpose of the investigation and identify the relevant scientific concepts). 2. Conduct systematic observations, (write procedures that are clear and replicable. Identify observables and examine relationships between test (independent) variable and outcome (dependent) variable. Employ appropriate methods for accurate and consistent observations; conduct and record measurements at appropriate levels of precision. Follow safety guidelines). 3. Examine books and other sources of information to see what is already known, 4. Review what is known in light of empirical evidence, (Examine whether available empirical evidence can be interpreted in terms of existing knowledge and models, and if not, modify or develop new models). 5. Plan investigations, (Design and evaluate a scientific investigation). 6. Use tools to gather, analyze, and interpret data (this includes the use of measurement in metric and other systems, and also the generation and interpretation of graphical representations of data, including data tables and graphs), (Collect data or evidence in an organized way. Properly use instruments, equipment, and materials (e.g., scales, probeware, meter sticks, microscopes, computers) including set-up, calibration, technique, maintenance, and storage). 7. Pose answers, explanations, or descriptions of events, 8. Generate explanations that explicate or describe natural phenomena (inferences), 9. Use appropriate evidence and reasoning to justify these explanations to others, 10. Communicate results of scientific investigations, and 11. Evaluate the merits of the explanations produced by others.</td>
</tr>
<tr>
<td>SC.912.N.1.2:</td>
<td>Describe and explain what characterizes science and its methods.</td>
</tr>
<tr>
<td>SC.912.N.1.3:</td>
<td>Recognize that the strength or usefulness of a scientific claim is evaluated through scientific argumentation, which depends on critical and logical thinking, and the active consideration of alternative scientific explanations to explain the data presented.</td>
</tr>
<tr>
<td>SC.912.N.1.4:</td>
<td>Identify sources of information and assess their reliability according to the strict standards of scientific investigation.</td>
</tr>
<tr>
<td>SC.912.N.1.5:</td>
<td>Describe and provide examples of how similar investigations conducted in many parts of the world result in the same outcome.</td>
</tr>
<tr>
<td>SC.912.N.1.6:</td>
<td>Describe how scientific inferences are drawn from scientific observations and provide examples from the content being studied.</td>
</tr>
<tr>
<td>SC.912.N.1.7:</td>
<td>Recognize the role of creativity in constructing scientific questions, methods and explanations.</td>
</tr>
<tr>
<td>SC.912.N.2.1:</td>
<td>Identify what is science, what clearly is not science, and what superficially resembles science (but fails to meet the criteria for science).</td>
</tr>
<tr>
<td>SC.912.N.2.2:</td>
<td>Identify which questions can be answered through science and which questions are outside the boundaries of scientific investigation, such as questions addressed by other ways of knowing, such as art, philosophy, and religion.</td>
</tr>
<tr>
<td>SC.912.N.2.3:</td>
<td>Identify examples of pseudoscience (such as astrology, phrenology) in society.</td>
</tr>
<tr>
<td>SC.912.N.2.4:</td>
<td>Explain that scientific knowledge is both durable and robust and open to change. Scientific knowledge can change because it is often examined and re-examined by new investigations and scientific argumentation. Because of these frequent examinations, scientific knowledge becomes stronger, leading to its durability.</td>
</tr>
<tr>
<td>SC.912.N.2.5:</td>
<td>Describe instances in which scientists’ varied backgrounds, talents, interests, and goals influence the inferences and thus the explanations that they make about observations of natural phenomena and describe that competing interpretations (explanations) of scientists are a strength of science as they are a source of new, testable ideas that have the potential to add new evidence to support one or another of the explanations.</td>
</tr>
<tr>
<td>SC.912.N.3.1:</td>
<td>Explain that a scientific theory is the culmination of many scientific investigations drawing together all the current evidence concerning a substantial range of phenomena; thus, a scientific theory represents the most powerful explanation scientists have to offer.</td>
</tr>
<tr>
<td>SC.912.N.3.2:</td>
<td>Describe the role consensus plays in the historical development of a theory in any one of the disciplines of science.</td>
</tr>
<tr>
<td>SC.912.N.3.3:</td>
<td>Explain that scientific laws are descriptions of specific relationships under given conditions in nature, but do not offer explanations for those relationships.</td>
</tr>
<tr>
<td>SC.912.N.3.4:</td>
<td>Recognize that theories do not become laws, nor do laws become theories; theories are well supported explanations and laws are well supported descriptions.</td>
</tr>
<tr>
<td>SC.912.N.3.5:</td>
<td>Describe the function of models in science, and identify the wide range of models used in science.</td>
</tr>
<tr>
<td>SC.912.N.4.1:</td>
<td>Explain how scientific knowledge and reasoning provide an empirically-based perspective to inform society’s decision making.</td>
</tr>
<tr>
<td>SC.912.N.4.2:</td>
<td>Weigh the merits of alternative strategies for solving a specific societal problem by comparing a number of different costs and benefits, such as human, economic, and environmental.</td>
</tr>
</tbody>
</table>
Relate acidity and basicity to hydronium and hydroxyl ion concentration and pH.

Cite specific textual evidence to support analysis of science and technical texts, attending to important distinctions the author makes and to any gaps or inconsistencies in the account.

Determine the central ideas or conclusions of a text; summarize complex concepts, processes, or information presented in a text by paraphrasing them in simpler but still accurate terms.

Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks; analyze the specific results based on explanations in the text.

Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 11–12 texts and topics.

Analyze how the text structures information or ideas into categories or hierarchies, demonstrating understanding of the information or ideas.

Analyze the author's purpose in providing an explanation, describing a procedure, or discussing an experiment in a text, identifying important issues that remain unresolved.

Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g., quantitative data, video, multimedia) in order to address a question or solve a problem.

Evaluate the hypotheses, data, analysis, and conclusions in a science or technical text, verifying the data when possible and corroborating or challenging conclusions with other sources of information.

Synthesize information from a range of sources (e.g., texts, experiments, simulations) into a coherent understanding of a process, phenomenon, or concept, resolving conflicting information when possible.

By the end of grade 12, read and comprehend science/technical texts in the grades 11–12 text complexity band independently and proficiently.

Initiate and participate effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grades 11–12 topics, texts, and issues, building on others' ideas and expressing their own clearly and persuasively.

Come to discussions prepared, having read and researched material under study; explicitly draw on that preparation by referring to evidence from texts and other research on the topic or issue to stimulate a thoughtful, well-reasoned exchange of ideas.

Work with peers to promote civil, democratic discussions and decision-making; set clear goals and deadlines, and establish individual roles as needed.

Propel conversations by posing and responding to questions that probe reasoning and evidence; ensure a hearing for a full range of positions on a topic or issue; clarify, verify, or challenge ideas and conclusions; and promote divergent and creative perspectives.

Respectfully listen to others' ideas and concerns; clarify your own ideas and questions in light of the evidence presented; resolve contradictions when possible; and determine what additional information or research is required to deepen the investigation or complete the task.

Integrate multiple sources of information presented in diverse formats and media (e.g., visually, quantitatively, orally) in order to make informed decisions and solve problems, evaluating the credibility and accuracy of each source and noting any discrepancies among the data.

Evaluate a speaker's point of view, reasoning, and use of evidence and rhetoric, assessing the stance, premises, links among ideas, word choice, points of emphasis, and tone used.

Present information, findings, and supporting evidence, conveying a clear and distinct perspective, such that listeners can follow the line of reasoning; alternative or opposing perspectives are addressed, and the organization, development, substance, and style are appropriate to purpose, audience, and a range of formal and informal tasks.

Make strategic use of digital media (e.g., textual, graphical, audio, visual, and interactive elements) in presentations to enhance understanding of findings, reasoning, and evidence and to add interest.

Write arguments focused on discipline-specific content.

Introduce precise, knowledgeable claim(s), establish the significance of the claim(s), distinguish the claim(s) from alternate or opposing claims, and create an organization that logically sequences the claim(s), counterclaims, reasons, and evidence.

Develop claim(s) and counterclaims fairly and thoroughly, supplying the most relevant data and evidence for each while pointing out the strengths and limitations of both claim(s) and counterclaims in a discipline-appropriate form that anticipates the audience's knowledge level, concerns, values, and possible biases.

Propel conversations by posing and responding to questions that probe reasoning and evidence; ensure a hearing for a full range of positions on a topic or issue; clarify, verify, or challenge ideas and conclusions; and promote divergent and creative perspectives.

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Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes.

Introduce a topic and organize complex ideas, concepts, and information so that each new element builds on that which precedes it to create a unified whole; include formatting (e.g., headings), graphics (e.g., figures, tables), and multimedia when useful to aiding comprehension.

Develop the topic thoroughly by selecting the most significant and relevant facts, extended definitions, concrete details, quotations, or other information and examples appropriate to the audience's knowledge of the topic.

Use varied transitions and sentence structures to link the major sections of the text, create cohesion, and clarify the relationships between claim(s) and reasons, between reasons and evidence, and between claim(s) and counterclaims.

Establish and maintain a formal style and objective tone while attending to the norms and conventions of the discipline in which they are writing.

Write a concluding statement or section that follows from or supports the argument presented.

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Establish and maintain a formal style and objective tone while attending to the norms and conventions of the discipline in which they are writing.

Write a concluding statement or section that follows from or supports the information or explanation provided (e.g., articulating implications or the significance of the topic).

Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.

Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience.

Use technology, including the Internet, to produce, publish, and update individual or shared writing products in response to ongoing feedback, including new arguments or information.

Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation.

Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the strengths and limitations of each source in terms of the specific task, purpose, and audience; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and overreliance on any one source and following a standard format for citation.

Draw evidence from informational texts to support analysis, reflection, and research.
LAFS.1112.WHST.4.10: Write routinely over extended time frames (time for reflection and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences.

MAFS.912.A-CED.1.4: Rearrange formulas to highlight a quantity of interest, using the same reasoning as in solving equations. For example, rearrange Ohm's law V = IR to highlight resistance R.

MAFS.912.A- SSE.1.1: Interpret expressions that represent a quantity in terms of its context.★
   a. Interpret parts of an expression, such as terms, factors, and coefficients.
   b. Interpret complicated expressions by viewing one or more of their parts as a single entity. For example, interpret \( P(1+r)^q \) as the product of \( P \) and a factor not depending on \( P \).

MAFS.912.F-IF.2.4: For a function that models a relationship between two quantities, interpret key features of graphs and tables in terms of the quantities, and sketch graphs showing key features given a verbal description of the relationship. Key features include: intercepts; intervals where the function is increasing, decreasing, positive, or negative; relative maximums and minimums; symmetries; end behavior; and periodicity.★
   a. Graph linear and quadratic functions and show intercepts, maxima, and minima.
   b. Graph square root, cube root, and piecewise-defined functions, including step functions and absolute value functions.
   c. Graph polynomial functions, identifying zeros when suitable factorizations are available, and showing end behavior.
   d. Graph rational functions, identifying zeros and asymptotes when suitable factorizations are available, and showing end behavior.
   e. Graph exponential and logarithmic functions, showing intercepts and end behavior, and trigonometric functions, showing period, midline, and amplitude, and using phase shift.

Distinguish between situations that can be modeled with linear functions and with exponential functions.★
   a. Prove that linear functions grow by equal differences over equal intervals, and that exponential functions grow by equal factors over equal intervals.
   b. Recognize situations in which one quantity changes at a constant rate per unit interval relative to another.
   c. Recognize situations in which a quantity grows or decays by a constant percent rate per unit interval relative to another.

MAFS.912.N-Q.1.1: Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays.★

MAFS.912.N-Q.1.2: Define appropriate quantities for the purpose of descriptive modeling.★

Clarifications:

Algebra 1 Content Notes:

MAFS.912.N-Q.1.3: Choose a level of accuracy appropriate to limitations on measurement when reporting quantities.★

MAFS.912.S-ID.1.1: Represent data with plots on the real number line (dot plots, histograms, and box plots).★

Clarifications:

In grades 6 – 8, students describe center and spread in a data distribution. Here they choose a summary statistic appropriate to the characteristics of the data distribution, such as the shape of the distribution or the existence of extreme data points.

MAFS.912.S-ID.1.3: Represent data on two quantitative variables on a scatter plot, and describe how the variables are related.★
   a. Fit a function to the data; use functions fitted to data to solve problems in the context of the data. Use given functions or choose a function suggested by the context. Emphasize linear, and exponential models.
   b. Informally assess the fit of a function by plotting and analyzing residuals.
   c. Fit a linear function for a scatter plot that suggests a linear association.

Clarifications:

Students take a more sophisticated look at using a linear function to model the relationship between two numerical variables. In addition to fitting a line to data, students assess how well the model fits by analyzing residuals.

Make sense of problems and persevere in solving them.

Mathematically proficient students start by explaining to themselves the meaning of a problem and looking for entry points to its solution. They analyze givens, constraints, relationships, and goals. They make conjectures about the form and meaning of the solution and plan a solution pathway rather than simply jumping into a solution attempt. They consider analogous problems, and try special cases and simpler forms of the original problem in order to gain insight into its solution. They monitor and evaluate their progress and change course if necessary. Older students might, depending on the context of the problem, transform algebraic expressions or change the viewing window on their graphing calculator to get the information they need. Mathematically proficient students can explain correspondences between equations, verbal descriptions, tables, and graphs or draw diagrams of important features and relationships, graph data, and search for regularity or trends. Younger students might rely on using concrete objects or pictures to help conceptualize and solve a problem. Mathematically proficient students check their answers to problems using a different method, and they continually ask themselves, “Does this make sense?” They can understand the approaches of others to solving complex problems and identify correspondences between different approaches.

Standard Relation to Course: Supporting

Reason abstractly and quantitatively.

Mathematically proficient students make sense of quantities and their relationships in problem situations. They bring two complementary abilities to bear on problems involving quantitative relationships: the ability to decontextualize—to abstract a given situation and represent it symbolically...
and manipulate the representing symbols as if they have a life of their own, without necessarily attending to their referents—and the ability to contextualize, to pause as needed during the manipulation process in order to probe into the referents for the symbols involved. Quantitative reasoning entails habits of creating a coherent representation of the problem at hand; considering the units involved; attending to the meaning of quantities, not just how to compute them; and knowing and flexibly using different properties of operations and objects.

**Standard Relation to Course: Supporting**

**MAFS.K12.MP.1:** Construct viable arguments and critique the reasoning of others.

Mathematically proficient students understand and use stated assumptions, definitions, and previously established results in constructing arguments. They make conjectures and build a logical progression of statements to explore the truth of their conjectures. They are able to analyze situations by breaking them into cases, and can recognize and use counterexamples. They justify their conclusions, communicate them to others, and respond to the arguments of others. They reason inductively about data, making plausible arguments that take into account the context from which the data arose. Mathematically proficient students are also able to compare the effectiveness of two plausible arguments, distinguish correct logic or reasoning from that which is flawed, and—if there is a flaw in an argument—explain what it is. Elementary students can construct arguments using concrete referents such as objects, drawings, diagrams, and actions. Such arguments can make sense and be correct, even though they are not generalized or made formal until later grades. Later, students learn to determine domains to which an argument applies. Students at all grades can listen or read the arguments of others, decide whether they make sense, and ask useful questions to clarify or improve the arguments.

**Standard Relation to Course: Supporting**

**MAFS.K12.MP.3:** Model with mathematics.

Mathematically proficient students can apply the mathematics they know to solve problems arising in everyday life, society, and the workplace. In early grades, this might be as simple as writing an addition equation to describe a situation. In middle grades, a student might apply proportional reasoning to plan a school event or analyze a problem in the community. By high school, a student might use geometry to solve a design problem or use a function to describe how one quantity of interest depends on another. Mathematically proficient students who can apply what they know are comfortable making assumptions and approximations to simplify a complicated situation, realizing that these may need revision later. They are able to identify important quantities in a practical situation and map their relationships using such tools as diagrams, two-way tables, graphs, flowcharts and formulas. They can analyze those relationships mathematically to draw conclusions. They routinely interpret their mathematical results in the context of the situation and reflect on whether the results make sense, possibly improving the model if it has not served its purpose.

**Standard Relation to Course: Supporting**

**MAFS.K12.MP.4:** Use appropriate tools strategically.

Mathematically proficient students consider the available tools when solving a mathematical problem. These tools might include pencil and paper, concrete models, a ruler, a protractor, a calculator, a spreadsheet, a computer algebra system, a statistical package, or dynamic geometry software. Proficient students are sufficiently familiar with tools appropriate for their grade or course to make sound decisions about when each of these tools might be helpful, recognizing both the insight to be gained and their limitations. For example, mathematically proficient high school students analyze graphs of functions and solutions generated using a graphing calculator. They detect possible errors by strategically using estimation and other mathematical knowledge. When making mathematical models, they know that technology can enable them to visualize the results of varying assumptions, explore consequences, and compare predictions with data. Mathematically proficient students at various grade levels are able to identify relevant external mathematical resources, such as digital content located on a website, and use them to pose or solve problems. They are able to use technological tools to explore and deepen their understanding of concepts.

**Standard Relation to Course: Supporting**

**MAFS.K12.MP.5:** Attend to precision.

Mathematically proficient students try to communicate precisely to others. They use clear definitions in discussion with others and in their own reasoning. They state the meaning of the symbols they choose, including using the equal sign consistently and appropriately. They are careful about specifying units of measure and labeling axes to clarify the correspondence with quantities in a problem. They calculate accurately and efficiently, express numerical answers with a degree of precision appropriate for the problem context. In the elementary grades, students give carefully formulated explanations to each other. By the time they reach high school they have learned to examine claims and make explicit use of definitions.

**Standard Relation to Course: Supporting**

**MAFS.K12.MP.6:** Look for and make use of structure.

Mathematically proficient students look closely to discern a pattern or structure. Young students, for example, might notice that three and seven more is the same amount as seven and three more, or they may sort a collection of shapes according to how many sides the shapes have. Later, students will see 7 × 8 equals the well remembered 7 × 5 + 7 × 3, in preparation for learning about the distributive property. In the expression x² + 9x + 14, older students can see the 14 as 2 × 7 and reason about the number of sides the shapes have. Later, they can see 2 ÷ 4 as a unit fraction 1/2. By the time they reach high school they have learned to examine claims and make explicit use of definitions.

**Standard Relation to Course: Supporting**

**MAFS.K12.MP.7:** Look for and express regularity in repeated reasoning.

Mathematically proficient students notice if calculations are repeated, and look both for general methods and for shortcuts. Upper elementary students might notice when dividing 25 by 11 that they are repeating the same calculations over and over again, and conclude they have a repeating decimal. By paying attention to the calculation of slope as they repeatedly check whether points are on the line through (1, 2) with slope 3, middle school students might abstract the equation (y − 2)/(x − 1) = 3. Noticing the regularity in the way terms cancel when expanding (x − 1)(x + 1), (x − 1)(x² + x + 1), and (x − 1)(x³ + x² + x + 1) might lead them to the general formula for the sum of a geometric series. As they work to solve a problem, mathematically proficient students maintain oversight of the process, while attending to the details. They continually evaluate the reasonableness of their intermediate results.

**Standard Relation to Course: Supporting**

**HE.912.C.1:** Propose strategies to reduce or prevent injuries and health problems.

**Clariﬁcations:**

Mandatory passenger-restraint/helmet laws, refusal skills, mandatory immunizations, healthy relationship skills, and improved inspection of food sources.
HE.912.C.1.5: Analyze strategies for prevention, detection, and treatment of communicable and chronic diseases.

Clarifications:
- Health prevention, detection, and treatment of: breast and testicular cancer, suicide, obesity, and industrial-related chronic disease.

HE.912.C.1.8: Assess the degree of susceptibility to injury, illness, or death if engaging in unhealthy/risky behaviors.

Clarifications:
- Risks associated with alcohol abuse, including poison, date rape, and death; cancer and chronic lung disease related to tobacco use; overdose from drug use; child abuse or neglect; and dating violence.

SS.912.C.2.4: Evaluate, take, and defend positions on issues that cause the government to balance the interests of individuals with the public good.

Clarifications:
- Examples are e-mail campaigns, boycotts, blogs, podcasts, protests, demonstrations, letters to editors.

SS.912.C.2.8: Analyze the impact of citizen participation as a means of achieving political and social change.

ELD.K12.ELL.SC.1: Analyze various forms of political communication and evaluate for bias, factual accuracy, omission, and emotional appeal.

Clarifications:
- Examples are political cartoons, propaganda, campaign advertisements, political speeches, electronic bumper stickers, blogs, media.

ELD.K12.ELL.SI.1: English language learners communicate information, ideas and concepts necessary for academic success in the content area of Science.

General Course Information and Notes

**General Notes**

Laboratory investigations that include the use of scientific inquiry, research, measurement, problem solving, laboratory apparatus and technologies, experimental procedures, and safety procedures are an integral part of this course. The National Science Teachers Association (NSTA) recommends that at the high school level, all students should be in the science lab or field, collecting data every week. School laboratory investigations (labs) are defined by the National Research Council (NRC) as an experience in the laboratory, classroom, or the field that provides students with opportunities to interact directly with natural phenomena or with data collected by others using tools, materials, data collection techniques, and models (NRC, 2006, p. 3). Laboratory investigations in the high school classroom should help all students develop a growing understanding of the complexity and ambiguity of empirical work, as well as the skills to calibrate and troubleshoot equipment used to make observations. Learners should understand measurement error; and have the skills to aggregate, interpret, and present the resulting data (National Research Council, 2006, p. 77; NSTA, 2007).

Bioscience II is a rigorous laboratory based course that provides an advanced foundation in the concepts, theories, and pioneering methods involved in micro and molecular based research including medical research, functional genomics, gene discovery, agriculture and forensics. Students will learn how to design plasmids and primers for polymerase chain reactions (PCR). Course focus will be on proteomics (the study of protein expression), protein separation and analysis, protein chromatography purification, protein quantification through spectroscopy, cladistical analysis, immunology, stem cell research, gene sequencing, and bioinformatics using BLAST (Basic Local Alignment Search Tool). Emphasis will be placed on training students in the means by which to design experiments in preparation for independent research. Students will learn the principles, methodologies, and applications of equipment such as thermocyclers, horizontal and vertical gel electrophoresis, micropipettes, spectrophotometers, centrifuges, and other advanced laboratory apparatus used in the bioscience industry.

Laboratory activities may include but not be limited to:

- The preparation of buffer solutions and polyacrylamide gels for vertical electrophoresis;
- Quantitative analysis of protein molecular weights by developing a standard curve;
- Western blotting and ELISA testing;
- The preparation of serial dilutions for spectroscopy to determine unknown concentrations;
- Bacterial transformation and ligation using bacterial blue/white screening;
- Extraction of DNA for chromatography purification to be used for electrophoresis;
- Polymerase chain reactions using self designed primers;
- Gene Sequencing and Bioinformatics.

**Honors and Advanced Level Course Note:** Advanced courses require a greater demand on students through increased academic rigor. Academic rigor is obtained through the application, analysis, evaluation, and creation of complex ideas that are often abstract and multi-faceted. Students are challenged to think and collaborate critically on the content they are learning. Honors level rigor will be achieved by increasing text complexity through text selection, focus on high-level qualitative measures, and complexity of task. Instruction will be structured to give students a deeper understanding of conceptual themes and organization within and across disciplines. Academic rigor is more than simply assigning to students a greater quantity of work.

**Special Notes**

**Instructional Practices:** Teaching from a range of complex text is optimized when teachers in all subject areas implement the following strategies on a routine basis:

1. Ensuring wide reading from complex text that varies in length.
2. Making close reading and rereading of texts central to lessons.
3. Emphasizing text-specific complex questions, and cognitively complex tasks, reinforce focus on the text and cultivate independence.
4. Emphasizing students supporting answers based upon evidence from the text.
5. Providing extensive research and writing opportunities (claims and evidence).

Prerequisite: Honors Chemistry and Bioscience I/or AP Biology
Corequisite: Honors Physics

**Science and Engineering Practices** (NRC Framework for K-12 Science Education, 2010)

- Asking questions (for science) and defining problems (for engineering).
- Developing and using models.
- Planning and carrying out investigations.
- Analyzing and interpreting data.
Using mathematics, information and computer technology, and computational thinking.
Constructing explanations (for science) and designing solutions (for engineering).
Engaging in argument from evidence.
Obtaining, evaluating, and communicating information.

**Literacy Standards in Science**
Secondary science courses include reading standards for literacy in science and technical subjects 6-12 and writing standards for literacy in history/social studies, science, and technical subjects 6-12. The courses also include speaking and listening standards. For a complete list of standards required for this course click on the blue tile labeled course standards. You may also download the complete course including all required standards and notes sections using the export function located at the top of this page.

**English Language Development ELD Standards Special Notes Section:**
Teachers are required to provide listening, speaking, reading and writing instruction that allows English language learners (ELL) to communicate information, ideas and concepts for academic success in the content area of Science. For the given level of English language proficiency and with visual, graphic, or interactive support, students will interact with grade level words, expressions, sentences and discourse to process or produce language necessary for academic success The ELD standard should specify a relevant content area concept or topic of study chosen by curriculum developers and teachers which maximizes an ELL's need for communication and social skills.
To access an ELL supporting document which delineates performance definitions and descriptors, please click on the following link: https://cpalmsmediaprod.blob.core.windows.net/uploads/docs/standards/eld/sc.pdf

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**GENERAL INFORMATION**

**Course Number:** 2000510

**Course Path:** Section: Grades PreK to 12 Education Courses > Grade Group: Grades 9 to 12 and Adult Education Courses > Subject: Science > SubSubject: Biological Sciences >

**Abbreviated Title:** BIOSCIENCE 2 HON

**Number of Credits:** One (1) credit

**Course Type:** Core Academic Course

**Course Status:** Course Approved

**Grade Level(s):** 9,10,11,12

**Graduation Requirement:** Equally Rigorous Science

**Course Length:** Year (Y)

**Course Attributes:**
- Honors

**Course Level:** 3

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**Educator Certifications**

- Biology (Grades 6-12)
- Chemistry (Grades 6-12)
Explain how mutations in the DNA sequence may or may not result in phenotypic change. Explain how mutations in gametes may result in phenotypic changes in offspring.

Discuss the mechanisms for regulation of gene expression in prokaryotes and eukaryotes at transcription and translation level.

Describe the function of models in science, and identify the wide range of models used in science.

Describe how mutation and genetic recombination increase genetic variation.

Explain that scientific laws are descriptions of specific relationships under given conditions in nature, but do not offer explanations for those relationships.

Define a problem based on a specific body of knowledge, for example: biology, chemistry, physics, and earth/space science, and do the following:

1. Pose questions about the natural world, (Articulate the purpose of the investigation and identify the relevant scientific concepts).

2. Conduct systematic observations, (Write procedures that are clear and replicable. Identify observables and examine relationships between test (independent) variable and outcome (dependent) variable. Employ appropriate methods for accurate and consistent observations; conduct and record measurements at appropriate levels of precision. Follow safety guidelines).

3. Examine books and other sources of information to see what is already known, and if not, modify or develop new models).

4. Plan investigations, (Design and evaluate a scientific investigation).

5. Use tools to gather, analyze, and interpret data (this includes the use of measurement in metric and other systems, and also the generation and interpretation of graphical representations of data, including data tables and graphs), (Collect data or evidence in an organized way. Properly use instruments, equipment, and materials (e.g., scales, probeware, meter sticks, microscopes, computers) including setup, calibration, technique, maintenance, and storage).

6. Pose answers, explanations, or descriptions of events,

7. Generate explanations that explicate or describe natural phenomena (inferences), and

8. Use appropriate evidence and reasoning to justify these explanations to others,

9. Communicate results of scientific investigations, and

10. Evaluate the merits of the explanations produced by others.

Describe and explain what characterizes science and its methods.

Describe instances in which scientists' varied backgrounds, talents, interests, and goals influence the inferences and thus the explanations that they make about observations of natural phenomena and describe that competing interpretations (explanations) of scientists are a strength of science as they are a source of new, testable ideas that have the potential to add new evidence to support one or another of the explanations.

Describe the role consensus plays in the historical development of a theory in any one of the disciplines of science.

Weigh the merits of alternative strategies for solving a specific societal problem by comparing a number of different costs and benefits, such as human, economic, and environmental.
Relate acidity and basicity to hydronium and hydroxyl ion concentration and pH.

**SC.912.P.8.11:**
Mathematicians who participate in effortful learning both individually and with others:
- Analyze the problem in a way that makes sense given the task.
- Ask questions that will help with solving the task.
- Build perseverance by modifying methods as needed while solving a challenging task.
- Stay engaged and maintain a positive mindset when working to solve tasks.
- Help and support each other when attempting a new method or approach.

**Clarifications:**
Teachers who encourage students to participate actively in effortful learning both individually and with others:
- Cultivate a community of growth mindset learners.
- Foster perseverance in students by choosing tasks that are challenging.
- Develop students' ability to analyze and problem solve.
- Recognize students' effort when solving challenging problems.

**Demonstrate understanding by representing problems in multiple ways.**
Mathematicians who demonstrate understanding by representing problems in multiple ways:
- Build understanding through modeling and using manipulatives.
- Represent solutions to problems in multiple ways using objects, drawings, tables, graphs and equations.
- Progress from modeling problems with objects and drawings to using algorithms and equations.
- Express connections between concepts and representations.
- Choose a representation based on the given context or purpose.

**Clarifications:**
Teachers who encourage students to demonstrate understanding by representing problems in multiple ways:
- Help students make connections between concepts and representations.
- Provide opportunities for students to use manipulatives when investigating concepts.
- Guide students from concrete to pictorial to abstract representations as understanding progresses.
- Show students that various representations can have different purposes and can be useful in different situations.

**Complete tasks with mathematical fluency.**
Mathematicians who complete tasks with mathematical fluency:
- Select efficient and appropriate methods for solving problems within the given context.
- Maintain flexibility and accuracy while performing procedures and mental calculations.
- Complete tasks accurately and with confidence.
- Adapt procedures to apply them to a new context.
- Use feedback to improve efficiency when performing calculations.

**Clarifications:**
Teachers who encourage students to complete tasks with mathematical fluency:
- Provide students with the flexibility to solve problems by selecting a procedure that allows them to solve efficiently and accurately.
- Offer multiple opportunities for students to practice efficient and generalizable methods.
- Provide opportunities for students to reflect on the method they used and determine if a more efficient method could have been used.

**Engage in discussions that reflect on the mathematical thinking of self and others.**
Mathematicians who engage in discussions that reflect on the mathematical thinking of self and others:
- Communicate mathematical ideas, vocabulary and methods effectively.
- Analyze the mathematical thinking of others.
- Compare the efficiency of a method to those expressed by others.
- Recognize errors and suggest how to correctly solve the task.
- Justify results by explaining methods and processes.
- Construct possible arguments based on evidence.

**Clarifications:**
Teachers who encourage students to engage in discussions that reflect on the mathematical thinking of self and others:
- Establish a culture in which students ask questions of the teacher and their peers, and error is an opportunity for learning.
- Create opportunities for students to discuss their thinking with peers.
- Select, sequence and present student work to advance and deepen understanding of correct and increasingly efficient methods.
- Develop students' ability to justify methods and compare their responses to the responses of their peers.

**Use patterns and structure to help understand and connect mathematical concepts.**
Mathematicians who use patterns and structure to help understand and connect mathematical concepts:
- Focus on relevant details within a problem.
- Create plans and procedures to logically order events, steps or ideas to solve problems.
- Decompose a complex problem into manageable parts.
- Relate previously learned concepts to new concepts.
- Look for similarities among problems.
- Connect solutions of problems to more complicated large-scale situations.

**Clarifications:**
Teachers who encourage students to use patterns and structure to help understand and connect mathematical concepts:
- Help students recognize the patterns in the world around them and connect these patterns to mathematical concepts.
- Support students to develop generalizations based on the similarities found among problems.
- Provide opportunities for students to create plans and procedures to solve problems.
- Develop students' ability to construct relationships between their current understanding and more sophisticated ways of thinking.
Assess the reasonableness of solutions.
Mathematicians who assess the reasonableness of solutions:
- Estimate to discover possible solutions.
- Use benchmark quantities to determine if a solution makes sense.
- Check calculations when solving problems.
- Verify possible solutions by explaining the methods used.
- Evaluate results based on the given context.

Clarifications:
Teachers who encourage students to assess the reasonableness of solutions:
- Have students estimate or predict solutions prior to solving.
- Prompt students to continually ask, “Does this solution make sense? How do you know?”
- Reinforce that students check their work as they progress within and after a task.
- Strengthen students’ ability to verify solutions through justifications.

Apply mathematics to real-world contexts.
Mathematicians who apply mathematics to real-world contexts:
- Connect mathematical concepts to everyday experiences.
- Use models and methods to understand, represent and solve problems.
- Perform investigations to gather data or determine if a method is appropriate.
- Redesign models and methods to improve accuracy or efficiency.

Clarifications:
Teachers who encourage students to apply mathematics to real-world contexts:
- Provide opportunities for students to create models, both concrete and abstract, and perform investigations.
- Challenge students to question the accuracy of their models and methods.
- Support students as they validate conclusions by comparing them to the given situation.
- Indicate how various concepts can be applied to other disciplines.

Cite evidence to explain and justify reasoning.

Clarifications:
K-1 Students include textual evidence in their oral communication with guidance and support from adults. The evidence can consist of details from the text without naming the text. During 1st grade, students learn how to incorporate the evidence in their writing.
2-3 Students include relevant textual evidence in their written and oral communication. Students should name the text when they refer to it. In 3rd grade, students should use a combination of direct and indirect citations.
4-5 Students continue with previous skills and reference comments made by speakers and peers. Students cite texts that they’ve directly quoted, paraphrased, or used for information. When writing, students will use the form of citation dictated by the instructor or the style guide referenced by the instructor.
6-8 Students continue with previous skills and use a style guide to create a proper citation.
9-12 Students continue with previous skills and should be aware of existing style guides and the ways in which they differ.

Read and comprehend grade-level complex texts proficiently.

Clarifications:
See Text Complexity for grade-level complexity bands and a text complexity rubric.

Make inferences to support comprehension.

Clarifications:
Students will make inferences before the words infer or inference are introduced. Kindergarten students will answer questions like “Why is the girl smiling?” or make predictions about what will happen based on the title page. Students will use the terms and apply them in 2nd grade and beyond.

Use appropriate collaborative techniques and active listening skills when engaging in discussions in a variety of situations.

Clarifications:
In kindergarten, students learn to listen to one another respectfully. In grades 1-2, students build upon these skills by justifying what they are thinking. For example: “I think _____ because _____.” The collaborative conversations are becoming academic conversations.
In grades 3-12, students engage in academic conversations discussing claims and justifying their reasoning, refining and applying skills. Students build on ideas, propel the conversation, and support claims and counterclaims with evidence.

Use the accepted rules governing a specific format to create quality work.

Clarifications:
Students will incorporate skills learned into work products to produce quality work. For students to incorporate these skills appropriately, they must receive instruction. A 3rd grade student creating a poster board display must have instruction in how to effectively present information to do quality work.

Use appropriate voice and tone when speaking or writing.

Clarifications:
In kindergarten and 1st grade, students learn the difference between formal and informal language. For example, the way we talk to our friends differs from the way we speak to adults. In 2nd grade and beyond, students practice appropriate social and academic language to discuss texts.

Propose strategies to reduce or prevent injuries and health problems.

Clarifications:
Mandatory passenger-restraint/helmet laws, refusal skills, mandatory immunizations, healthy relationship skills, and improved inspection of food sources.
| HE.912.C.1.5: | Analyze strategies for prevention, detection, and treatment of communicable and chronic diseases. |
| HE.912.C.1.8: | Clarifications: Risks associated with alcohol abuse, including poison, date rape, and death; cancer and chronic lung disease related to tobacco use; overdose from drug use; child abuse or neglect; and dating violence. |
| SS.912.C.2.4: | Evaluate, take, and defend positions on issues that cause the government to balance the interests of individuals with the public good. |
| SS.912.C.2.8: | Clarifications: Examples are e-mail campaigns, boycotts, blogs, podcasts, protests, demonstrations, letters to editors. |
| SS.912.C.13: | Analyze various forms of political communication and evaluate for bias, factual accuracy, omission, and emotional appeal. |
| ELD.K12.ELL.SC.1: | English language learners communicate information, ideas and concepts. |
| ELD.K12.ELL.SI.1: | English language learners communicate for social and instructional purposes within the school setting. |

General Course Information and Notes

**GENERAL NOTES**

Laboratory investigations that include the use of scientific inquiry, research, measurement, problem solving, laboratory apparatus and technologies, experimental procedures, and safety procedures are an integral part of this course. The National Science Teachers Association (NSTA) recommends that at the high school level, all students should be in the science lab or field, collecting data every week. School laboratory investigations (labs) are defined by the National Research Council (NRC) as an experience in the laboratory, classroom, or the field that provides students with opportunities to interact directly with natural phenomena or with data collected by others using tools, materials, data collection techniques, and models (NRC, 2006, p. 3). Laboratory investigations in the high school classroom should help all students develop a growing understanding of the complexity and ambiguity of empirical work, as well as the skills to calibrate and troubleshoot equipment used to make observations. Learners should understand measurement error; and have the skills to aggregate, interpret, and present the resulting data (National Research Council, 2006, p. 77; NSTA, 2007).

Bioscience II is a rigorous laboratory based course that provides an advanced foundation in the concepts, theories, and pioneering methods involved in micro and molecular based research including medical research, functional genomics, gene discovery, agriculture and forensics. Students will learn how to design plasmids and primers for polymerase chain reactions (PCR). Course focus will be on proteomics (the study of protein expression), protein separation and analysis, protein chromatography purification, protein quantification through spectroscopy, cladistical analysis, immunology, stem cell research, gene sequencing, and bioinformatics using BLAST (Basic Local Alignment Search Tool.) Emphasis will be placed on training students in the means by which to design experiments in preparation for independent research. Students will learn the principles, methodologies, and applications of equipment such as thermocyclers, horizontal and vertical gel electrophoresis, micropipettes, spectrophotometers, centrifuges, and other advanced laboratory apparatus used in the bioscience industry.

Laboratory activities may include but not be limited to:

- The preparation of buffer solutions and polyacrylamide gels for vertical electrophoresis;
- Quantitative analysis of protein molecular weights by developing a standard curve;
- Western blotting and ELISA testing;
- The preparation of serial dilutions for spectroscopy to determine unknown concentrations;
- Bacterial transformation and ligation using bacterial blue/white screening;
- Extraction of DNA for chromatography purification to be used for electrophoresis;
- Polymerase chain reactions using self designed primers;
- Gene Sequencing and Bioinformatics.

**Honors and Advanced Level Course Note:** Advanced courses require a greater demand on students through increased academic rigor. Academic rigor is obtained through the application, analysis, evaluation, and creation of complex ideas that are often abstract and multi-faceted. Students are challenged to think and collaborate critically on the content they are learning. Honors level rigor will be achieved by increasing text complexity through text selection, focus on high-level qualitative measures, and complexity of task. Instruction will be structured to give students a deeper understanding of conceptual themes and organization within and across disciplines. Academic rigor is more than simply assigning to students a level of rigor.  

**Special Notes**

**Instructional Practices:** Teaching from a range of complex text is optimized when teachers in all subject areas implement the following strategies on a routine basis:

1. Ensuring wide reading from complex text that varies in length.
2. Making close reading and rereading of texts central to lessons.
3. Emphasizing text-specific complex questions, and cognitively complex tasks, reinforce focus on the text and cultivate independence.
4. Emphasizing students supporting answers based upon evidence from the text.
5. Providing extensive research and writing opportunities (claims and evidence).

Prerequisite: Honors Chemistry and Bioscience I/or AP Biology

**Corequisite:** Honors Physics

**Science and Engineering Practices (NRC Framework for K-12 Science Education, 2010)**

- Asking questions (for science) and defining problems (for engineering).
- Developing and using models.
- Planning and carrying out investigations.
- Analyzing and interpreting data.
Using mathematics, information and computer technology, and computational thinking.
Constructing explanations (for science) and designing solutions (for engineering).
Engaging in argument from evidence.
Obtaining, evaluating, and communicating information.

Florida’s Benchmarks for Excellent Student Thinking (B.E.S.T.) Standards

This course includes Florida’s B.E.S.T. ELA Expectations (EE) and Mathematical Thinking and Reasoning Standards (MTRs) for students. Florida educators should intentionally embed these standards within the content and their instruction as applicable. For guidance on the implementation of the EEs and MTRs, please visit https://www.cpalms.org/Standards/BEST_Standards.aspx and select the appropriate B.E.S.T. Standards package.

English Language Development ELD Standards Special Notes Section:
Teachers are required to provide listening, speaking, reading and writing instruction that allows English language learners (ELL) to communicate information, ideas and concepts for academic success in the content area of Science. For the given level of English language proficiency and with visual, graphic, or interactive support, students will interact with grade level words, expressions, sentences and discourse to process or produce language necessary for academic success. The ELD standard should specify a relevant content area concept or topic of study chosen by curriculum developers and teachers which maximizes an ELL’s need for communication and social skills. To access an ELL supporting document which delineates performance definitions and descriptors, please click on the following link: https://cpalmsmediaprod.blob.core.windows.net/uploads/docs/standards/eld/sc.pdf

GENERAL INFORMATION

Course Number: 2000510

Number of Credits: One (1) credit

Course Type: Core Academic Course

Course Status: State Board Approved

Graduation Requirement: Equally Rigorous Science

Educator Certifications

Biology (Grades 6-12)
Chemistry (Grades 6-12)
Define a problem based on a specific body of knowledge, for example: biology, chemistry, physics, and earth/space science, and do the following:

1. Pose questions about the natural world, (Articulate the purpose of the investigation and identify the relevant scientific concepts).
2. Conduct systematic observations, (Write procedures that are clear and replicable. Identify observables and examine relationships between test (independent) variable and outcome (dependent) variable. Employ appropriate methods for accurate and consistent observations; conduct and record measurements at appropriate levels of precision. Follow safety guidelines).
3. Examine books and other sources of information to see what is already known,
4. Review what is known in light of empirical evidence, (Examine whether available empirical evidence can be interpreted in terms of existing knowledge and models, and if not, modify or develop new models).
5. Plan investigations, (Design and evaluate a scientific investigation).
6. Use tools to gather, analyze, and interpret data (this includes the use of measurement in metric and other systems, and also the generation and interpretation of graphical representations of data, including data tables and graphs), (Collect data or evidence in an organized way. Properly use instruments, equipment, and materials (e.g., scales, probeware, meter sticks, microscopes, computers) including set-up, calibration, technique, maintenance, and storage).
7. Pose answers, explanations, or descriptions of events,
8. Generate explanations that explicate or describe natural phenomena (inferences),
9. Use appropriate evidence and reasoning to justify these explanations to others,
10. Communicate results of scientific investigations, and
11. Evaluate the merits of the explanations produced by others.
Relate acidity and basicity to hydronium and hydroxyl ion concentration and pH.

Mathematicians who participate in effortful learning both individually and with others:
- Analyze the problem in a way that makes sense given the task.
- Ask questions that will help with solving the task.
- Build perseverance by modifying methods as needed while solving a challenging task.
- Stay engaged and maintain a positive mindset when working to solve tasks.
- Help and support each other when attempting a new method or approach.

Clariifications:
Teachers who encourage students to participate actively in effortful learning both individually and with others:
- Cultivate a community of growth mindset learners.
- Foster perseverance in students by choosing tasks that are challenging.
- Develop students' ability to analyze and problem solve.
- Recognize students' effort when solving challenging problems.

Mathematicians who demonstrate understanding by representing problems in multiple ways:
- Build understanding through modeling and using manipulatives.
- Represent solutions to problems in multiple ways using objects, drawings, tables, graphs and equations.
- Progress from modeling problems with objects and drawings to using algorithms and equations.
- Express connections between concepts and representations.
- Choose a representation based on the given context or purpose.

Clariifications:
Teachers who encourage students to demonstrate understanding by representing problems in multiple ways:
- Help students make connections between concepts and representations.
- Provide opportunities for students to use manipulatives when investigating concepts.
- Guide students from concrete to pictorial to abstract representations as understanding progresses.
- Show students that various representations can have different purposes and can be useful in different situations.

Mathematicians who complete tasks with mathematical fluency:
- Select efficient and appropriate methods for solving problems within the given context.
- Maintain flexibility and accuracy while performing procedures and mental calculations.
- Complete tasks accurately and with confidence.
- Adapt procedures to apply them to a new context.
- Use feedback to improve efficiency when performing calculations.

Clariifications:
Teachers who encourage students to complete tasks with mathematical fluency:
- Provide students with the flexibility to solve problems by selecting a procedure that allows them to solve efficiently and accurately.
- Offer multiple opportunities for students to practice efficient and generalizable methods.
- Provide opportunities for students to reflect on the method they used and determine if a more efficient method could have been used.

Mathematicians who engage in discussions that reflect on the mathematical thinking of self and others:
- Communicate mathematical ideas, vocabulary and methods effectively.
- Analyze the mathematical thinking of others.
- Compare the efficiency of a method to those expressed by others.
- Recognize errors and suggest how to correctly solve the task.
- Justify results by explaining methods and processes.
- Construct possible arguments based on evidence.

Clariifications:
Teachers who encourage students to engage in discussions that reflect on the mathematical thinking of self and others:
- Establish a culture in which students ask questions of the teacher and their peers, and error is an opportunity for learning.
- Create opportunities for students to discuss their thinking with peers.
- Select, sequence and present student work to advance and deepen understanding of correct and increasingly efficient methods.
- Develop students' ability to justify methods and compare their responses to the responses of their peers.

Mathematicians who use patterns and structure to help understand and connect mathematical concepts:
- Focus on relevant details within a problem.
- Create plans and procedures to logically order events, steps or ideas to solve problems.
- Decompose a complex problem into manageable parts.
- Relate previously learned concepts to new concepts.
- Look for similarities among problems.
- Connect solutions of problems to more complicated large-scale situations.

Clariifications:
Teachers who encourage students to use patterns and structure to help understand and connect mathematical concepts:
- Help students recognize the patterns in the world around them and connect these patterns to mathematical concepts.
- Support students to develop generalizations based on the similarities found among problems.
- Provide opportunities for students to create plans and procedures to solve problems.
- Develop students' ability to construct relationships between their current understanding and more sophisticated ways of thinking.
MA.K12.MTR.6.1: Assess the reasonableness of solutions. Mathematicians who assess the reasonableness of solutions:

- Estimate to discover possible solutions.
- Use benchmark quantities to determine if a solution makes sense.
- Check calculations when solving problems.
- Verify possible solutions by explaining the methods used.
- Evaluate results based on the given context.

**Clarifications:**
Teachers who encourage students to assess the reasonableness of solutions:

- Have students estimate or predict solutions prior to solving.
- Prompt students to continually ask, “Does this solution make sense? How do you know?”
- Reinforce that students check their work as they progress within and after a task.
- Strengthen students’ ability to verify solutions through justifications.

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MA.K12.MTR.7.1: Apply mathematics to real-world contexts. Mathematicians who apply mathematics to real-world contexts:

- Connect mathematical concepts to everyday experiences.
- Use models and methods to understand, represent and solve problems.
- Perform investigations to gather data or determine if a method is appropriate. • Redesign models and methods to improve accuracy or efficiency.

**Clarifications:**
Teachers who encourage students to apply mathematics to real-world contexts:

- Provide opportunities for students to create models, both concrete and abstract, and perform investigations.
- Challenge students to question the accuracy of their models and methods.
- Support students as they validate conclusions by comparing them to the given situation.
- Indicate how various concepts can be applied to other disciplines.

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ELA.K12.EE.1.1: Cite evidence to explain and justify reasoning.

**Clarifications:**
K-1 Students include textual evidence in their oral communication with guidance and support from adults. The evidence can consist of details from the text without naming the text. During 1st grade, students learn how to incorporate the evidence in their writing.

2-3 Students include relevant textual evidence in their written and oral communication. Students should name the text when they refer to it. In 3rd grade, students should use a combination of direct and indirect citations.

4-5 Students continue with previous skills and reference comments made by speakers and peers. Students cite texts that they’ve directly quoted, paraphrased, or used for information. When writing, students will use the form of citation dictated by the instructor or the style guide referenced by the instructor.

6-8 Students continue with previous skills and use a style guide to create a proper citation.

9-12 Students continue with previous skills and should be aware of existing style guides and the ways in which they differ.

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ELA.K12.EE.2.1: Read and comprehend grade-level complex texts proficiently.

**Clarifications:**
See Text Complexity for grade-level complexity bands and a text complexity rubric.

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ELA.K12.EE.3.1: Make inferences to support comprehension.

**Clarifications:**
Students will make inferences before the words infer or inference are introduced. Kindergarten students will answer questions like “Why is the girl smiling?” or make predictions about what will happen based on the title page. Students will use the terms and apply them in 2nd grade and beyond.

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ELA.K12.EE.4.1: Use appropriate collaborative techniques and active listening skills when engaging in discussions in a variety of situations.

**Clarifications:**
In kindergarten, students learn to listen to one another respectfully. In grades 1-2, students build upon these skills by justifying what they are thinking. For example: “I think _____ because _____.” The collaborative conversations are becoming academic conversations.

In grades 3-12, students engage in academic conversations discussing claims and justifying their reasoning, refining and applying skills. Students build on ideas, propel the conversation, and support claims and counterclaims with evidence.

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ELA.K12.EE.5.1: Use the accepted rules governing a specific format to create quality work.

**Clarifications:**
Students will incorporate skills learned into work products to produce quality work. For students to incorporate these skills appropriately, they must receive instruction. A 3rd grade student creating a poster board display must have instruction in how to effectively present information to do quality work.

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ELA.K12.EE.6.1: Use appropriate voice and tone when speaking or writing.

**Clarifications:**
In kindergarten and 1st grade, students learn the difference between formal and informal language. For example, the way we talk to our friends differs from the way we speak to adults. In 2nd grade and beyond, students practice appropriate social and academic language to discuss texts.

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HE.912.C.1.4: Propose strategies to reduce or prevent injuries and health problems.

**Clarifications:**
Mandatory passenger-restraint/ helmet laws, refusal skills, mandatory immunizations, healthy relationship skills, and improved inspection of food sources.
General Course Information and Notes

GENERAL NOTES

Laboratory investigations that include the use of scientific inquiry, research, measurement, problem solving, laboratory apparatus and technologies, experimental procedures, and safety procedures are an integral part of this course. The National Science Teachers Association (NSTA) recommends that at the high school level, all students should be in the science lab or field, collecting data every week. School laboratory investigations (labs) are defined by the National Research Council (NRC) as an experience in the laboratory, classroom, or the field that provides students with opportunities to interact directly with natural phenomena or with data collected by others using tools, materials, data collection techniques, and models (NRC, 2006, p. 3). Laboratory investigations in the high school classroom should help all students develop a growing understanding of the complexity and ambiguity of empirical work, as well as the skills to calibrate and troubleshoot equipment used to make observations. Learners should understand measurement error; and have the skills to aggregate, interpret, and present the resulting data (National Research Council, 2006, p.77; NSTA, 2007). Bioscience II is a rigorous laboratory based course that provides an advanced foundation in the concepts, theories, and pioneering methods involved in micro and molecular based research including medical research, functional genomics, gene discovery, agriculture and forensics. Students will learn how to design plasmids and primers for polymerase chain reactions (PCR). Course focus will be on proteomics (the study of protein expression), protein separation and analysis, protein chromatography purification, protein quantification through spectroscopy, cladistical analysis, immunology, stem cell research, gene sequencing, and bioinformatics using BLAST (Basic Local Alignment Search Tool). Emphasis will be placed on training students in the means by which to design experiments in preparation for independent research. Students will learn the principles, methodologies, and applications of equipment such as thermocyclers, horizontal and vertical gel electrophoresis, micropipettes, spectrophotometers, centrifuges, and other advanced laboratory apparatus used in the bioscience industry.

Laboratory activities may include but not be limited to:

- The preparation of buffer solutions and polyacrylamide gels for vertical electrophoresis;
- Quantitative analysis of protein molecular weights by developing a standard curve;
- Western blotting and ELISA testing;
- The preparation of serial dilutions for spectroscopy to determine unknown concentrations;
- Bacterial transformation and ligation using bacterial blue/white screening;
- Extraction of DNA for chromatography purification to be used for electrophoresis;
- Polymerase chain reactions using self designed primers;
- Gene Sequencing and Bioinformatics.

Honors and Advanced Level Course Note: Advanced courses require a greater demand on students through increased academic rigor. Academic rigor is obtained through the application, analysis, evaluation, and creation of complex ideas that are often abstract and multi-faceted. Students are challenged to think and collaborate critically on the content they are learning. Honors level rigor will be achieved by increasing text complexity through text selection, focus on high-level qualitative measures, and complexity of task. Instruction will be structured to give students a deeper understanding of conceptual themes and organization within and across disciplines. Academic rigor is more than simply assigning to students a greater quantity of work.

Special Notes

Instructional Practices: Teaching from a range of complex text is optimized when teachers in all subject areas implement the following strategies on a routine basis:

1. Ensuring wide reading from complex text that varies in length.
2. Making close reading and rereading of texts central to lessons.
3. Emphasizing text-specific complex questions, and cognitively complex tasks, reinforce focus on the text and cultivate independence.
4. Emphasizing students supporting answers based upon evidence from the text.
5. Providing extensive research and writing opportunities (claims and evidence).

Prerequisite: Honors Chemistry and Bioscience I/or AP Biology
Corequisite: Honors Physics

- Asking questions (for science) and defining problems (for engineering).
- Developing and using models.
- Planning and carrying out investigations.
- Analyzing and interpreting data.
- Using mathematics, information and computer technology, and computational thinking.
- Constructing explanations (for science) and designing solutions (for engineering).
- Engaging in argument from evidence.
- Obtaining, evaluating, and communicating information.

Florida's Benchmarks for Excellent Student Thinking (B.E.S.T.) Standards

This course includes Florida's B.E.S.T. ELA Expectations (EE) and Mathematical Thinking and Reasoning Standards (MTRs) for students. Florida educators should intentionally embed these standards within the content and their instruction as applicable. For guidance on the implementation of the EEs and MTRs, please visit https://www.cpalms.org/Standards/BEST_Standards.aspx and select the appropriate B.E.S.T. Standards package.

English Language Development ELD Standards Special Notes Section:
Teachers are required to provide listening, speaking, reading and writing instruction that allows English language learners (ELL) to communicate information, ideas and concepts for academic success in the content area of Science. For the given level of English language proficiency and with visual, graphic, or interactive support, students will interact with grade level words, expressions, sentences and discourse to process or produce language necessary for academic success. The ELD standard should specify a relevant content area concept or topic of study chosen by curriculum developers and teachers which maximizes an ELL's need for communication and social skills. To access an ELL supporting document which delineates performance definitions and descriptors, please click on the following link: https://cpalmsmediaprod.blob.core.windows.net/uploads/docs/standards/eld/sc.pdf

GENERAL INFORMATION

Course Number: 2000510
Course Path: Section: Grades PreK to 12 Education
Courses > Grade Group: Grades 9 to 12 and Adult
Education Courses > Subject: Science > SubSubject: Biological Sciences
Abbreviated Title: BIOSCIENCE 2 HON
Course Length: Year (Y)
Course Attributes: Honors
Course Level: 3

Grade Level(s): 9,10,11,12
Graduation Requirement: Equally Rigorous Science

Educator Certifications

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<td><strong>LAFS.1112.WHST.1.2:</strong></td>
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Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience.

Use technology, including the Internet, to produce, publish, and update individual or shared writing products in response to ongoing feedback, including new arguments or information.

Develop short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation.

Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the strengths and limitations of each source in terms of the specific task, purpose, and audience; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and overreliance on any one source and following a standard format for citation.

Draw evidence from informational texts to support analysis, reflection, and research.

Write routinely over extended time frames (time for reflection and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences.

Discuss the technologies associated with forensic medicine and DNA identification, including restriction fragment length polymorphism (RFLP) analysis.

Explain that scientific knowledge is both durable and robust and open to re-examined by new investigations and scientific argumentation. Because of these frequent examinations, scientific knowledge becomes more of their parts as a single entity. For example, interpret as the product of P and a factor not depending on P.

Interpret expressions by viewing one or more of their parts as a single entity. Interpret parts of an expression, such as terms, factors, and coefficients. Interpret complicated expressions by viewing one or more of their parts as a single entity. For example, interpret as the product of and a factor not depending on .

Interpret complicated expressions by viewing one or more of their parts as a single entity. For example, interpret as the product of and a factor not depending on .

Pose questions about the natural world, (Articulate the purpose of the investigation and identify the relevant scientific concepts).

Conduct systematic observations, (Write procedures that are clear and replicable. Identify observables and examine relationships between test (independent) variable and outcome (dependent) variable. Employ appropriate methods for accurate and consistent observations; conduct and record measurements at appropriate levels of precision. Follow safety guidelines).

Examine books and other sources of information to see what is already known,

Review what is known in light of empirical evidence, (Examine whether available empirical evidence can be interpreted in terms of existing knowledge and models, and if not, modify or develop new models).

Plan investigations, (Design and evaluate a scientific investigation).

Use tools to gather, analyze, and interpret data (this includes the use of measurement in metric and other systems, and also the generation and interpretation of graphical representations of data, including data tables and graphs), (Collect data or evidence in an organized way. Properly use instruments, equipment, and materials (e.g., scales, probeware, meter sticks, microscopes, computers) including set-up, calibration, technique, maintenance, and storage).

Pose answers, explanations, or descriptions of events,

Generate explanations that explicate or describe natural phenomena (inferences),

Use appropriate evidence and reasoning to justify these explanations to others,

Communicate results of scientific investigations, and

Evaluate the merits of the explanations produced by others.

Describe a problem based on a specific body of knowledge, for example: biology, chemistry, physics, and earth/space science, and do the following:

1. Pose questions about the natural world, (Articulate the purpose of the investigation and identify the relevant scientific concepts).

2. Conduct systematic observations, (Write procedures that are clear and replicable. Identify observables and examine relationships between test (independent) variable and outcome (dependent) variable. Employ appropriate methods for accurate and consistent observations; conduct and record measurements at appropriate levels of precision. Follow safety guidelines).

3. Examine books and other sources of information to see what is already known,

4. Review what is known in light of empirical evidence, (Examine whether available empirical evidence can be interpreted in terms of existing knowledge and models, and if not, modify or develop new models).

5. Plan investigations, (Design and evaluate a scientific investigation).

6. Use tools to gather, analyze, and interpret data (this includes the use of measurement in metric and other systems, and also the generation and interpretation of graphical representations of data, including data tables and graphs), (Collect data or evidence in an organized way. Properly use instruments, equipment, and materials (e.g., scales, probeware, meter sticks, microscopes, computers) including set-up, calibration, technique, maintenance, and storage).

7. Pose answers, explanations, or descriptions of events,

8. Generate explanations that explicate or describe natural phenomena (inferences),

9. Use appropriate evidence and reasoning to justify these explanations to others,

10. Communicate results of scientific investigations, and

11. Evaluate the merits of the explanations produced by others.

Describe and explain what characterizes science and its methods.

Recognize the strength or usefulness of a scientific claim is evaluated through scientific argumentation, which depends on critical and logical thinking, and the active consideration of alternative scientific explanations to explain the data presented.

Identify sources of information and assess their reliability according to the strict standards of scientific investigation.

Describe and provide examples of how similar investigations conducted in many parts of the world result in the same outcome.

Describe how scientific inferences are drawn from scientific observations and provide examples from the content being studied.

Recognize the role of creativity in constructing scientific questions, methods and explanations.

Identify which questions can be answered through science and which questions are outside the boundaries of scientific investigation, such as questions addressed by other ways of knowing, such as art, philosophy, and religion.

Identify examples of pseudoscience (such as astrology, phrenology) in society.

Identify the function of models in science, and identify the wide range of models used in science.

Explain how scientific knowledge and reasoning provide an empirically-based perspective to inform society's decision making.

Weigh the merits of alternative strategies for solving a specific societal problem by comparing a number of different costs and benefits, such as human, economic, and environmental.

Relate acidity and basicity to hydronium and hydroxyl ion concentration and pH.

Explain how various factors, such as concentration, temperature, and presence of a catalyst affect the rate of a chemical reaction.

Rearrange formulas to highlight a quantity of interest, using the same reasoning as in solving equations. For example, rearrange Ohm's law for to highlight resistance .

Interpret expressions that represent a quantity in terms of its context. Interpret parts of an expression, such as terms, factors, and coefficients.

Interpret complicated expressions by viewing one or more of their parts as a single entity. For example, interpret as the product of and a factor not depending on .

Identify examples of pseudoscience (such as astrology, phrenology) in society.

Explain how scientific knowledge and reasoning provide an empirically-based perspective to inform society's decision making.

Describe the function of models in science, and identify the wide range of models used in science.

Explain how scientific knowledge and reasoning provide an empirically-based perspective to inform society's decision making.

Evaluate the merits of the explanations produced by others.
Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases.

- Graph linear and quadratic functions and show intercepts, maxima, and minima.
- Graph square root, cube root, and piecewise-defined functions, including step functions and absolute value functions.
- Graph polynomial functions, identifying zeros when suitable factorizations are available, and showing end behavior.
- Graph rational functions, identifying zeros and asymptotes when suitable factorizations are available, and showing end behavior.
- Graph exponential and logarithmic functions, showing intercepts and end behavior, and trigonometric functions, showing period, midline, and amplitude, and using phase shift.

**MAFS.912.F-IF.3.7:** Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays.

**Clarifications:**
- Define appropriate quantities for the purpose of descriptive modeling.
- Working with quantities and the relationships between them provides grounding for work with expressions, equations, and functions.

**MAFS.912.N-Q.1.1:** Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays.

**Clarifications:**
- Students are comfortable making assumptions and can apply what they know to solve a design problem or analyze a situation in the community. By high school, a student might use geometry to model the relationship between two numerical variables. In addition to fitting a line to data, students assess how well the model fits by analyzing residuals.

**MAFS.912.S-ID.2.6:** Represent data on two quantitative variables on a scatter plot, and describe how the variables are related.

- a. Fit a function to the data; use functions fitted to data to solve problems in the context of the data. Use given functions or choose a function suggested by the context. Emphasize linear, and exponential models.
- b. Informally assess the fit of a function by plotting and analyzing residuals.
- c. Fit a linear function for a scatter plot that suggests a linear association.

**Clarifications:**
- Students take a more sophisticated look at using a linear function to model the relationship between two numerical variables. In addition to fitting a line to data, students assess how well the model fits by analyzing residuals.

**MAFS.912.S-ID.3.8:** Compute (using technology) and interpret the correlation coefficient of a linear fit.

**Make sense of problems and persevere in solving them.**

Mathematically proficient students start by explaining to themselves the meaning of a problem and looking for entry points to its solution. They analyze given constraints, relationships, and goals. They make conjectures about the form and meaning of the solution and plan a solution pathway rather than simply jumping into a solution attempt. They consider analogous problems, and try special cases and simpler forms of the original problem in order to gain insight into its solution. They monitor and evaluate their progress and change course if necessary. Older students might, depending on the context of the problem, transform algebraic expressions or change the viewing window on their graphing calculator to get more information about the relationship. Mathematically proficient students can explain correspondences between equations, verbal descriptions, tables, and graphs or draw diagrams of important features and relationships, graph data, and search for regularity or trends. Younger students might rely on using concrete objects or pictures to help conceptualize and solve a problem. Mathematically proficient students check their answers to problems using a different method, and they continually ask themselves, “Does this make sense?” They can understand the approaches of others to solving complex problems and identify correspondences between different approaches.

**Standard Relation to Course: Supporting**

**Reason abstractly and quantitatively.**

Mathematically proficient students make sense of quantities and their relationships in problem situations. They bring two complementary abilities to bear on problems involving quantitative relationships: the ability to decontextualize—to abstract a given situation and represent it symbolically and manipulatively the representing symbols as if they have a meaning of their own, without necessarily attending to their referents—and the ability to contextualize, to pause as needed during the manipulation process in order to probe into the referents for the symbols involved. Quantitative reasoning entails habits of creating a coherent representation of the problem at hand; considering the units involved; attending to the meaning of quantities, not just how to compute them; and knowing and flexibly using different properties of operations and objects.

**Standard Relation to Course: Supporting**

**Construct viable arguments and critique the reasoning of others.**

Mathematically proficient students understand and use stated assumptions, definitions, and previously established results in constructing arguments. They make conjectures and build a logical progression of statements to explore the truth of their conjectures. They are able to analyze situations by breaking them into cases, and can recognize and use counterexamples. They justify their conclusions, communicate them to others, and respond to the arguments of others. They reason inductively about data, making plausible arguments that take into account the context from which the data arose. Mathematically proficient students are also able to compare the effectiveness of two plausible arguments, distinguish correct logic or reasoning from that which is flawed, and—if there is a flaw in an argument—explain what it is. Elementary students can construct arguments using concrete referents such as objects, drawings, diagrams, and actions. Such arguments can make sense and be correct, even though they are not generalized or made formal until later grades. Later, students learn to determine domains to which an argument applies. Students at all grades can listen or read the arguments of others, decide whether they make sense, and ask useful questions to clarify or improve the arguments.

**Standard Relation to Course: Supporting**

**Model with mathematics.**

Mathematically proficient students can apply the mathematics they know to solve problems arising in everyday life, society, and the workplace. In early grades, this might be as simple as writing an addition equation to describe a situation. In middle grades, a student might apply proportional reasoning to plan a school event or analyze a problem in the community. By high school, a student might use geometry to solve a design problem or use a function to describe how one quantity of interest depends on another. Mathematically proficient students who can apply what they know are comfortable making assumptions and approximations to simplify a complicated situation, realizing that these may need revision later. They are able to identify important quantities in a practical situation and map their relationships using such tools as diagrams, two-way tables, graphs,
flowcharts and formulas. They can analyze those relationships mathematically to draw conclusions. They routinely interpret their mathematical results in the context of the situation and reflect on whether the results make sense, possibly improving the model if it has not served its purpose.

Standard Relation to Course: Supporting

Use appropriate tools strategically.

MAFS.K12.MP.5.1: Mathematically proficient students consider the available tools when solving a mathematical problem. These tools might include pencil and paper, concrete models, a ruler, a protractor, a calculator, a spreadsheet, a computer algebra system, a statistical package, or dynamic geometry software. Proficient students are sufficiently familiar with tools appropriate for their grade or course to make sound decisions about when each of these tools might be helpful, recognizing both the insight to be gained and their limitations. For example, mathematically proficient high school students analyze graphs of functions and solutions generated using a graphing calculator. They detect possible errors by strategically using estimation and other mathematical knowledge. When making mathematical models, they know that technology can enable them to visualize the results of varying assumptions, explore consequences, and compare predictions with data. Mathematically proficient students at various grade levels are able to identify relevant external mathematical resources, such as digital content located on a website, and use them to pose or solve problems. They are able to use technological tools to explore and deepen their understanding of concepts.

Standard Relation to Course: Supporting

Attend to precision.

MAFS.K12.MP.6.1: Mathematically proficient students try to communicate precisely to others. They try to use clear definitions in discussion with others and in their own reasoning. They state the meaning of the symbols they choose, including using the equal sign consistently and appropriately. They are careful about specifying units of measure, and labeling axes to clarify the correspondence with quantities in a problem. They calculate accurately and efficiently, express numerical answers with a degree of precision appropriate for the problem context. In the elementary grades, students give carefully formulated explanations to each other. By the time they reach high school they have learned to examine claims and make explicit use of definitions.

Standard Relation to Course: Supporting

Look for and make use of structure.

MAFS.K12.MP.7.1: Mathematically proficient students look closely to discern a pattern or structure. Young students, for example, might notice that three and seven more is the same amount as seven and three more, or they may sort a collection of shapes according to how many sides the shapes have. Later, students will see 7 × 8 equals the well remembered 7 × 5 + 7 × 3, in preparation for learning about the distributive property. In the expression x² + 9x + 14, older students can see the 14 as 2 × 7 and the 9 as 2 + 7. They recognize the significance of an existing line in a geometric figure and can use the strategy of drawing an auxiliary line for solving problems. They also can step back for an overview and shift perspective. They can see complicated things, such as some algebraic expressions, as single objects or as being composed of several objects. For example, they can see 5 – 3(x – y²) as 5 minus a positive number times a square and use that to realize that its value cannot be more than 5 for any real numbers x and y.

Standard Relation to Course: Supporting

Look for and express regularity in repeated reasoning.

MAFS.K12.MP.8.1: Mathematically proficient students notice if calculations are repeated, and look both for general methods and for shortcuts. Upper elementary students might notice when dividing 25 by 11 that they are repeating the same calculations over and over again, and conclude they have a repeating decimal. By paying attention to the calculation of slope as they repeatedly check whether points are on the line through (1, 2) with slope 3, middle school students might abstract the equation (y – 2) = 3(x – 1). Notice the regularity in the way terms cancel when expanding (x – 1)(x + 1), (x – 1)(x² + x + 1), and (x – 1)(x³ + x² + x + 1) might lead them to the general formula for the sum of a geometric series. As they work to solve a problem, mathematically proficient students maintain oversight of the process, while attending to the details. They continually evaluate the reasonableness of their intermediate results.

Standard Relation to Course: Supporting

SS.912.C.2.4: Evaluate, take, and defend positions on issues that cause the government to balance the interests of individuals with the public good.

SS.912.C.2.5: Conduct a service project to further the public good.

SS.912.C.2.6: Analyze the impact of citizen participation as a means of achieving political and social change.

SS.912.C.2.8: Monitor current public issues in Florida.

SS.912.C.2.10: Analyze various forms of political communication and evaluate for bias, factual accuracy, omission, and emotional appeal.

SS.912.C.2.13: Evaluate how environment and personal health are interrelated.

HE.912.C.1.3: Propose strategies to reduce or prevent injuries and health problems.

HE.912.C.1.4: Assess the degree of susceptibility to injury, illness, or death if engaging in unhealthy/risky behaviors.

E.LD.K12.ELL.SC.1: English language learners communicate information, ideas and concepts necessary for academic success in the content area of Science.
General Course Information and Notes

GENERAL NOTES

Laboratory investigations that include the use of scientific inquiry, research, measurement, problem solving, laboratory apparatus and technologies, experimental procedures, and safety procedures are an integral part of this course. The National Science Teachers Association (NSTA) recommends that at the high school level, all students should be in the science lab or field, collecting data every week. School laboratory investigations (labs) are defined by the National Research Council (NRC) as an experience in the laboratory, classroom, or the field that provides students with opportunities to interact directly with natural phenomena or with data collected by others using tools, materials, data collection techniques, and models (NRC, 2006, p. 3). Laboratory investigations in the high school classroom should help all students develop a growing understanding of the complexity and ambiguity of empirical work, as well as the skills to calibrate and troubleshoot equipment used to make observations. Learners should understand measurement error; and have the skills to aggregate, interpret, and present the resulting data (National Research Council, 2006, p.77; NSTA, 2007).

Bioscience III is an advanced laboratory based research course that will apply the conceptual knowledge and practical skills learned in Bioscience I and II. The goal of this course is to develop skills in the evaluation of research, to provide practice in scientific writing, to develop oral communication skills, and to expose students to current literature and research in the field of Bioscience. The first part of the course will focus on the analysis, evaluation, and discussion of recent Bioscience-related research publications. Students will be required to provide both oral and written evaluations of the publications that are discussed. Students will form teams and work with faculty to design and implement an independent research project, prepare a technical paper, and present their results. Students will be given the option to participate in local and/or national science competitions. Students will have opportunities to contact mentors from surrounding Bioscience educational and research facilities for advice during the development and implementation of their research projects.

Independent laboratory activities should emphasize experimental design of an original research project and may include but should not be limited to:

- Determine and implement specific electrophoresis techniques;
- Primer Design specified by the parameters of the research project;
- Plasmid Design;
- Extraction and purification of DNA and/or protein.

**Honors and Advanced Level Course Note:** Advanced courses require a greater demand on students through increased academic rigor. Academic rigor is obtained through the application, analysis, evaluation, and creation of complex ideas that are often abstract and multi-faceted. Students are challenged to think critically on the content they are learning. Honors level rigor will be achieved by increasing text complexity through text selection, focus on high-level qualitative measures, and complexity of task. Instruction will be structured to give students a deeper understanding of conceptual themes and organization within and across disciplines. Academic rigor is more than simply assigning to students a greater quantity of work.

**Special Notes**

**Instructional Practices**

Teaching from a range of complex text is optimized when teachers in all subject areas implement the following strategies on a routine basis:

1. Ensuring wide reading from complex text that varies in length.
2. Making close reading and rereading of texts central to lessons.
3. Emphasizing text-specific complex questions, and cognitively complex tasks, reinforce focus on the text and cultivate independence.
4. Emphasizing students supporting answers based upon evidence from the text.
5. Providing extensive research and writing opportunities (claims and evidence). Integration of Florida Standards for Mathematical Practice.

**Pre-requisites:** Bioscience II

**Corequisite:** Equally rigorous science course

**Science and Engineering Practices** (NRC Framework for K-12 Science Education, 2010)

- Asking questions (for science) and defining problems (for engineering).
- Developing and using models.
- Planning and carrying out investigations.
- Analyzing and interpreting data.
- Using mathematics, information and computer technology, and computational thinking.
- Constructing explanations (for science) and designing solutions (for engineering).
- Engaging in argument from evidence.
- Obtaining, evaluating, and communicating information.

**Literacy Standards in Science**

Secondary science courses include reading standards for literacy in science and technical subjects 6-12 and writing standards for literacy in history/social studies, science, and technical subjects 6-12. The courses also include speaking and listening standards. For a complete list of standards required for this course click on the blue tile labeled course standards. You may also download the complete course including all required standards and notes sections using the export function located at the top of this page.

**English Language Development ELD Standards Special Notes Section:**

Teachers are required to provide listening, speaking, reading and writing instruction that allows English language learners (ELL) to communicate information, ideas and concepts for academic success in the content area of Science. For the given level of English language proficiency and with visual, graphic, or interactive support, students will interact with grade level words, expressions, sentences and discourse to process or produce language necessary for academic success. The ELD standard should specify a relevant content area concept or topic of study chosen by curriculum developers and teachers which maximizes an ELL's need for communication and social skills. To access an ELL supporting document which delineates performance definitions and descriptors, please click on the following link:

https://cpalmsmediaprod.blob.core.windows.net/uploads/docs/standards/eld/sc.pdf

GENERAL INFORMATION
### Educator Certifications

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Course Standards

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<th>Name</th>
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<tr>
<td>SC.912.L.16.11:</td>
<td>Discuss the technologies associated with forensic medicine and DNA identification, including restriction fragment length polymorphism (RFLP) analysis.</td>
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<tr>
<td>SC.912.L.18.11:</td>
<td>Define a problem based on a specific body of knowledge, for example: biology, chemistry, physics, and earth/space science, and do the following: 1. Pose questions about the natural world, (Articulate the purpose of the investigation and identify the relevant scientific concepts). 2. Conduct systematic observations, (Write procedures that are clear and replicable. Identify observables and examine relationships between test (independent) variable and outcome (dependent) variable. Employ appropriate methods for accurate and consistent observations; conduct and record measurements at appropriate levels of precision. Follow safety guidelines). 3. Examine books and other sources of information to see what is already known, 4. Review what is known in light of empirical evidence, (Examine whether available empirical evidence can be interpreted in terms of existing knowledge and models, and if not, modify or develop new models). 5. Plan investigations, (Design and evaluate a scientific investigation). 6. Use tools to gather, analyze, and interpret data (this includes the use of measurement in metric and other systems, and also the generation and interpretation of graphical representations of data, including data tables and graphs). (Collect data or evidence in an organized way. Properly use instruments, equipment, and materials (e.g., scales, probeware, meter sticks, microscopes, computers) including setup, calibration, technique, maintenance, and storage). 7. Pose answers, explanations, or descriptions of events, 8. Generate explanations that explicate or describe natural phenomena (inferences), 9. Use appropriate evidence and reasoning to justify these explanations to others, 10. Communicate results of scientific investigations, and 11. Evaluate the merits of the explanations produced by others.</td>
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<td>SC.912.N.2.1:</td>
<td>Identify what is science, what clearly is not science, and what superficially resembles science (but fails to meet the criteria for science).</td>
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<td>SC.912.N.2.2:</td>
<td>Identify which questions can be answered through science and which questions are outside the boundaries of scientific investigation, such as questions addressed by other ways of knowing, such as art, philosophy, and religion.</td>
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<td>Identify examples of pseudoscience (such as astrology, phrenology) in society.</td>
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<tr>
<td>SC.912.N.2.4:</td>
<td>Explain that scientific knowledge is both durable and robust and open to change. Scientific knowledge can change because it is often examined and re-examined by new investigations and scientific argumentation. Because of these frequent examinations, scientific knowledge becomes stronger, leading to its durability.</td>
</tr>
<tr>
<td>SC.912.N.2.5:</td>
<td>Describe instances in which scientists’ varied backgrounds, talents, interests, and goals influence the inferences and thus the explanations that they make about observations of natural phenomena and describe that competing interpretations (explanations) of scientists are a strength of science as they are a source of new, testable ideas that have the potential to add new evidence to support one or another of the explanations.</td>
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<td>SC.912.N.3.1:</td>
<td>Explain that a scientific theory is the culmination of many scientific investigations drawing together all the current evidence concerning a substantial range of phenomena; thus, a scientific theory represents the most powerful explanation scientists have to offer.</td>
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<td>SC.912.N.3.2:</td>
<td>Describe the role consensus plays in the historical development of a theory in any one of the disciplines of science.</td>
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<td>SC.912.N.3.3:</td>
<td>Explain that scientific laws are descriptions of specific relationships under given conditions in nature, but do not offer explanations for those relationships.</td>
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<td>SC.912.N.3.4:</td>
<td>Recognize that theories do not become laws, nor do laws become theories; theories are well supported explanations and laws are well supported descriptions.</td>
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<td>SC.912.N.3.5:</td>
<td>Describe the function of models in science, and identify the wide range of models used in science.</td>
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<td>Weigh the merits of alternative strategies for solving a specific societal problem by comparing a number of different costs and benefits, such as human, economic, and environmental.</td>
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<td>SC.912.P.8.11:</td>
<td>Relate acidity and basicity to hydronium and hydroxyl ion concentration and pH.</td>
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<td>SC.912.P.12.12:</td>
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Clariﬁcations:
Teachers who encourage students to participate actively in effortful learning both individually and with others:

- Help and support each other when attempting a new method or approach.
- Ask questions that will help with solving the task.
- Build perseverance by modifying methods as needed while solving a challenging task.
- Stay engaged and maintain a positive mindset when working to solve tasks.
- Plan investigations, (Design and evaluate a scientific investigation).
- Cultivate a community of growth mindset learners.
- Foster perseverance in students by choosing tasks that are challenging.
- Develop students' ability to analyze and problem solve.
- Recognize students' effort when solving challenging problems.

Demonstrate understanding by representing problems in multiple ways.

Mathematicians who demonstrate understanding by representing problems in multiple ways:

- Build understanding through modeling and using manipulatives.
- Represent solutions to problems in multiple ways using objects, drawings, tables, graphs and equations.
- Progress from modeling problems with objects and drawings to using algorithms and equations.
- Express connections between concepts and representations.
- Choose a representation based on the given context or purpose.

**Clarifications:**
Teachers who encourage students to demonstrate understanding by representing problems in multiple ways:

- Help students make connections between concepts and representations.
- Provide opportunities for students to use manipulatives when investigating concepts.
- Guide students from concrete to pictorial to abstract representations as understanding progresses.
- Show students that various representations can have different purposes and can be useful in different situations.

Complete tasks with mathematical fluency.

Mathematicians who complete tasks with mathematical fluency:

- Select efficient and appropriate methods for solving problems within the given context.
- Maintain flexibility and accuracy while performing procedures and mental calculations.
- Complete tasks accurately and with confidence.
- Adapt procedures to apply them to a new context.
- Use feedback to improve efficiency when performing calculations.

**Clarifications:**
Teachers who encourage students to complete tasks with mathematical fluency:

- Provide students with the flexibility to solve problems by selecting a procedure that allows them to solve efficiently and accurately.
- Offer multiple opportunities for students to practice efficient and generalizable methods.
- Provide opportunities for students to reflect on the method they used and determine if a more efficient method could have been used.

Engage in discussions that reflect on the mathematical thinking of self and others.

Mathematicians who engage in discussions that reflect on the mathematical thinking of self and others:

- Communicate mathematical ideas, vocabulary and methods effectively.
- Analyze the mathematical thinking of others.
- Compare the efficiency of a method to those expressed by others.
- Recognize errors and suggest how to correctly solve the task.
- Justify results by explaining methods and processes.
- Construct possible arguments based on evidence.

**Clarifications:**
Teachers who encourage students to engage in discussions that reflect on the mathematical thinking of self and others:

- Establish a culture in which students ask questions of the teacher and their peers, and error is an opportunity for learning.
- Create opportunities for students to discuss their thinking with peers.
- Select, sequence and present student work to advance and deepen understanding of correct and increasingly efficient methods.
- Develop students' ability to justify methods and compare their responses to the responses of their peers.

Use patterns and structure to help understand and connect mathematical concepts.

Mathematicians who use patterns and structure to help understand and connect mathematical concepts:

- Focus on relevant details within a problem.
- Create plans and procedures to logically order events, steps or ideas to solve problems.
- Decompose a complex problem into manageable parts.
- Relate previously learned concepts to new concepts.
- Look for similarities among problems.
- Connect solutions of problems to more complicated large-scale situations.

**Clarifications:**
Teachers who encourage students to use patterns and structure to help understand and connect mathematical concepts:

- Help students recognize the patterns in the world around them and connect these patterns to mathematical concepts.
- Support students to develop generalizations based on the similarities found among problems.
- Provide opportunities for students to create plans and procedures to solve problems.
- Develop students' ability to construct relationships between their current understanding and more sophisticated ways of thinking.

Assess the reasonableness of solutions.

Mathematicians who assess the reasonableness of solutions:

- Estimate to discover possible solutions.
- Use benchmark quantities to determine if a solution makes sense.
- Check calculations when solving problems.
- Verify possible solutions by explaining the methods used.
- Evaluate results based on the given context.

**Clarifications:**
Teachers who encourage students to assess the reasonableness of solutions:
- Have students estimate or predict solutions prior to solving.
- Prompt students to continually ask, “Does this solution make sense? How do you know?”
- Reinforce that students check their work as they progress within and after a task.
- Strengthen students’ ability to verify solutions through justifications.

Apply mathematics to real-world contexts.
Mathematicians who apply mathematics to real-world contexts:
- Connect mathematical concepts to everyday experiences.
- Use models and methods to understand, represent, and solve problems.
- Perform investigations to gather data or determine if a method is appropriate.
- Redesign models and methods to improve accuracy or efficiency.

Clarifications:
- Teachers who encourage students to apply mathematics to real-world contexts:
  - Provide opportunities for students to create models, both concrete and abstract, and perform investigations.
  - Challenge students to question the accuracy of their models and methods.
  - Support students as they validate conclusions by comparing them to the given situation.
  - Indicate how various concepts can be applied to other disciplines.

Cite evidence to explain and justify reasoning.

Clarifications:
- K-1 Students include textual evidence in their oral communication with guidance and support from adults. The evidence can consist of details from the text without naming the text. During 1st grade, students learn how to incorporate the evidence in their writing.
- 2-3 Students include relevant textual evidence in their written and oral communication. Students should name the text when they refer to it. In 3rd grade, students should use a combination of direct and indirect citations.
- 4-5 Students continue with previous skills and reference comments made by speakers and peers. Students cite texts that they’ve directly quoted, paraphrased, or used for information. When writing, students will use the form of citation dictated by the instructor or the style guide referenced by the instructor.
- 6-8 Students continue with previous skills and use a style guide to create a proper citation.
- 9-12 Students continue with previous skills and should be aware of existing style guides and the ways in which they differ.

Read and comprehend grade-level complex texts proficiently.

Clarifications:
- See Text Complexity for grade-level complexity bands and a text complexity rubric.

Make inferences to support comprehension.

Clarifications:
- Students will make inferences before the words infer or inference are introduced. Kindergarten students will answer questions like “Why is the girl smiling?” or make predictions about what will happen based on the title page. Students will use the terms and apply them in 2nd grade and beyond.

Use appropriate collaborative techniques and active listening skills when engaging in discussions in a variety of situations.

Clarifications:
- In kindergarten, students learn to listen to one another respectfully.
- In grades 1-2, students build upon these skills by justifying what they are thinking. For example: “I think _____ because _____.” The collaborative conversations are becoming academic conversations.
- In grades 3-12, students engage in academic conversations discussing claims and justifying their reasoning, refining and applying skills. Students build on ideas, propel the conversation, and support claims and counterclaims with evidence.

Use the accepted rules governing a specific format to create quality work.

Clarifications:
- Students will incorporate skills learned into work products to produce quality work. For students to incorporate these skills appropriately, they must receive instruction. A 3rd grade student creating a poster board display must have instruction in how to effectively present information to do quality work.

Use appropriate voice and tone when speaking or writing.

Clarifications:
- In kindergarten and 1st grade, students learn the difference between formal and informal language. For example, the way we talk to our friends differs from the way we speak to adults. In 2nd grade and beyond, students practice appropriate social and academic language to discuss texts.

Evaluate, take, and defend positions on issues that cause the government to balance the interests of individuals with the public good.

Clarifications:
- Examples are school, community, state, national, international.

Analyze the impact of citizen participation as a means of achieving political and social change.

Clarifications:
- Examples are e-mail campaigns, boycotts, blogs, podcasts, protests, demonstrations, letters to editors.

Monitor current public issues in Florida.

Clarifications:
- Examples are On-line Sunshine, media, e-mails to government officials, political text messaging.

Analyze various forms of political communication and evaluate for bias, factual accuracy, omission, and emotional appeal.
General Course Information and Notes

GENERAL NOTES

Laboratory investigations that include the use of scientific inquiry, research, measurement, problem solving, laboratory apparatus and technologies, experimental procedures, and safety procedures are an integral part of this course. The National Science Teachers Association (NSTA) recommends that at the high school level, all students should be in the science lab or field, collecting data every week. School laboratory investigations (labs) are defined by the National Research Council (NRC) as an experience in the laboratory, classroom, or the field that provides students with opportunities to interact directly with natural phenomena or with data collected by others using tools, materials, data collection techniques, and models (NRC, 2006, p. 3). Laboratory investigations in the high school classroom should help all students develop a growing understanding of the complexity and ambiguity of empirical work, as well as the skills to calibrate and troubleshoot equipment used to make observations. Learners should understand measurement error; and have the skills to aggregate, interpret, and present the resulting data (National Research Council, 2006, p. 77; NSTA, 2007).

Bioscience III is an advanced laboratory based research course that will apply the conceptual knowledge and practical skills learned in Bioscience I and II. The goal of this course is to develop skills in the evaluation of research, to provide practice in scientific writing, to develop oral communication skills, and to expose students to current literature and research in the field of Bioscience. The first part of the course will focus on the analysis, evaluation, and discussion of recent Bioscience-related research publications. Students will be required to provide both oral and written evaluations of the publications that are discussed. Students will form teams and work with faculty to design and implement an independent research project, prepare a technical paper, and present their results. Students will be given the option to participate in local and/or national science competitions. Students will have opportunities to contact mentors from surrounding Bioscience educational and research facilities for advice during the development and implementation of their research projects.

Independent laboratory activities should emphasize experimental design of an original research project and may include but should not be limited to:

- Determine and implement specific electrophoresis techniques;
- Primer Design specified by the parameters of the research project;
- Plasmid Design;
- Extraction and purification of DNA and/or protein.

Honors and Advanced Level Course Note: Advanced courses require a greater demand on students through increased academic rigor. Academic rigor is obtained through the application, analysis, evaluation, and creation of complex ideas that are often abstract and multi-faceted. Students are challenged to think and collaborate critically on the content they are learning. Honors level rigor will be achieved by increasing text complexity through text selection, focus on high-level qualitative measures, and complexity of task. Instruction will be structured to give students a deeper understanding of conceptual themes and organization within and across disciplines. Academic rigor is more than simply assigning to students a greater quantity of work.

Special Notes

Instructional Practices
Teaching from a range of complex text is optimized when teachers in all subject areas implement the following strategies on a routine basis:

Ensuring wide reading from complex text that varies in length.

1. Making close reading and rereading of texts central to lessons.
2. Emphasizing text-specific complex questions, and cognitively complex tasks, reinforce focus on the text and cultivate independence.
3. Emphasizing students supporting answers based upon evidence from the text.
4. Providing extensive research and writing opportunities (claims and evidence).
5. Integration of Florida Standards for Mathematical Practice.

Pre-requisites: Bioscience II
Corequisite: Equally rigorous science course


- Asking questions (for science) and defining problems (for engineering).
- Developing and using models.
- Planning and carrying out investigations.
- Analyzing and interpreting data.
- Using mathematics, information and computer technology, and computational thinking.
- Constructing explanations (for science) and designing solutions (for engineering).
- Engaging in argument from evidence.
Educator Certifications

- Biology (Grades 6-12)
- Chemistry (Grades 6-12)

Obtaining, evaluating, and communicating information.

**Florida's Benchmarks for Excellent Student Thinking (B.E.S.T.) Standards**

This course includes Florida's B.E.S.T. ELA Expectations (EE) and Mathematical Thinking and Reasoning Standards (MTRs) for students. Florida educators should intentionally embed these standards within the content and their instruction as applicable. For guidance on the implementation of the EE and MTRs, please visit https://www.cpalms.org/Standards/BEST_Standards.aspx and select the appropriate B.E.S.T. Standards package.

**English Language Development ELD Standards Special Notes Section:**

Teachers are required to provide listening, speaking, reading and writing instruction that allows English language learners (ELL) to communicate information, ideas and concepts for academic success in the content area of Science. For the given level of English language proficiency and with visual, graphic, or interactive support, students will interact with grade level words, expressions, sentences and discourse to process or produce language necessary for academic success. The ELD standard should specify a relevant content area concept or topic of study chosen by curriculum developers and teachers which maximizes an ELL's need for communication and social skills.

To access an ELL supporting document which delineates performance definitions and descriptors, please click on the following link: https://cpalmsmediaprod.blob.core.windows.net/uploads/docs/standards/eld/sc.pdf

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**GENERAL INFORMATION**

- **Course Number:** 2000520
- **Course Path:** Grades PreK to 12 Education Courses > Grade Group: Grades 9 to 12 and Adult Education Courses > Subject: Science > SubSubject: Biological Sciences >
- **Abbreviated Title:** BIOSCIENCE 3 HON
- **Course Length:** Year (Y)
- **Course Attributes:** Honors
- **Course Level:** 3
- **Grade Level(s):** 9,10,11,12
- **Graduation Requirement:** Equally Rigorous Science
**Course Standards**

<table>
<thead>
<tr>
<th>Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>SC.912.L.16.11:</td>
<td>Discuss the technologies associated with forensic medicine and DNA identification, including restriction fragment length polymorphism (RFLP) analysis.</td>
</tr>
<tr>
<td>SC.912.L.18.11:</td>
<td>Explain the role of enzymes as catalysts that lower the activation energy of biochemical reactions. Identify factors, such as pH and temperature, and their effect on enzyme activity.</td>
</tr>
<tr>
<td>SC.912.N.1.1:</td>
<td>Define a problem based on a specific body of knowledge, for example: biology, chemistry, physics, and earth/space science, and do the following: 1. Pose questions about the natural world, (Articulate the purpose of the investigation and identify the relevant scientific concepts). 2. Conduct systematic observations, (Write procedures that are clear and replicable. Identify observables and examine relationships between test (independent) variable and outcome (dependent) variable. Employ appropriate methods for accurate and consistent observations; conduct and record measurements at appropriate levels of precision. Follow safety guidelines). 3. Examine books and other sources of information to see what is already known, 4. Review what is known in light of empirical evidence, (Examine whether available empirical evidence can be interpreted in terms of existing knowledge and models, and if not, modify or develop new models). 5. Plan investigations, (Design and evaluate a scientific investigation). 6. Use tools to gather, analyze, and interpret data (this includes the use of measurement in metric and other systems, and also the generation and interpretation of graphical representations of data, including data tables and graphs), (Collect data or evidence in an organized way. Properly use instruments, equipment, and materials (e.g., scales, probeware, meter sticks, microscopes, computers) including set-up, calibration, technique, maintenance, and storage). 7. Pose answers, explanations, or descriptions of events, 8. Generate explanations that explicate or describe natural phenomena (inferences), 9. Use appropriate evidence and reasoning to justify these explanations to others, 10. Communicate results of scientific investigations, and 11. Evaluate the merits of the explanations produced by others.</td>
</tr>
<tr>
<td>SC.912.N.1.2:</td>
<td>Describe and explain what characterizes science and its methods.</td>
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<tr>
<td>SC.912.N.1.3:</td>
<td>Recognize that the strength or usefulness of a scientific claim is evaluated through scientific argumentation, which depends on critical and logical thinking, and the active consideration of alternative scientific explanations to explain the data presented.</td>
</tr>
<tr>
<td>SC.912.N.1.4:</td>
<td>Identify sources of information and assess their reliability according to the strict standards of scientific investigation.</td>
</tr>
<tr>
<td>SC.912.N.1.5:</td>
<td>Describe and provide examples of how similar investigations conducted in many parts of the world result in the same outcome.</td>
</tr>
<tr>
<td>SC.912.N.1.6:</td>
<td>Describe how scientific inferences are drawn from scientific observations and provide examples from the content being studied.</td>
</tr>
<tr>
<td>SC.912.N.1.7:</td>
<td>Recognize the role of creativity in constructing scientific questions, methods and explanations.</td>
</tr>
<tr>
<td>SC.912.N.2.1:</td>
<td>Identify what science, what clearly is not science, and what superficially resembles science (but fails to meet the criteria for science).</td>
</tr>
<tr>
<td>SC.912.N.2.2:</td>
<td>Identify which questions can be answered through science and which questions are outside the boundaries of scientific investigation, such as questions addressed by other ways of knowing, such as art, philosophy, and religion.</td>
</tr>
<tr>
<td>SC.912.N.2.3:</td>
<td>Identify examples of pseudoscience (such as astrology, phrenology) in society.</td>
</tr>
<tr>
<td>SC.912.N.2.4:</td>
<td>Explain that scientific knowledge is both durable and robust and open to change. Scientific knowledge can change because it is often examined and re-examined by new investigations and scientific argumentation. Because of these frequent examinations, scientific knowledge becomes stronger, leading to its durability.</td>
</tr>
<tr>
<td>SC.912.N.2.5:</td>
<td>Describe instances in which scientists’ varied backgrounds, talents, interests, and goals influence the inferences and thus the explanations that they make about observations of natural phenomena and describe that competing interpretations (explanations) of scientists are a strength of science as they are a source of new, testable ideas that have the potential to add new evidence to support one or another of the explanations.</td>
</tr>
<tr>
<td>SC.912.N.3.1:</td>
<td>Explain that a scientific theory is the culmination of many scientific investigations drawing together all the current evidence concerning a substantial range of phenomena; thus, a scientific theory represents the most powerful explanation scientists have to offer.</td>
</tr>
<tr>
<td>SC.912.N.3.2:</td>
<td>Describe the role consensus plays in the historical development of a theory in any one of the disciplines of science.</td>
</tr>
<tr>
<td>SC.912.N.3.3:</td>
<td>Explain that scientific laws are descriptions of specific relationships under given conditions in nature, but do not offer explanations for those relationships.</td>
</tr>
<tr>
<td>SC.912.N.3.4:</td>
<td>Recognize that theories do not become laws, nor do laws become theories; theories are well supported explanations and laws are well supported descriptions.</td>
</tr>
<tr>
<td>SC.912.N.3.5:</td>
<td>Describe the function of models in science, and identify the wide range of models used in science.</td>
</tr>
<tr>
<td>SC.912.N.4.1:</td>
<td>Explain how scientific knowledge and reasoning provide an empirically-based perspective to inform society’s decision making.</td>
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<tr>
<td>SC.912.N.4.2:</td>
<td>Weigh the merits of alternative strategies for solving a specific societal problem by comparing a number of different costs and benefits, such as human, economic, and environmental.</td>
</tr>
<tr>
<td>SC.912.P.8.11:</td>
<td>Relate acidity and basicity to hydronium and hydroxyl ion concentration and pH.</td>
</tr>
<tr>
<td>SC.912.P.12.12:</td>
<td>Explain how various factors, such as concentration, temperature, and presence of a catalyst affect the rate of a chemical reaction. Mathematicians who participate in effortful learning both individually and with others: 1. Analyze the problem in a way that makes sense given the task. 2. Ask questions that will help with solving the task. 3. Build perseverance by modifying methods as needed while solving a challenging task. 4. Stay engaged and maintain a positive mindset when working to solve tasks. 5. Help and support each other when attempting a new method or approach.</td>
</tr>
<tr>
<td>MA.K12.MTR.1.1:</td>
<td>Clarifications: Teachers who encourage students to participate actively in effortful learning both individually and with others:</td>
</tr>
</tbody>
</table>
Cultivate a community of growth mindset learners.
Foster perseverance in students by choosing tasks that are challenging.
Develop students' ability to analyze and problem solve.
Recognize students' effort when solving challenging problems.

### Demonstrate understanding by representing problems in multiple ways.
Mathematicians who demonstrate understanding by representing problems in multiple ways:
- Build understanding through modeling and using manipulatives.
- Represent solutions to problems in multiple ways using objects, drawings, tables, graphs and equations.
- Progress from modeling problems with objects and drawings to using algorithms and equations.
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#### Clarifications:
Teachers who encourage students to demonstrate understanding by representing problems in multiple ways:
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- Select efficient and appropriate methods for solving problems within the given context.
- Maintain flexibility and accuracy while performing procedures and mental calculations.
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- Provide students with the flexibility to solve problems by selecting a procedure that allows them to solve efficiently and accurately.
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- Justify results by explaining methods and processes.
- Construct possible arguments based on evidence.

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Teachers who encourage students to engage in discussions that reflect on the mathematical thinking of self and others:
- Establish a culture in which students ask questions of the teacher and their peers, and error is an opportunity for learning.
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- Have students estimate or predict solutions prior to solving.
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Mathematicians who apply mathematics to real-world contexts:
- Connect mathematical concepts to everyday experiences.
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Teachers who encourage students to apply mathematics to real-world contexts:
- Provide opportunities for students to create models, both concrete and abstract, and perform investigations.
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**Clarifications:**
Students will make inferences before the words infer or inference are introduced. Kindergarten students will answer questions like “Why is the girl smiling?” or make predictions about what will happen based on the title page. Students will use the terms and apply them in 2nd grade and beyond.

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In kindergarten, students learn to listen to one another respectfully. In grades 1-2, students build upon these skills by justifying what they are thinking. For example: “I think _____ because _____. “ The collaborative conversations are becoming academic conversations.
In grades 3-12, students engage in academic conversations discussing claims and justifying their reasoning, refining and applying skills. Students build on ideas, propel the conversation, and support claims and counterclaims with evidence.

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Use appropriate voice and tone when speaking or writing.

**Clarifications:**
In kindergarten and 1st grade, students learn the difference between formal and informal language. For example, the way we talk to our friends differs from the way we speak to adults. In 2nd grade and beyond, students practice appropriate social and academic language to discuss texts.

Explain the responsibilities of citizens at the local, state and national levels.
- Students will identify various responsibilities held by citizens (e.g., voting, volunteering and being informed, respecting laws).
- Students will understand the process of registering or preregistering to vote and how to complete a ballot in Florida (e.g., uniform primary and general election ballot).
- Students will discuss appropriate methods of communication with public officials (e.g., corresponding, attending public meetings, requesting a meeting and providing information).
- Students will participate in classroom activities that simulate exercising the responsibilities of citizenship.

Evaluate, take and defend objective, evidence-based positions on issues that cause the government to balance the interests of individuals with the public good.
- Students will examine situations when individuals' rights have been restricted for the public good (e.g., limits on speech or rationing of goods during wartime, enactment of the Patriot Act).
- Students will analyze how environmental and financial policies place limitations on citizens and private industry for the public good.
- Students will explain different services provided by local, state and national governments to citizens to ensure their rights are protected (e.g.,...
English language learners communicate information, ideas and concepts for social and instructional purposes within the school setting. Students will identify legal methods that citizens can use to promote social and political change (e.g., voting, peaceful protests, petitioning, demonstrations, contacting government offices). Students will identify historical examples of citizens achieving or preventing social and political change through civic engagement (e.g., the Abolitionist Movement).

Service Learning:
Evaluate political communication for bias, factual accuracy, omission and emotional appeal.
- Students will compare the reporting on the same political event or issue from multiple perspectives.
- Students will identify various forms of propaganda (e.g., plain folks, glittering generalities, testimonial, fear, logical fallacies).
- Students will discuss the historical impact of political communication on American political process and public opinion.
- Examples of political communication may include, but are not limited to, political cartoons, propaganda, campaign advertisements, political speeches, bumper stickers, blogs, press and social media.

General Course Information and Notes

**GENERAL NOTES**

Laboratory investigations that include the use of scientific inquiry, research, measurement, problem solving, laboratory apparatus and technologies, experimental procedures, and safety procedures are an integral part of this course. The National Science Teachers Association (NSTA) recommends that at the high school level, all students should be in the science lab or field, collecting data every week. School laboratory investigations (labs) are defined by the National Research Council (NRC) as an experience in the laboratory, classroom, or the field that provides students with opportunities to interact directly with natural phenomena or with data collected by others using tools, materials, data collection techniques, and models (NRC, 2006, p. 3). Laboratory investigations in the high school classroom should help all students develop a growing understanding of the complexity and ambiguity of empirical work, as well as the skills to calibrate and troubleshoot equipment used to make observations. Learners should understand measurement error; and have the skills to aggregate, interpret, and present the resulting data (National Research Council, 2006, p. 77; NSTA, 2007).

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- Plasmid Design;
- Extraction and purification of DNA and/or protein.

**Honors and Advanced Level Course Notes:** Advanced courses require a greater demand on students through increased academic rigor. Academic rigor is obtained through the application, analysis, evaluation, and creation of complex ideas that are often abstract and multi-faceted. Students are challenged to think and collaborate critically on the content they are learning. Honors level rigor will be achieved by increasing text complexity through text selection, focus on high-level qualitative measures, and complexity of task. Instruction will be structured to give students a deeper understanding of conceptual themes and organization within and across disciplines. Academic rigor is more than simply assigning to students a greater quantity of work.

**Special Notes**

**Instructional Practices**

Teaching from a range of complex text is optimized when teachers in all subject areas implement the following strategies on a routine basis:

- Ensuring wide reading from complex text that varies in length.
  1. Making close reading and rereading of texts central to lessons.
  2. Emphasizing text-specific complex questions, and cognitively complex tasks, reinforce focus on the text and cultivate independence.
3. Emphasizing students supporting answers based upon evidence from the text.
4. Providing extensive research and writing opportunities (claims and evidence).
5. Integration of Florida Standards for Mathematical Practice.

Pre-requisites: Bioscience II
Corequisite: Equally rigorous science course


- Asking questions (for science) and defining problems (for engineering).
- Developing and using models.
- Planning and carrying out investigations.
- Analyzing and interpreting data.
- Using mathematics, information and computer technology, and computational thinking.
- Constructing explanations (for science) and designing solutions (for engineering).
- Engaging in argument from evidence.
- Obtaining, evaluating, and communicating information.

Florida's Benchmarks for Excellent Student Thinking (B.E.S.T.) Standards

This course includes Florida's B.E.S.T. ELA Expectations (EE) and Mathematical Thinking and Reasoning Standards (MTRs) for students. Florida educators should intentionally embed these standards within the content and their instruction as applicable. For guidance on the implementation of the EE and MTRs, please visit https://www.cpalms.org/Standards/BEST_Standards.aspx and select the appropriate B.E.S.T. Standards package.

English Language Development ELD Standards Special Notes Section:

Teachers are required to provide listening, speaking, reading and writing instruction that allows English language learners (ELL) to communicate information, ideas and concepts for academic success in the content area of Science. For the given level of English language proficiency and with visual, graphic, or interactive support, students will interact with grade level words, expressions, sentences and discourse to process or produce language necessary for academic success. The ELD standard should specify a relevant content area concept or topic of study chosen by curriculum developers and teachers which maximizes an ELL's need for communication and social skills.

To access an ELL supporting document which delineates performance definitions and descriptors, please click on the following link: https://cpalmsmediaprod.blob.core.windows.net/uploads/docs/standards/eld/sc.pdf

GENERAL INFORMATION

Course Number: 2000520
Course Path: Section: Grades PreK to 12 Education
Courses > Grade Group: Grades 9 to 12 and Adult Education Courses > Subject: Science > SubSubject: Biological Sciences
Abbreviated Title: BIOSCIENCE 3 HON
Number of Credits: One (1) credit
Course Length: Year (Y)
Course Attributes:
- Honors
Course Level: 3

Graduation Requirement: Equally Rigorous Science

Educator Certifications

<table>
<thead>
<tr>
<th>Biology (Grades 6-12)</th>
<th>Chemistry (Grades 6-12)</th>
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### Course Standards

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<tr>
<th>Name</th>
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<tbody>
<tr>
<td>SC.912.L.18.7</td>
<td>Explain the movement of matter and energy through the different biogeochemical cycles, including water and carbon.</td>
</tr>
<tr>
<td>SC.912.L.18.8</td>
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<td>SC.912.L.18.11</td>
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<td>Compare and contrast structure and function of various types of microscopes.</td>
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<td>SC.912.L.18.13</td>
<td>Describe the basic processes of transcription and translation, and how they result in the expression of genes.</td>
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<td>SC.912.L.18.14</td>
<td>Explain how mutations in the DNA sequence may or may not result in phenotypic change. Explain how mutations in gametes may result in phenotypic changes in offspring.</td>
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<td>SC.912.L.18.15</td>
<td>Explain the general distribution of life in aquatic systems as a function of chemistry, geography, light, depth, salinity, and temperature.</td>
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<td>SC.912.L.18.16</td>
<td>Use Mendel's laws of segregation and independent assortment to analyze patterns of inheritance.</td>
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<td>SC.912.L.18.17</td>
<td>Discuss observed inheritance patterns caused by various modes of inheritance, including dominant, recessive, codominant, sex-linked, polygenic, and multiple alleles.</td>
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<td>SC.912.L.18.18</td>
<td>Analyze the movement of energy through trophic levels and the reduction of available energy at successive trophic levels.</td>
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<tr>
<td>SC.912.L.18.19</td>
<td>Explain how and why organisms are hierarchically classified and based on evolutionary relationships.</td>
</tr>
<tr>
<td>SC.912.L.18.20</td>
<td>Discuss the basic anatomy and physiology of the human reproductive system. Describe the process of human development from fertilization to birth and major changes that occur in each trimester of pregnancy.</td>
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<td>SC.912.L.18.21</td>
<td>Evaluate the impact of biotechnology on the individual, society and the environment, including medical and ethical issues.</td>
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Connect the role of adenosine triphosphate (ATP) to energy transfers within a cell.

Explain the role of enzymes as catalysts that lower the activation energy of biochemical reactions. Identify factors, such as pH and temperature, and their effect on enzyme activity.

Discuss the special properties of water that contribute to Earth's suitability as an environment for life: cohesive behavior, ability to moderate temperature, expansion upon freezing, and versatility as a solvent.

Define a problem based on a specific body of knowledge, for example: biology, chemistry, physics, and earth/space science, and do the following:
1. Pose questions about the natural world. (Articulate the purpose of the investigation and identify the relevant scientific concepts).
2. Conduct systematic observations. Write procedures that are clear and replicable. Identify observables and examine relationships between test (independent) variable and outcome (dependent) variable. Employ appropriate methods for accurate and consistent observations; conduct and record measurements at appropriate levels of precision. Follow safety guidelines.
3. Examine books and other sources of information to see what is already known.
4. Review what is known in light of empirical evidence. (Examine whether available empirical evidence can be interpreted in terms of existing knowledge and models, and if not, modify or develop new models).
5. Plan investigations. (Design and evaluate a scientific investigation).
6. Use tools to gather, analyze, and interpret data (this includes the use of measurement in metric and other systems, and also the generation and interpretation of graphical representations of data, including data tables and graphs). (Collect data or evidence in an organized way. Properly use instruments, equipment, and materials (e.g., scales, probeware, meter sticks, microscopes, computers) including set-up, calibration, technique, maintenance, and storage).
7. Pose answers, explanations, or descriptions of events.
8. Generate explanations that explicate or describe natural phenomena (inferences).
9. Use appropriate evidence and reasoning to justify these explanations to others.
10. Communicate results of scientific investigations, and
11. Evaluate the merits of the explanations produced by others.

Recognize that the strength or usefulness of a scientific claim is evaluated through scientific argumentation, which depends on critical and logical thinking, and the active consideration of alternative scientific explanations to explain the data presented.

Identify sources of information and assess their reliability according to the strict standards of scientific investigation.

Describe how scientific inferences are drawn from scientific observations and provide examples from the content being studied.

Identify which questions can be answered through science and which cannot.

Evaluate a speaker's point of view, reasoning, and use of evidence and rhetoric, identifying any fallacious reasoning or exaggerated or distorted evidence.

Present information, findings, and supporting evidence clearly, accurately, and logically such that listeners can follow the line of reasoning and make new connections in light of the evidence and reasoning presented.

Cite specific textual evidence to support analysis of science and technical texts.

Integrate multiple sources of information presented in diverse media or formats (e.g., visually, quantitatively, orally) evaluating the credibility and accuracy of each source.

Evaluate a speaker's point of view, reasoning, and use of evidence and rhetoric, identifying any fallacious reasoning or exaggerated or distorted evidence.

Present information, findings, and supporting evidence clearly, concisely, and logically such that listeners can follow the line of reasoning and the organization, development, substance, and style are appropriate to purpose, audience, and task.

Make strategic use of digital media (e.g., textual, graphical, audio, visual, and interactive elements) in presentations to enhance understanding of findings, reasoning, and evidence and to add interest.
### Write informative/explanatory texts, including the narration of historical events, scientific procedures/experiments, or technical processes.

- **LAFS.910.WHST.1.1:** Write arguments focused on discipline-specific content.
  - a. Introduce precise claim(s), distinguish the claim(s) from alternate or opposing claims, and create an organization that establishes clear relationships among the claim(s), counterclaims, reasons, and evidence.
  - b. Develop claim(s) and counterclaims fairly, supplying data and evidence for each while pointing out the strengths and limitations of both claim(s) and counterclaim(s) in a discipline-appropriate form and in a manner that anticipates the audience's knowledge level and concerns.
  - c. Use words, phrases, and clauses to link the major sections of the text, create cohesion, and clarify the relationships between claim(s) and reasons, between reasons and evidence, and between claim(s) and counterclaims.
  - d. Establish and maintain a formal style and objective tone while attending to the norms and conventions of the discipline in which they are writing.
  - e. Provide a concluding statement or section that follows from or supports the argument presented.

- **LAFS.910.WHST.1.2:** Write informative/explanatory texts, including the narration of historical events, scientific procedures/experiments, or technical processes.
  - a. Introduce a topic and organize ideas, concepts, and information to make important connections and distinctions; include formatting (e.g., headings), graphics (e.g., figures, tables), and multimedia when useful to aiding comprehension.
  - b. Develop the topic with well-chosen, relevant, and sufficient facts, extended definitions, concrete details, quotations, or other information and examples appropriate to the audience's knowledge of the topic.
  - c. Use varied transitions and sentence structures to link the major sections of the text, create cohesion, and clarify the relationships among ideas and concepts.
  - d. Use precise language and domain-specific vocabulary to manage the complexity of the topic and convey a style appropriate to the discipline and context as well as to the expertise of likely readers.
  - e. Establish and maintain a formal style and objective tone while attending to the norms and conventions of the discipline in which they are writing.
  - f. Provide a concluding statement or section that follows from and supports the information or explanation presented (e.g., articulating implications or the significance of the topic).

### Make sense of problems and persevere in solving them.

Mathematically proficient students start by explaining themselves to the meaning of a problem and looking for entry points to its solution. They analyze givens, constraints, relationships, and goals. They make conjectures about the form and meaning of the solution and plan a solution pathway rather than simply jumping into a solution attempt. They consider analogous problems, and try special cases and simpler forms of the original problem in order to gain insight into its solution. They monitor and evaluate their progress and change course if necessary. Older students might, depending on the context of the problem, transform algebraic expressions or change the viewing window on their graphing calculator to get the information they need. Mathematically proficient students can explain correspondences between equations, verbal descriptions, tables, and graphs or draw diagrams of important features and relationships, graph data, and search for regularity or trends. Younger students might rely on using concrete objects or pictures to help conceptualize and solve a problem. Mathematically proficient students check their answers to problems using a different method, and they continually ask themselves, “Does this make sense?” They can understand the approaches of others to solving complex problems and identify correspondences between different approaches.

### Reason abstractly and quantitatively.

Mathematically proficient students make sense of quantities and their relationships in problem situations. They bring two complementary abilities to bear on problems involving quantitative relationships: the ability to contextualize—to abstract a given situation and represent it symbolically and manipulate the representing symbols as if they have a life of their own, without necessarily attending to their referents—and the ability to decontextualize, to pause as needed during the manipulation process in order to probe into the referents for the symbols involved. Quantitative reasoning entails habits of creating a coherent representation of the problem at hand; considering the units involved; attending to the meaning of quantities, not just how to compute them; and knowing and flexibly using different properties of operations and objects.

### Construct viable arguments and critique the reasoning of others.

Mathematically proficient students understand and use stated assumptions, definitions, and previously established results in constructing arguments. They make conjectures and build a logical progression of statements to explore the truth of their conjectures. They are able to analyze situations by breaking them into cases, and can recognize and use counterexamples. They justify their conclusions, communicate them to others, and respond to the arguments of others. They reason inductively about data, making plausible arguments that take into account the context from which the data arose. Mathematically proficient students are also able to compare the effectiveness of two plausible arguments, distinguish correct logic or reasoning from that which is flawed, and—if there is a flaw in an argument—explain what it is. Elementary students can construct arguments using concrete referents such as objects, drawings, diagrams, and actions. Such arguments can make sense and be correct, even though they are not generalized or made formal until later grades. Later, students learn to determine domains to which an argument applies. Students at all grades can listen or read the arguments of others, decide whether they make sense, and ask useful questions to clarify or improve the arguments.
Mathematically proficient students can apply the mathematics they know to solve problems arising in everyday life, society, and the workplace. In early grades, this might be as simple as writing an addition equation to describe a situation. In middle grades, a student might apply proportional reasoning to plan a school event or analyze a problem in the community. By high school, a student might use geometry to solve a design problem or use a function to describe how one quantity of interest depends on another. Mathematically proficient students who can apply what they know are comfortable making assumptions and approximations to simplify a complicated situation, realizing that these may need revision later. They are able to identify important quantities in a practical situation and map their relationships using such tools as diagrams, two-way tables, graphs, flowcharts and formulas. They can analyze those relationships mathematically to draw conclusions. They routinely interpret their mathematical results in the context of the situation and reflect on whether the results make sense, possibly improving the model if it has not served its purpose.

**Standard Relation to Course: Supporting**

Use appropriate tools strategically.

Mathematically proficient students consider the available tools when solving a mathematical problem. These tools might include pencil and paper, concrete models, a ruler, a protractor, a calculator, a spreadsheet, a computer algebra system, a statistical package, or dynamic geometry software. Proficient students are sufficiently familiar with tools appropriate for their grade or course to make sound decisions about when each of these tools might be helpful, recognizing both the insight to be gained and their limitations. For example, mathematically proficient high school students analyze graphs of functions and solutions generated using a graphing calculator. They detect possible errors by strategically using estimation and other mathematical knowledge. When making mathematical models, they know that technology can enable them to visualize the results of varying assumptions, explore consequences, and compare predictions with data. Mathematically proficient students at various grade levels are able to identify relevant external mathematical resources, such as digital content located on a website, and use them to pose or solve problems. They are able to use technological tools to explore and deepen their understanding of concepts.

**Standard Relation to Course: Supporting**

Attend to precision.

Mathematically proficient students try to communicate precisely to others. They try to use clear definitions in discussion with others and in their own reasoning. They state the meaning of the symbols they choose, including using the equal sign consistently and appropriately. They are careful about specifying units of measure, and labeling axes to clarify the correspondence with quantities in a problem. They calculate accurately and efficiently, express numerical answers with a degree of precision appropriate for the problem context. In the elementary grades, students give carefully formulated explanations to each other. By the time they reach high school they have learned to examine claims and make explicit use of definitions.

**Standard Relation to Course: Supporting**

Look for and make use of structure.

Mathematically proficient students look closely to discern a pattern or structure. Young students, for example, might notice that three and seven more is the same amount as seven and three more, or they may sort a collection of shapes according to how many sides the shapes have. Later, students will see 7 × 8 equals the well remembered 7 × 5 + 7 × 3, in preparation for learning about the distributive property. In the expression x² + 9x + 14, older students can see the 14 as 2 × 7 and the 9 as 2 + 7. They recognize the significance of an existing line in a geometric figure and can use the strategy of drawing an auxiliary line for solving problems. They also can step back for an overview and shift perspective. They can see complicated things, such as some algebraic expressions, as single objects or as being composed of several objects. For example, they can see 5 − 3(x − y)² as 5 minus a positive number times a square and use that to realize that its value cannot be more than 5 for any real numbers x and y.

**Standard Relation to Course: Supporting**

Look for and express regularity in repeated reasoning.

Mathematically proficient students notice if calculations are repeated, and look both for general methods and for shortcuts. Upper elementary students might notice when dividing 25 by 11 that they are repeating the same calculations over and over again, and conclude they have a repeating decimal. By paying attention to the calculation of slope as they repeatedly check whether points are on the line through (1, 2) with slope 3, middle school students might abstract the equation (y − 2)/(x − 1) = 3. Noticing the regularity in the way terms cancel when expanding (x − 1)(x + 1), (x − 1)(x² + x + 1), and (x − 1)(x⁴ + x³ + x² + x + 1) might lead them to the general formula for the sum of a geometric series. As they work to solve a problem, mathematically proficient students maintain oversight of the process, while attending to the details. They continually evaluate the reasonableness of their intermediate results.

**Standard Relation to Course: Supporting**

**HE.912.C.1.3:**

Evaluate how environment and personal health are interrelated.

**Clarifications:**

Food options within a community; prenatal-care services; availability of recreational facilities; air quality; weather-safety awareness; and weather, air, and water conditions.

**HE.912.C.1.8:**

Assess the degree of susceptibility to injury, illness, or death if engaging in unhealthy/risky behaviors.

**Clarifications:**

Risks associated with alcohol abuse, including poison, date rape, and death; cancer and chronic lung disease related to tobacco use; overdose from drug use; child abuse or neglect; and dating violence.

**HE.912.C.1.4 (Archived Standard):**

Analyze how heredity and family history can impact personal health.

**Clarifications:**

Some examples may include drug use, family obesity, heart disease, mental health, and non-communicable illness or disease.

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**General Course Information and Notes**

**GENERAL NOTES**
Special Note. Pre-IB courses have been created by individual schools or school districts since before the MYP started. These courses mapped backwards the Diploma Programme (DP) to prepare students as early as age 14. The IB was never involved in creating or approving these courses. The IB acknowledges that it is important for students to receive preparation for taking part in the DP, and that preparation is the MYP. The IB designed the MYP to address the whole child, which, as a result, has a very different philosophical approach that aims at educating all students aged 11-16. Pre-IB courses usually deal with content, with less emphasis upon the needs of the whole child or the affective domain than the MYP. A school can have a course that it calls “pre-IB” as long as it makes it clear that the course and any supporting material have been developed independently of the IB. For this reason, the school must name the course along the lines of, for example, the “Any School pre-IB course”.

The IB does not recognize pre-IB courses or courses labeled IB by different school districts which are not an official part of the IBDP or IBCC curriculum. Typically, students enrolled in grade 9 or 10 are not in the IBDP or IBCC programmes. https://ibanswers.ibo.org/app/answers/detail/a_id/5414/kw/pre-ib. Florida’s Pre-IB courses should only be used in schools where MYP is not offered in order to prepare students to enter the IBDP. Teachers of Florida’s Pre-IB courses should have undergone IB training in order to ensure seamless articulation for students within the subject area.

Honors and Advanced Level Course Note: Advanced courses require a greater demand on students through increased academic rigor. Academic rigor is obtained through the application, analysis, evaluation, and creation of complex ideas that are often abstract and multi-faceted. Students are challenged to think and collaborate critically on the content they are learning. Honors level rigor will be achieved by increasing text complexity through text selection, focus on high-level qualitative measures, and complexity of task. Instruction will be structured to give students a deeper understanding of conceptual themes and organization within and across disciplines. Academic rigor is more than simply assigning to students a greater quantity of work.

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<td>Course Type: Core Academic Course</td>
</tr>
<tr>
<td>Course Status: Course Approved</td>
</tr>
<tr>
<td>Grade Level(s): 9,10</td>
</tr>
<tr>
<td>Graduation Requirement: Biology</td>
</tr>
</tbody>
</table>

**Educator Certifications**

Science (Secondary Grades 7-12)
Biology (Grades 6-12)

**Equivalent Courses**

2000310-Biology 1
Course Standards

<table>
<thead>
<tr>
<th>Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>SC.912.L.14.1</td>
<td>Describe the scientific theory of cells (cell theory) and relate the history of its discovery to the process of science.</td>
</tr>
<tr>
<td>SC.912.L.14.2</td>
<td>Relate structure to function for the components of plant and animal cells. Explain the role of cell membranes as a highly selective barrier (passive and active transport).</td>
</tr>
<tr>
<td>SC.912.L.14.3</td>
<td>Compare and contrast the general structures of plant and animal cells. Compare and contrast the general structures of prokaryotic and eukaryotic cells.</td>
</tr>
<tr>
<td>SC.912.L.14.4</td>
<td>Compare and contrast structure and function of various types of microscopes.</td>
</tr>
<tr>
<td>SC.912.L.14.6</td>
<td>Explain the significance of genetic factors, environmental factors, and pathogenic agents to health from the perspectives of both individual and public health.</td>
</tr>
<tr>
<td>SC.912.L.14.7</td>
<td>Relate the structure of each of the major plant organs and tissues to physiological processes.</td>
</tr>
<tr>
<td>SC.912.L.14.26</td>
<td>Identify the major parts of the brain on diagrams or models.</td>
</tr>
<tr>
<td>SC.912.L.14.36</td>
<td>Describe the factors affecting blood flow through the cardiovascular system.</td>
</tr>
<tr>
<td>SC.912.L.14.52</td>
<td>Explain the basic functions of the human immune system, including specific and nonspecific immune response, vaccines, and antibiotics.</td>
</tr>
<tr>
<td>SC.912.L.15.1</td>
<td>Explain how the scientific theory of evolution is supported by the fossil record, comparative anatomy, comparative embryology, biogeography, molecular biology, and observed evolutionary change.</td>
</tr>
<tr>
<td>SC.912.L.15.4</td>
<td>Describe how and why organisms are hierarchically classified and based on evolutionary relationships.</td>
</tr>
<tr>
<td>SC.912.L.15.5</td>
<td>Explain the reasons for changes in how organisms are classified.</td>
</tr>
<tr>
<td>SC.912.L.15.6</td>
<td>Discuss distinguishing characteristics of the domains and kingdoms of living organisms.</td>
</tr>
<tr>
<td>SC.912.L.15.8</td>
<td>Describe the scientific explanations of the origin of life on Earth.</td>
</tr>
<tr>
<td>SC.912.L.15.10</td>
<td>Identify basic trends in hominid evolution from early ancestors six million years ago to modern humans, including brain size, jaw size, language, and manufacture of tools.</td>
</tr>
<tr>
<td>SC.912.L.15.13</td>
<td>Describe the conditions required for natural selection, including: overproduction of offspring, inherited variation, and the struggle to survive, which result in differential reproductive success.</td>
</tr>
<tr>
<td>SC.912.L.15.14</td>
<td>Discuss mechanisms of evolutionary change other than natural selection such as genetic drift and gene flow.</td>
</tr>
<tr>
<td>SC.912.L.15.15</td>
<td>Describe how mutation and genetic recombination increase genetic variation.</td>
</tr>
<tr>
<td>SC.912.L.16.1</td>
<td>Use Mendel's laws of segregation and independent assortment to analyze patterns of inheritance.</td>
</tr>
<tr>
<td>SC.912.L.16.2</td>
<td>Discuss observed inheritance patterns caused by various modes of inheritance, including dominant, recessive, codominant, sex-linked, polygenic, and multiple alleles.</td>
</tr>
<tr>
<td>SC.912.L.16.3</td>
<td>Describe the basic process of DNA replication and how it relates to the transmission and conservation of the genetic information.</td>
</tr>
<tr>
<td>SC.912.L.16.4</td>
<td>Explain how mutations in the DNA sequence may or may not result in phenotypic change. Explain how mutations in gametes may result in phenotypic changes in offspring.</td>
</tr>
<tr>
<td>SC.912.L.16.5</td>
<td>Explain the basic processes of transcription and translation, and how they result in the expression of genes.</td>
</tr>
<tr>
<td>SC.912.L.16.8</td>
<td>Explain the relationship between mutation, cell cycle, and uncontrolled cell growth potentially resulting in cancer.</td>
</tr>
<tr>
<td>SC.912.L.16.9</td>
<td>Explain how and why the genetic code is universal and is common to almost all organisms.</td>
</tr>
<tr>
<td>SC.912.L.16.10</td>
<td>Evaluate the impact of biotechnology on the individual, society and the environment, including medical and ethical issues.</td>
</tr>
<tr>
<td>SC.912.L.16.13</td>
<td>Describe the basic anatomy and physiology of the human reproductive system. Describe the process of human development from fertilization to birth and major changes that occur in each trimester of pregnancy.</td>
</tr>
<tr>
<td>SC.912.L.16.14</td>
<td>Describe the cell cycle, including the process of mitosis. Explain the role of mitosis in the formation of new cells and its importance in maintaining chromosome number during asexual reproduction.</td>
</tr>
<tr>
<td>SC.912.L.16.16</td>
<td>Describe the process of meiosis, including independent assortment and crossing over. Explain how reduction division results in the formation of haploid gametes or spores.</td>
</tr>
<tr>
<td>SC.912.L.16.17</td>
<td>Compare and contrast mitosis and meiosis and relate to the processes of sexual and asexual reproduction and their consequences for genetic variation.</td>
</tr>
<tr>
<td>SC.912.L.17.2</td>
<td>Explain the general distribution of life in aquatic systems as a function of chemistry, geography, light, depth, salinity, and temperature.</td>
</tr>
<tr>
<td>SC.912.L.17.4</td>
<td>Describe changes in ecosystems resulting from seasonal variations, climate change and succession.</td>
</tr>
<tr>
<td>SC.912.L.17.5</td>
<td>Analyze how population size is determined by births, deaths, immigration, emigration, and limiting factors (biotic and abiotic) that determine carrying capacity.</td>
</tr>
<tr>
<td>SC.912.L.17.8</td>
<td>Recognize the consequences of the losses of biodiversity due to catastrophic events, climate changes, human activity, and the introduction of invasive, non-native species.</td>
</tr>
<tr>
<td>SC.912.L.17.9</td>
<td>Use a food web to identify and distinguish producers, consumers, and decomposers. Explain the pathway of energy transfer through trophic levels and the reduction of available energy at successive trophic levels.</td>
</tr>
<tr>
<td>SC.912.L.17.11</td>
<td>Evaluate the costs and benefits of renewable and nonrenewable resources, such as water, energy, fossil fuels, wildlife, and forests.</td>
</tr>
<tr>
<td>SC.912.L.17.13</td>
<td>Discuss the need for adequate monitoring of environmental parameters when making policy decisions.</td>
</tr>
<tr>
<td>SC.912.L.17.20</td>
<td>Predict the impact of individuals on environmental systems and examine how human lifestyles affect sustainability.</td>
</tr>
<tr>
<td>SC.912.L.18.1</td>
<td>Describe the basic molecular structures and primary functions of the four major categories of biological macromolecules.</td>
</tr>
<tr>
<td>SC.912.L.18.7</td>
<td>Identify the reactants, products, and basic functions of photosynthesis.</td>
</tr>
<tr>
<td>SC.912.L.18.8</td>
<td>Identify the reactants, products, and basic functions of aerobic and anaerobic cellular respiration.</td>
</tr>
<tr>
<td>SC.912.L.18.9</td>
<td>Explain the interrelated nature of photosynthesis and cellular respiration.</td>
</tr>
</tbody>
</table>
SC.912.L.18.10: Connect the role of adenosine triphosphate (ATP) to energy transfers within a cell.

SC.912.L.18.11: Explain the role of enzymes as catalysts that lower the activation energy of biochemical reactions. Identify factors, such as pH and temperature, and their effect on enzyme activity.

SC.912.L.18.12: Discuss the special properties of water that contribute to Earth's suitability as an environment for life: cohesive behavior, ability to moderate temperature, expansion upon freezing, and versatility as a solvent.

SC.912.L.18.13: Define a problem based on a specific body of knowledge, for example: biology, chemistry, physics, and earth/space science, and do the following:

1. Pose questions about the natural world. (Articulate the purpose of the investigation and identify the relevant scientific concepts).
2. Conduct systematic observations. (Write procedures that are clear and replicable. Identify observables and examine relationships between test (independent) variable and outcome (dependent) variable. Employ appropriate methods for accurate and consistent observations; conduct and record measurements at appropriate levels of precision. Follow safety guidelines).
3. Examine books and other sources of information to see what is already known.
4. Review what is known in light of empirical evidence. (Examine whether available empirical evidence can be interpreted in terms of existing knowledge and models, and if not, modify or develop new models).
5. Plan investigations. (Design and evaluate a scientific investigation).
6. Use tools to gather, analyze, and interpret data (this includes the use of measurement in metric and other systems, and also the generation and interpretation of graphical representations of data, including data tables and graphs). (Collect data or evidence in an organized way. Properly use instruments, equipment, and materials (e.g., scales, probeware, meter sticks, microscopes, computers) including set-up, calibration, technique, maintenance, and storage).
7. Pose answers, explanations, or descriptions of events.
8. Generate explanations that explicate or describe natural phenomena (inferences).
9. Use appropriate evidence and reasoning to justify these explanations to others.
10. Communicate results of scientific investigations, and
11. Evaluate the merits of the explanations produced by others.

SC.912.N.1.3: Recognize that the strength or usefulness of a scientific claim is evaluated through scientific argumentation, which depends on critical and logical thinking, and the active consideration of alternative scientific explanations to explain the data presented.

SC.912.N.1.4: Identify sources of information and assess their reliability according to the strict standards of scientific investigation.

SC.912.N.1.6: Describe how scientific inferences are drawn from scientific observations and provide examples from the content being studied.

SC.912.N.2.1: Identify what is science, what clearly is not science, and what superficially resembles science (but fails to meet the criteria for science).

SC.912.N.2.2: Identify which questions can be answered through science and which questions are outside the boundaries of scientific investigation, such as questions addressed by other ways of knowing, such as art, philosophy, and religion.

SC.912.N.3.1: Explain that a scientific theory is the culmination of many scientific investigations drawing together all the current evidence concerning a substantial range of phenomena; thus, a scientific theory represents the most powerful explanation scientists have to offer.

SC.912.N.3.4: Recognize that theories do not become laws, nor do laws become theories; theories are well supported explanations and laws are well supported descriptions.

Mathematicians who participate in effortful learning both individually and with others:

- Analyze the problem in a way that makes sense given the task.
- Ask questions that will help with solving the task.
- Build perseverance by modifying methods as needed while solving a challenging task.
- Stay engaged and maintain a positive mindset when working to solve tasks.
- Help and support each other when attempting a new method or approach.

Clarifications:

Teachers who encourage students to participate actively in effortful learning both individually and with others:

- Cultivate a community of growth mindset learners.
- Foster perseverance in students by choosing tasks that are challenging.
- Develop students' ability to analyze and problem solve.
- Recognize students' effort when solving challenging problems.

Demonstrate understanding by representing problems in multiple ways.

Mathematicians who demonstrate understanding by representing problems in multiple ways:

- Build understanding through modeling and using manipulatives.
- Represent solutions to problems in multiple ways using objects, drawings, tables, graphs, and equations.
- Progress from modeling problems with objects and drawings to using algorithms and equations.
- Express connections between concepts and representations.
- Choose a representation based on the given context or purpose.

Clarifications:

Teachers who encourage students to demonstrate understanding by representing problems in multiple ways:

- Help students make connections between concepts and representations.
- Provide opportunities for students to use manipulatives when investigating concepts.
- Guide students from concrete to pictorial to abstract representations as understanding progresses.
- Show students that various representations can have different purposes and can be useful in different situations.

Complete tasks with mathematical fluency.

Mathematicians who complete tasks with mathematical fluency:

- Select efficient and appropriate methods for solving problems within the given context.
- Maintain flexibility and accuracy while performing procedures and mental calculations.
- Complete tasks accurately and with confidence.
- Adapt procedures to apply them to a new context.
- Use feedback to improve efficiency when performing calculations.

Clarifications:

Teachers who encourage students to complete tasks with mathematical fluency:
Engage in discussions that reflect on the mathematical thinking of self and others.
Mathematicians who engage in discussions that reflect on the mathematical thinking of self and others:

- Communicate mathematical ideas, vocabulary and methods effectively.
- Analyze the mathematical thinking of others.
- Compare the efficiency of a method to those expressed by others.
- Recognize errors and suggest how to correctly solve the task.
- Justify results by explaining methods and processes.
- Construct possible arguments based on evidence.

**Clarifications:**
Teachers who encourage students to engage in discussions that reflect on the mathematical thinking of self and others:

- Establish a culture in which students ask questions of the teacher and their peers, and error is an opportunity for learning.
- Create opportunities for students to discuss their thinking with peers.
- Select, sequence and present student work to advance and deepen understanding of correct and increasingly efficient methods.
- Develop students' ability to justify methods and compare their responses to the responses of their peers.

Use patterns and structure to help understand and connect mathematical concepts.
Mathematicians who use patterns and structure to help understand and connect mathematical concepts:

- Focus on relevant details within a problem.
- Create plans and procedures to logically order events, steps or ideas to solve problems.
- Decompose a complex problem into manageable parts.
- Relate previously learned concepts to new concepts.
- Look for similarities among problems.
- Connect solutions of problems to more complicated large-scale situations.

**Clarifications:**
Teachers who encourage students to use patterns and structure to help understand and connect mathematical concepts:

- Help students recognize the patterns in the world around them and connect these patterns to mathematical concepts.
- Support students to develop generalizations based on the similarities found among problems.
- Provide opportunities for students to create plans and procedures to solve problems.
- Develop students' ability to construct relationships between their current understanding and more sophisticated ways of thinking.

Assess the reasonableness of solutions.
Mathematicians who assess the reasonableness of solutions:

- Estimate to discover possible solutions.
- Use benchmark quantities to determine if a solution makes sense.
- Check calculations when solving problems.
- Verify possible solutions by explaining the methods used.
- Evaluate results based on the given context.

**Clarifications:**
Teachers who encourage students to assess the reasonableness of solutions:

- Have students estimate or predict solutions prior to solving.
- Prompt students to continually ask, “Does this solution make sense? How do you know?”
- Reinforce that students check their work as they progress within and after a task.
- Strengthen students' ability to verify solutions through justifications.

Apply mathematics to real-world contexts.
Mathematicians who apply mathematics to real-world contexts:

- Connect mathematical concepts to everyday experiences.
- Use models and methods to understand, represent and solve problems.
- Perform investigations to gather data or determine if a method is appropriate.
- Redesign models and methods to improve accuracy or efficiency.

**Clarifications:**
Teachers who encourage students to apply mathematics to real-world contexts:

- Provide opportunities for students to create models, both concrete and abstract, and perform investigations.
- Challenge students to question the accuracy of their models and methods.
- Support students as they validate conclusions by comparing them to the given situation.
- Indicate how various concepts can be applied to other disciplines.

Cite evidence to explain and justify reasoning.

**Clarifications:**
K-1 Students include textual evidence in their oral communication with guidance and support from adults. The evidence can consist of details from the text without naming the text. During 1st grade, students learn how to incorporate the evidence in their writing. 2-3 Students include relevant textual evidence in their written and oral communication. Students should name the text when they refer to it. In 3rd grade, students should use a combination of direct and indirect citations.

4-5 Students continue with previous skills and reference comments made by speakers and peers. Students cite texts that they've directly quoted, paraphrased, or used for information. When writing, students will use the form of citation dictated by the instructor or the style guide referenced by the instructor.
6-8 Students continue with previous skills and use a style guide to create a proper citation.
9-12 Students continue with previous skills and should be aware of existing style guides and the ways in which they differ.

**ELA.K12.EE.2.1:**
- **Clariations:**
  - See Text Complexity for grade-level complexity bands and a text complexity rubric.

**ELA.K12.EE.3.1:**
- **Clariations:**
  - Students will make inferences before the words infer or inference are introduced. Kindergarten students will answer questions like “Why is the girl smiling?” or make predictions about what will happen based on the title page. Students will use the terms and apply them in 2nd grade and beyond.

**ELA.K12.EE.4.1:**
- **Clariations:**
  - In kindergarten, students learn to listen to one another respectfully.
  - In grades 1-2, students build upon these skills by justifying what they are thinking. For example: “I think _______ because _______.” The collaborative conversations are becoming academic conversations.
  - In grades 3-12, students engage in academic conversations discussing claims and justifying their reasoning, refining and applying skills. Students build on ideas, propel the conversation, and support claims and counterclaims with evidence.

**ELA.K12.EE.5.1:**
- **Clariations:**
  - Students will incorporate skills learned into work products to produce quality work. For students to incorporate these skills appropriately, they must receive instruction. A 3rd grade student creating a poster board display must have instruction in how to effectively present information to do quality work.

**ELA.K12.EE.6.1:**
- **Clariations:**
  - In kindergarten and 1st grade, students learn the difference between formal and informal language. For example, the way we talk to our friends differs from the way we speak to adults. In 2nd grade and beyond, students practice appropriate social and academic language to discuss texts.

**HE.912.C.1.3:**
- **Clariations:**
  - Evaluate how environment and personal health are interrelated.
  - Food options within a community; prenatal-care services; availability of recreational facilities; air quality; weather-safety awareness; and weather, air, and water conditions.

**HE.912.C.1.4:**
- **Clariations:**
  - Propose strategies to reduce or prevent injuries and health problems.
  - Mandatory passenger-restraint/helmet laws, refusal skills, mandatory immunizations, healthy relationship skills, and improved inspection of food sources.

**HE.912.C.1.8:**
- **Clariations:**
  - Assess the degree of susceptibility to injury, illness, or death if engaging in unhealthy/risky behaviors.
  - Risks associated with alcohol abuse, including poison, date rape, and death; cancer and chronic lung disease related to tobacco use; overdose from drug use; child abuse or neglect; and dating violence.

**ELD.K12.ELL.SC.1:**
- **Clariations:**
  - English language learners communicate information, ideas and concepts necessary for academic success in the content area of Science.

**ELD.K12.ELL.SI.1:**
- **Clariations:**
  - English language learners communicate for social and instructional purposes within the school setting.

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**General Course Information and Notes**

**GENERAL NOTES**

**Special Note.** Pre-IB courses have been created by individual schools or school districts since before the MYP started. These courses mapped backwards the Diploma Programme (DP) to prepare students as early as age 14. The IB was never involved in creating or approving these courses. The IB acknowledges that it is important for students to receive preparation for taking part in the DP, and that preparation is the MYP. The IB designed the MYP to address the whole child, which, as a result, has a very different philosophical approach that aims at educating all students aged 11-16. Pre-IB courses usually deal with content, with less emphasis upon the needs of the whole child or the affective domain than the MYP. A school can have a course that it calls “pre-IB” as long as it makes it clear that the course and any supporting material have been developed independently of the IB. For this reason, the school must name the course along the lines of, for example, the “Any School pre-IB course”.

The IB does not recognize pre-IB courses or courses labeled IB by different school districts which are not an official part of the IBDP or IBCC curriculum. Typically, students enrolled in grade 9 or 10 are not in the IBDP or IBCC programmes. Florida’s Pre-IB courses should only be used in schools where MYP is not offered in order to prepare students to enter the IBDP. Teachers of Florida’s Pre-IB courses should have undergone IB training in order to ensure seamless articulation for students within the subject area.

**Honors and Advanced Level Course Note:** Advanced courses require a greater demand on students through increased academic rigor. Academic rigor is obtained through the application, analysis, evaluation, and creation of complex ideas that are often abstract and multi-faceted. Students are challenged to think and collaborate critically on the content they are learning. Honors level rigor will be achieved by increasing text complexity through text selection, focus on high-level qualitative measures, and complexity of task. Instruction will be structured to give students a deeper understanding of conceptual themes and organization within and across disciplines. Academic rigor is more than simply assigning to students a greater quantity of work.

**Florida’s Benchmarks for Excellent Student Thinking (B.E.S.T.) Standards**

This course includes Florida’s B.E.S.T. ELA Expectations (EE) and Mathematical Thinking and Reasoning Standards (MTRs) for students. Florida educators should intentionally
Educator Certifications
Science (Secondary Grades 7-12)
Biology (Grades 6-12)

Equivalent Courses
2000310-Biology 1
General Course Information and Notes

GENERAL NOTES

The curriculum description for this IB course is provided at http://www.ibo.org/en/programmes/.

GENERAL INFORMATION

- **Course Number:** 2000805
- **Number of Credits:** One (1) credit
- **Course Type:** Core Academic Course
- **Course Status:** Course Approved
- **Grade Level(s):** 9,10,11,12
- **Graduation Requirement:** District-Determined
- **Course Path:** Grade PreK to 12 Education Courses > Grade Group: Grades 9 to 12 and Adult Education Courses > Subject: Science > SubSubject: Biological Sciences
- **Abbreviated Title:** IB BIOLOGY 1
- **Course Length:** Year (Y)
- **Course Attributes:**
  - International Baccalaureate (IB)
- **Course Level:** 3

Educator Certifications

- Science (Secondary Grades 7-12)
- Biology (Grades 6-12)

Equivalent Courses

- **2000805-International Baccalaureate Biology 1**
  - Equivalency end year: 2018
General Course Information and Notes

GENERAL NOTES

The curriculum description for this IB course is provided at http://www.ibo.org/en/programmes/.

GENERAL INFORMATION

Course Number: 2000810
Number of Credits: One (1) credit
Course Type: Core Academic Course
Course Status: Course Approved
Grade Level(s): 9,10,11,12
Graduation Requirement: District-Determined

Course Path: Section: Grades PreK to 12 Education Courses > Grade Group: Grades 9 to 12 and Adult Education Courses > Subject: Science > SubSubject: Biological Sciences
Abbreviated Title: IB BIO 2
Course Length: Year (Y)
Course Attributes:
- International Baccalaureate (IB)
Course Level: 3

Educator Certifications

Science (Secondary Grades 7-12)
Biology (Grades 6-12)

Equivalent Courses

2000810-International Baccalaureate Biology 2
Equivalency end year: 2018
General Course Information and Notes

GENERAL NOTES

The curriculum description for this IB course is provided at http://www.ibo.org/en/programmes/.

GENERAL INFORMATION

Course Number: 2000820
Course Path: Section: Grades PreK to 12 Education Courses > Grade Group: Grades 9 to 12 and Adult Education Courses > Subject: Science > SubSubject: Biological Sciences >
Abbreviated Title: IB BIO 3
Course Length: Year (Y)
Course Attributes:
  • International Baccalaureate (IB)
Course Level: 3

Number of Credits: One (1) credit

Course Type: Core Academic Course
Course Status: Course Approved
Grade Level(s): 9, 10, 11, 12
Graduation Requirement: District-Determined

Educator Certifications

<table>
<thead>
<tr>
<th>Science (Secondary Grades 7-12)</th>
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</thead>
<tbody>
<tr>
<td>Biology (Grades 6-12)</td>
</tr>
</tbody>
</table>

Equivalent Courses

2000820-International Baccalaureate Biology 3
Equivalency end year: 2018
General Course Information and Notes

GENERAL NOTES

The curriculum description for this IB course is provided at http://www.ibo.org/en/programmes/.

### GENERAL INFORMATION

- **Course Number:** 2000850
- **Number of Credits:** One (1) credit
- **Course Type:** Core Academic Course
- **Course Status:** Course Approved
- **Course Length:** Year (Y)
- **Course Attributes:**
  - International Baccalaureate (IB)
- **Grade Level(s):** 9,10,11,12
- **Graduation Requirement:** District-Determined

### Educator Certifications

- Middle Grades General Science (Middle Grades 5-9)
- Biology (Grades 6-12)
- Science (Secondary Grades 7-12)

### Equivalent Courses

- 2000850-International Baccalaureate Mid Years Prog Biology
  - Equivalency end year: 2018
GENERAL NOTES

SUBJECT AREA TRANSFER NUMBERS

Each course transferred into a Florida public school by an out-of-state or non-public school student should be matched with a course title and number when such course provides substantially the same content. However, a few transfer courses may not be close enough in content to be matched. For those courses a subject area transfer number is provided.

GENERAL INFORMATION

- **Course Number:** 2000990
- **Course Path:** Grades PreK to 12 Education Courses > Grade Group: Grades 9 to 12 and Adult Education Courses > Subject: Science > SubSubject: Chemistry
- **Abbreviated Title:** SCI TRAN
- **Course Length:** Not Applicable
- **Course Type:** Transfer Course
- **Course Status:** Course Approved
- **Grade Level(s):** 9, 10, 11, 12
### Course Standards

<table>
<thead>
<tr>
<th>Name</th>
<th>Description</th>
</tr>
</thead>
</table>
| MA.K12.MTR.1.1: | Mathematicians who participate in effortful learning both individually and with others:  
- Analyze the problem in a way that makes sense given the task.  
- Ask questions that will help with solving the task.  
- Build perseverance by modifying methods as needed while solving a challenging task.  
- Stay engaged and maintain a positive mindset when working to solve tasks.  
- Help and support each other when attempting a new method or approach.  
  **Clarifications:**  
  Teachers who encourage students to participate actively in effortful learning both individually and with others:  
  - Cultivate a community of growth mindset learners.  
  - Foster perseverance in students by choosing tasks that are challenging.  
  - Develop students' ability to analyze and problem solve.  
  - Recognize students' effort when solving challenging problems. |
| MA.K12.MTR.2.1: | Mathematicians who demonstrate understanding by representing problems in multiple ways:  
- Build understanding through modeling and using manipulatives.  
- Represent solutions to problems in multiple ways using objects, drawings, tables, graphs and equations.  
- Progress from modeling problems with objects and drawings to using algorithms and equations.  
- Express connections between concepts and representations.  
- Choose a representation based on the given context or purpose.  
  **Clarifications:**  
  Teachers who encourage students to demonstrate understanding by representing problems in multiple ways:  
  - Help students make connections between concepts and representations.  
  - Provide opportunities for students to use manipulatives when investigating concepts.  
  - Guide students from concrete to pictorial to abstract representations as understanding progresses.  
  - Show students that various representations can have different purposes and can be useful in different situations. |
| MA.K12.MTR.3.1: | Mathematicians who complete tasks with mathematical fluency:  
- Select efficient and appropriate methods for solving problems within the given context.  
- Maintain flexibility and accuracy while performing procedures and mental calculations.  
- Complete tasks accurately and with confidence.  
- Adapt procedures to apply them to a new context.  
- Use feedback to improve efficiency when performing calculations.  
  **Clarifications:**  
  Teachers who encourage students to complete tasks with mathematical fluency:  
  - Provide students with the flexibility to solve problems by selecting a procedure that allows them to solve efficiently and accurately.  
  - Offer multiple opportunities for students to practice efficient and generalizable methods.  
  - Provide opportunities for students to reflect on the method they used and determine if a more efficient method could have been used. |
| MA.K12.MTR.4.1: | Mathematicians who engage in discussions that reflect on the mathematical thinking of self and others:  
- Communicate mathematical ideas, vocabulary and methods effectively.  
- Analyze the mathematical thinking of others.  
- Compare the efficiency of a method to those expressed by others.  
- Recognize errors and suggest how to correctly solve the task.  
- Justify results by explaining methods and processes.  
- Construct possible arguments based on evidence.  
  **Clarifications:**  
  Teachers who encourage students to engage in discussions that reflect on the mathematical thinking of self and others:  
  - Establish a culture in which students ask questions of the teacher and their peers, and error is an opportunity for learning.  
  - Create opportunities for students to discuss their thinking with peers.  
  - Select, sequence and present student work to advance and deepen understanding of correct and increasingly efficient methods.  
  - Develop students' ability to justify methods and compare their responses to the responses of their peers. |
| MA.K12.MTR.4.1: | Mathematicians who use patterns and structure to help understand and connect mathematical concepts:  
- Focus on relevant details within a problem.  
- Create plans and procedures to logically order events, steps or ideas to solve problems.  
- Decompose a complex problem into manageable parts.  
  **Clarifications:**  
  Use patterns and structure to help understand and connect mathematical concepts.  
  Mathematicians who use patterns and structure to help understand and connect mathematical concepts:  
  - Focus on relevant details within a problem.  
  - Create plans and procedures to logically order events, steps or ideas to solve problems.  
  - Decompose a complex problem into manageable parts. |
- Relate previously learned concepts to new concepts.
- Look for similarities among problems.
- Connect solutions of problems to more complicated large-scale situations.

**Clarifications:**
Teachers who encourage students to use patterns and structure to help understand and connect mathematical concepts:
- Help students recognize the patterns in the world around them and connect these patterns to mathematical concepts.
- Support students to develop generalizations based on the similarities found among problems.
- Provide opportunities for students to create plans and procedures to solve problems.
- Develop students' ability to construct relationships between their current understanding and more sophisticated ways of thinking.

**Assess the reasonableness of solutions.**
Mathematicians who assess the reasonableness of solutions:
- Estimate to discover possible solutions.
- Use benchmark quantities to determine if a solution makes sense.
- Check calculations when solving problems.
- Verify possible solutions by explaining the methods used.
- Evaluate results based on the given context.

**Clarifications:**
Teachers who encourage students to assess the reasonableness of solutions:
- Students estimate or predict solutions prior to solving.
- Prompt students to continually ask, "Does this solution make sense? How do you know?"
- Reinforce that students check their work as they progress within and after a task.
- Strengthen students' ability to verify solutions through justifications.

**Apply mathematics to real-world contexts.**
Mathematicians who apply mathematics to real-world contexts:
- Connect mathematical concepts to everyday experiences.
- Use models and methods to understand, represent and solve problems.
- Perform investigations to gather data or determine if a method is appropriate.
- Redesign models and methods to improve accuracy or efficiency.

**Clarifications:**
Teachers who encourage students to apply mathematics to real-world contexts:
- Provide opportunities for students to create models, both concrete and abstract, and perform investigations.
- Challenge students to question the accuracy of their models and methods.
- Support students as they validate conclusions by comparing them to the given situation.
- Indicate how various concepts can be applied to other disciplines.

**Cite evidence to explain and justify reasoning.**
K-1 Students include textual evidence in their oral communication with guidance and support from adults. The evidence can consist of details from the text without naming the text. During 1st grade, students learn how to incorporate the evidence in their writing.
2-3 Students include relevant textual evidence in their written and oral communication. Students should name the text when they refer to it. In 3rd grade, students should use a combination of direct and indirect citations.
4-5 Students continue with previous skills and reference comments made by speakers and peers. Students cite texts that they've directly quoted, paraphrased, or used for information. When writing, students will use the form of citation dictated by the instructor or the style guide referenced by the instructor.
6-8 Students continue with previous skills and use a style guide to create a proper citation.
9-12 Students continue with previous skills and should be aware of existing style guides and the ways in which they differ.

**Read and comprehend grade-level complex texts proficiently.**
See Text Complexity for grade-level complexity bands and a text complexity rubric.

**Make inferences to support comprehension.**
Students will make inferences before the words infer or inference are introduced. Kindergarten students will answer questions like "Why is the girl smiling?" or make predictions about what will happen based on the title page. Students will use the terms and apply them in 2nd grade and beyond.

**Use appropriate collaborative techniques and active listening skills when engaging in discussions in a variety of situations.**
In kindergarten, students learn to listen to one another respectfully.
In grades 1-2, students build upon these skills by justifying what they are thinking. For example: "I think _____ because _____." The collaborative conversations are becoming academic conversations.
In grades 3-12, students engage in academic conversations discussing claims and justifying their reasoning, refining and applying skills. Students build on ideas, propel the conversation, and support claims and counterclaims with evidence.

**Use the accepted rules governing a specific format to create quality work.**
Students will incorporate skills learned into work products to produce quality work. For students to incorporate these skills appropriately, they must receive instruction. A 3rd grade student creating a poster board display must have instruction in how to effectively present information to
do quality work.

**ELA.K12.EE.6.1:**
Use appropriate voice and tone when speaking or writing.

**Clarifications:**
In kindergarten and 1st grade, students learn the difference between formal and informal language. For example, the way we talk to our friends differs from the way we speak to adults. In 2nd grade and beyond, students practice appropriate social and academic language to discuss texts.

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**General Course Information and Notes**

**GENERAL NOTES**

**SUBJECT AREA TRANSFER NUMBERS**

Each course transferred into a Florida public school by an out-of-state or non-public school student should be matched with a course title and number when such course provides substantially the same content. However, a few transfer courses may not be close enough in content to be matched. For those courses a subject area transfer number is provided.

**Florida's Benchmarks for Excellent Student Thinking (B.E.S.T.) Standards**

This course includes Florida's B.E.S.T. ELA Expectations (EE) and Mathematical Thinking and Reasoning Standards (MTRs) for students. Florida educators should intentionally embed these standards within the content and their instruction as applicable. For guidance on the implementation of the EEs and MTRs, please visit https://www.cpalms.org/Standards/BEST_Standards.aspx and select the appropriate B.E.S.T. Standards package.

**GENERAL INFORMATION**

**Course Number:** 2000990

**Course Path:** Section: Grades PreK to 12 Education Courses > Grade Group: Grades 9 to 12 and Adult Education Courses > Subject: Science > SubSubject:
Chemistry >

**Abbreviated Title:** SCI TRAN

**Course Length:** Not Applicable

**Course Type:** Transfer Course

**Course Status:** State Board Approved

**Grade Level(s):** 9,10,11,12
General Course Information and Notes

VERSION DESCRIPTION

Section 1007.2616(6)(a), F.S., authorizes the substitution of up to one (1) mathematics credit (MA) and one (1) equally rigorous science (EQ) credit toward high school graduation for a student receiving a passing score on an industry certification examination and using an eligible computer science course containing content related to the course for which it is substituting. A listing of eligible computer science courses for the current school year is posted at https://www.fldoe.org/core/fileparse.php/7746/urlt/1819CompSci.pdf.

The school district would determine which industry certification exams (passing scores) can yield course substitutions for mathematics and science. It is important to note that one qualifying industry certification attainment equates to one substitution credit. A student would need to earn two distinct industry certifications tied to college credit in order to earn the maximum two substitution credits (one for math, one for science). The eligible industry certifications that are tied to statewide college credit may be found at https://www.fldoe.org/academics/career-adult-edu/career-technical-edu-agreements/industry-certification.stml.

Per statute, the substitution does not apply to Biology1 or other higher-level equally-rigorous science courses; higher-level courses are Level 3 courses in the Florida Course Code Directory.

Students who receive a course substitution earn course credit counted toward high school graduation. A course substitution does not factor into a student's grade point average (GPA).

Please note that course substitutions may not meet State University System (SUS) admission requirements or state scholarship program requirements.

QUALIFICATIONS

Not applicable

GENERAL INFORMATION

Course Number: 2000998
Course Path: Section: Grades PreK to 12 Education Courses > Grade Group: Grades 9 to 12 and Adult Education Courses > Subject: Science > SubSubject: Chemistry >
Abbreviated Title: COMP SCI SUB EQ SCI
Course Length: Not Applicable
Course Type: Course Substitution
Course Status: Course Approved
Grade Level(s): 9,10,11,12
Graduation Requirement: Equally Rigorous Science
Section 1003.4282, F.S., authorizes the substitution of up to one (1) equally rigorous science credit (EQ) toward high school graduation for a student receiving a passing score on an industry certification examination. Only one substitution per industry certification attained is allowed.

The school district would determine which industry certification exams (passing scores) can yield course substitutions for science. It is important to note that one qualifying industry certification attainment equates to one substitution credit. The eligible industry certifications that are tied to statewide college credit may be found at https://www.fldoe.org/academics/career-adult-edu/career-technical-edu-agreements/industry-certification.stml.

Students who receive a course substitution earn course credit counted toward high school graduation. A course substitution does not factor into a student's grade point average (GPA).

### GENERAL INFORMATION

- **Course Number:** 2000999
- **Course Path:** Section: Grades PreK to 12 Education Courses > Grade Group: Grades 9 to 12 and Adult Education Courses > Subject: Science > SubSubject: Chemistry
- **Abbreviated Title:** CTE/IC SCI SUB
- **Course Length:** Not Applicable
- **Course Type:** Course Substitution
- **Course Status:** State Board Approved
- **Graduation Requirement:** Equally Rigorous Science
## Course Standards

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<th>Name</th>
<th>Description</th>
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| MA.K12.MTR.1.1: | Mathematicians who participate in effortful learning both individually and with others:  
- Analyze the problem in a way that makes sense given the task.  
- Ask questions that will help with solving the task.  
- Build perseverance by modifying methods as needed while solving a challenging task.  
- Stay engaged and maintain a positive mindset when working to solve tasks.  
- Help and support each other when attempting a new method or approach.  

**Clarifications:**  
Teachers who encourage students to participate actively in effortful learning both individually and with others:  
- Cultivate a community of growth mindset learners.  
- Foster perseverance in students by choosing tasks that are challenging.  
- Develop students’ ability to analyze and problem solve.  
- Recognize students’ effort when solving challenging problems. |
| MA.K12.MTR.2.1: | Demonstrate understanding by representing problems in multiple ways. Mathematicians who demonstrate understanding by representing problems in multiple ways:  
- Build understanding through modeling and using manipulatives.  
- Represent solutions to problems in multiple ways using objects, drawings, tables, graphs and equations.  
- Progress from modeling problems with objects and drawings to using algorithms and equations.  
- Express connections between concepts and representations.  
- Choose a representation based on the given context or purpose.  

**Clarifications:**  
Teachers who encourage students to demonstrate understanding by representing problems in multiple ways:  
- Help students make connections between concepts and representations.  
- Provide opportunities for students to use manipulatives when investigating concepts.  
- Guide students from concrete to pictorial to abstract representations as understanding progresses.  
- Show students that various representations can have different purposes and can be useful in different situations. |
| MA.K12.MTR.3.1: | Complete tasks with mathematical fluency. Mathematicians who complete tasks with mathematical fluency:  
- Select efficient and appropriate methods for solving problems within the given context.  
- Maintain flexibility and accuracy while performing procedures and mental calculations.  
- Complete tasks accurately and with confidence.  
- Adapt procedures to apply them to a new context.  
- Use feedback to improve efficiency when performing calculations.  

**Clarifications:**  
Teachers who encourage students to complete tasks with mathematical fluency:  
- Provide students with the flexibility to solve problems by selecting a procedure that allows them to solve efficiently and accurately.  
- Offer multiple opportunities for students to practice efficient and generalizable methods.  
- Provide opportunities for students to reflect on the method they used and determine if a more efficient method could have been used. |
| MA.K12.MTR.4.1: | Engage in discussions that reflect on the mathematical thinking of self and others. Mathematicians who engage in discussions that reflect on the mathematical thinking of self and others:  
- Communicate mathematical ideas, vocabulary and methods effectively.  
- Analyze the mathematical thinking of others.  
- Compare the efficiency of a method to those expressed by others.  
- Recognize errors and suggest how to correctly solve the task.  
- Justify results by explaining methods and processes.  
- Construct possible arguments based on evidence.  

**Clarifications:**  
Teachers who encourage students to engage in discussions that reflect on the mathematical thinking of self and others:  
- Establish a culture in which students ask questions of the teacher and their peers, and error is an opportunity for learning.  
- Create opportunities for students to discuss their thinking with peers.  
- Select, sequence and present student work to advance and deepen understanding of correct and increasingly efficient methods.  
- Develop students’ ability to justify methods and compare their responses to the responses of their peers. |
| **Use patterns and structure to help understand and connect mathematical concepts:** Mathemicians who use patterns and structure to help understand and connect mathematical concepts:  
- Focus on relevant details within a problem. |
- Create plans and procedures to logically order events, steps or ideas to solve problems.
- Decompose a complex problem into manageable parts.
- Relate previously learned concepts to new concepts.
- Look for similarities among problems.
- Connect solutions of problems to more complicated large-scale situations.

**MA.K12.MTR.5.1:**

**Clarifications:**
- Teachers who encourage students to use patterns and structure to help understand and connect mathematical concepts:
  - Help students recognize the patterns in the world around them and connect these patterns to mathematical concepts.
  - Support students to develop generalizations based on the similarities found among problems.
  - Provide opportunities for students to create plans and procedures to solve problems.
  - Develop students' ability to construct relationships between their current understanding and more sophisticated ways of thinking.

**MA.K12.MTR.6.1:**

- Assess the reasonableness of solutions.
- Mathematicians who assess the reasonableness of solutions:
  - Estimate to discover possible solutions.
  - Use benchmark quantities to determine if a solution makes sense.
  - Check calculations when solving problems.
  - Verify possible solutions by explaining the methods used.
  - Evaluate results based on the given context.

**MA.K12.MTR.7.1:**

- Apply mathematics to real-world contexts.
- Mathematicians who apply mathematics to real-world contexts:
  - Connect mathematical concepts to everyday experiences.
  - Use models and methods to understand, represent and solve problems.
  - Perform investigations to gather data or determine if a method is appropriate. • Redesign models and methods to improve accuracy or efficiency.

**ELA.K12.EE.1.1:**

- Cite evidence to explain and justify reasoning.
- Students include textual evidence in their oral communication with guidance and support from adults. The evidence can consist of details from the text without naming the text. During 1st grade, students learn how to incorporate the evidence in their writing. 2-3 Students include relevant textual evidence in their written and oral communication. Students should name the text when they refer to it. In 3rd grade, students should use a combination of direct and indirect citations.

**ELA.K12.EE.2.1:**

- Read and comprehend grade-level complex texts proficiently.
- Students continue with previous skills and reference comments made by speakers and peers. Students cite texts that they've directly quoted, paraphrased, or used for information. When writing, students will use the form of citation dictated by the instructor or the style guide referenced by the instructor.

**ELA.K12.EE.3.1:**

- Make inferences to support comprehension.
- Students will make inferences before the words infer or inference are introduced. Kindergarten students will answer questions like “Why is the girl smiling?” or make predictions about what will happen based on the title page. Students will use the terms and apply them in 2nd grade and beyond.

**ELA.K12.EE.4.1:**

- Use appropriate collaborative techniques and active listening skills when engaging in discussions in a variety of situations.
- In grades 3-12, students engage in academic conversations discussing claims and justifying their reasoning, refining and applying skills. Students build on ideas, propel the conversation, and support claims and counterclaims with evidence.

**Clarifications:**
- Students should name the text when they refer to it.
- Students should use a combination of direct and indirect citations.
- Students continue with previous skills and reference comments made by speakers and peers.
General Course Information and Notes

VERSION DESCRIPTION

Section 1003.4282, F.S., authorizes the substitution of up to one (1) equally rigorous science credit (EQ) toward high school graduation for a student receiving a passing score on an industry certification examination. Only one substitution per industry certification attained is allowed.

The school district would determine which industry certification exams (passing scores) can yield course substitutions for science. It is important to note that one qualifying industry certification attainment equates to one substitution credit. The eligible industry certifications that are tied to statewide college credit may be found at https://www.fldoe.org/academics/career-adult-edu/career-technical-edu-agreements/industry-certification.stml.

Students who receive a course substitution earn course credit counted toward high school graduation. A course substitution does not factor into a student's grade point average (GPA).

GENERAL INFORMATION

Course Number: 2000999
Course Path: Section: Grades PreK to 12 Education
Courses > Grade Group: Grades 9 to 12 and Adult Education Courses > Subject: Science > SubSubject: Chemistry
Abbreviated Title: CTE/IC SCI SUB
Course Length: Not Applicable
Course Type: Course Substitution
Course Status: State Board Approved
Graduation Requirement: Equally Rigorous Science
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Explain how scientific knowledge and reasoning provide an empirically-based perspective to inform society's decision making.

Describe heat as the energy transferred by convection, conduction, and radiation, and explain the connection of heat to change in temperature or states of matter.

Compare the magnitude and range of the four fundamental forces (gravitational, electromagnetic, weak nuclear, strong nuclear).

Compare and contrast findings presented in a text to those from other researchers.

Determine the meaning of symbols, key terms, and other domain-specific words as they are used in a specific scientific or technical context relevant to grades 9–10 texts and topics.

Analyze the motion of an object in terms of its position, velocity, and acceleration (with respect to a frame of reference) as functions of time.

Analyze the author's purpose in providing an explanation, describing a procedure, or discussing an experiment in a text, defining the question the author seeks to address.

Analyze the structure of the relationships among concepts in a text, including relationships among key terms (e.g., force, friction, reaction force, energy).

Analyze the author's claim or a recommendation for solving a scientific or technical problem.

Analyze the relationship between moving charges and magnetic fields, as well as changing magnetic fields and electric fields, and their application to modern technologies.

Analyze the theory of electromagnetism by comparing and contrasting the different parts of the electromagnetic spectrum in terms of wavelength, frequency, and energy, and relate them to phenomena and applications.

Analyze the measurable properties of waves and explain the relationships among them and how these properties change when the wave moves from one medium to another.

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e. Establish and maintain a formal style and objective tone while attending to the norms and conventions of the discipline in which they are writing.

f. Provide a concluding statement or section that follows from and supports the information or explanation presented (e.g., articulating implications or the significance of the topic).

LAFS.910.WHST.2.4: Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.

LAFS.910.WHST.2.5: Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience.

LAFS.910.WHST.2.6: Use technology, including the Internet, to produce, publish, and update individual or shared writing products, taking advantage of technology's capacity to link to other information and to display information flexibly and dynamically.

LAFS.910.WHST.3.7: Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation.

LAFS.910.WHST.3.8: Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the usefulness of each source in answering the research question; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and following a standard format for citation.

LAFS.910.WHST.3.9: Draw evidence from informational texts to support analysis, reflection, and research.

LAFS.910.WHST.4.10: Write routinely over extended time frames (time for reflection and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences.

MAFS.912.N-Q.1.1: Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays.

MAFS.912.N-Q.1.3: Choose a level of accuracy appropriate to limitations on measurement when reporting quantities.

Make sense of problems and persevere in solving them.

Mathematically proficient students start by explaining to themselves the meaning of a problem and looking for entry points to its solution. They analyze givens, constraints, relationships, and goals. They make conjectures about the form and meaning of the solution and plan a solution pathway rather than simply jumping into a solution attempt. They consider analogous problems, and try special cases and simpler forms of the original problem in order to gain insight into its solution. They monitor and evaluate their progress and change course if necessary. Older students might, depending on the context of the problem, transform algebraic expressions or change the viewing window on their graphing calculator to get information they need. Mathematically proficient students can explain correspondences between equations, verbal descriptions, tables, and graphs or diagrams of important features and relationships, graph data, and search for regularity or trends. Younger students might rely on using concrete objects or pictures to help conceptualize and solve a problem. Mathematically proficient students check their answers to problems using a different method, and they continually ask themselves, “Does this make sense?” They can understand the approaches of others to solving complex problems and identify correspondences between different approaches.

Standard Relation to Course: Supporting

Reason abstractly and quantitatively.

Mathematically proficient students make sense of quantities and their relationships in problem situations. They bring two complementary abilities to bear on problems involving quantitative relationships: the ability to decontextualize—to abstract a given situation and represent it symbolically and manipulate the representing symbols as if they have a life of their own, without necessarily attending to their referents—and the ability to contextualize, to pause as needed during the manipulation process in order to probe into the referents for the symbols involved. Quantitative reasoning entails habits of creating a coherent representation of the problem at hand; considering the units involved; attending to the meaning of quantities, not just how to compute them; and knowing and flexibly using different properties of operations and objects.

Standard Relation to Course: Supporting

Construct viable arguments and critique the reasoning of others.

Mathematically proficient students understand and use stated assumptions, definitions, and previously established results in constructing arguments. They make conjectures and build a logical progression of statements to explore the truth of their conjectures. They are able to analyze situations by breaking them into cases, and can recognize and use counterexamples. They justify their conclusions, communicate them to others, and Respond to the arguments of others. They reason inductively about data, making plausible arguments that take into account the context from which the data arose. Mathematically proficient students are also able to compare the effectiveness of two plausible arguments, distinguish correct logic or reasoning from that which is flawed, and—if there is a flaw in an argument—explain what it is. Elementary students can construct arguments using concrete referents such as objects, drawings, diagrams, and actions. Such arguments can make sense and be correct, even though they are not generalized or made formal until later grades. Later, students learn to determine domains to which an argument applies. Students at all grades can listen or read the arguments of others, decide whether they make sense, and ask useful questions to clarify or improve the arguments.

Standard Relation to Course: Supporting

Model with mathematics.

Mathematically proficient students can apply the mathematics they know to solve problems arising in everyday life, society, and the workplace. In early grades, this might be as simple as writing an addition equation to describe a situation. In middle grades, a student might apply proportional reasoning to plan a school event or analyze a problem in the community. By high school, a student might use geometry to solve a design problem or use a function to describe how one quantity is related to another. Mathematically proficient students who can apply what they know are comfortable making assumptions and approximations to simplify a complicated situation, realizing that these may need revision later. They are able to identify important quantities in a practical situation and map their relationships using such tools as diagrams, two-way tables, graphs, flowcharts and formulas. They can analyze those relationships mathematically to draw conclusions. They routinely interpret their mathematical results in the context of the situation and reflect on whether the results make sense, possibly improving the model if it has not served its purpose.

Standard Relation to Course: Supporting

Use appropriate tools strategically.

Mathematically proficient students choose the available tools when solving a mathematical problem. These tools might include pencil and paper, concrete models, a ruler, a protractor, a calculator, a spreadsheet, a computer algebra system, a statistical package, or dynamic geometry software. Proficient students are sufficiently familiar with tools appropriate for their grade or course to make sound decisions about when each of these tools might be helpful, recognizing both the insight to be gained and their limitations. For example, mathematically proficient high school students analyze graphs of functions and solutions generated using a graphing calculator. They detect possible errors by strategically using estimation and other mathematical knowledge. When making mathematical models, they know that technology can enable them to visualize the results of varying assumptions, explore consequences, and compare predictions with data. Mathematically proficient students at various grade levels are able to
identify relevant external mathematical resources, such as digital content located on a website, and use them to pose or solve problems. They are able to use technological tools to explore and deepen their understanding of concepts.

**Standard Relation to Course: Supporting**

**MAFS.K12.MP.6.1:**

**Attend to precision.**

Mathematically proficient students try to communicate precisely to others. They try to use clear definitions in discussion with others and in their own reasoning. They state the meaning of the symbols they choose, including using the equal sign consistently and appropriately. They are careful about specifying units of measure, and labeling axes to clarify the correspondence with quantities in a problem. They calculate accurately and efficiently, express numerical answers with a degree of precision appropriate for the problem context. In the elementary grades, students give carefully formulated explanations to each other. By the time they reach high school they have learned to examine claims and make explicit use of definitions.

**Standard Relation to Course: Supporting**

**MAFS.K12.MP.7.1:**

**Look for and make use of structure.**

Mathematically proficient students look closely to discern a pattern or structure. Young students, for example, might notice that three and seven more is the same amount as seven and three more, or they may sort a collection of shapes according to how many sides the shapes have. Later, students will see 7 × 8 equals the well remembered 7 × 5 + 7. And, by grade 3, they will have learned that 3 × 2 × 5 equals 3 × 10, and they will understand the powers 3² and 5³. Teachers should use supportive questions and activities to help students see and express structural regularity in a range of contexts.

**Standard Relation to Course: Supporting**

**MAFS.K12.MP.8.1:**

**Look for and express regularity in repeated reasoning.**

Mathematically proficient students notice if calculations are repeated, and look both for general methods and for shortcuts. Upper elementary students might notice when dividing 25 by 11 that they are repeating the same calculations over and over again, and conclude they have a repeating decimal. By paying attention to the calculation of slope as they repeatedly check whether points are on the line through (1, 2) with slope 3, middle school students might abstract the equation \((y – 2)/(x – 1) = 3\). Noticing the regularity in the way terms cancel when expanding \((x - 1)(x + 1), (x - 1)(x² + x + 1)\), and \((x - 1)(x³ + x² + x + 1)\) might lead them to the general formula for the sum of a geometric series. As they work to solve a problem, mathematically proficient students maintain oversight of the process, while attending to the details. They continually evaluate the reasonableness of their intermediate results.

**Standard Relation to Course: Supporting**

**ELD.K12.ELL.SC.1:**

*English language learners communicate information, ideas and concepts necessary for academic success in the content area of Science.*

**ELD.K12.ELL.SI.1:**

*English language learners communicate for social and instructional purposes within the school setting.*

**General Course Information and Notes**

**VERSION DESCRIPTION**

Laboratory investigations that include the use of scientific inquiry, research, measurement, problem solving, laboratory apparatus and technologies, experimental procedures, and safety procedures are an integral part of this course. The National Science Teachers Association (NSTA) recommends that at the high school level, all students should be in the science lab or field, collecting data every week. School laboratory investigations (labs) are defined by the National Research Council (NRC) as an experience in the laboratory, classroom, or the field that provides students with opportunities to interact directly with natural phenomena or with data collected by others using tools, materials, data collection techniques, and models (NRC, 2006, p. 3). Laboratory investigations in the high school classroom should help all students develop a growing understanding of the complexity and ambiguity of empirical work, as well as the skills to calibrate and troubleshoot equipment used to make observations. Learners should understand measurement error; and have the skills to aggregate, interpret, and present the resulting data (National Research Council, 2006, p.77; NSTA, 2007).

**Special Notes:**

**Instructional Practices**

Teaching from a range of complex text is optimized when teachers in all subject areas implement the following strategies on a routine basis:

1. Ensuring wide reading from complex text that varies in length.
2. Making close reading and rereading of texts central to lessons.
3. Emphasizing text-specific complex questions, and cognitively complex tasks, reinforce focus on the text and cultivate independence.
4. Emphasizing students supporting answers based upon evidence from the text.
5. Providing extensive research and writing opportunities (claims and evidence).

**Science and Engineering Practices** (NRC Framework for K-12 Science Education, 2010)

- Asking questions (for science) and defining problems (for engineering).
- Developing and using models.
- Planning and carrying out investigations.
- Analyzing and interpreting data.
- Using mathematics, information and computer technology, and computational thinking.
- Constructing explanations (for science) and designing solutions (for engineering).
- Engaging in argument from evidence.
- Obtaining, evaluating, and communicating information.

**GENERAL NOTES**
English Language Development ELD Standards Special Notes Section:
Teachers are required to provide listening, speaking, reading and writing instruction that allows English language learners (ELL) to communicate information, ideas and concepts for academic success in the content area of Science. For the given level of English language proficiency and with visual, graphic, or interactive support, students will interact with grade level words, expressions, sentences and discourse to process or produce language necessary for academic success. The ELD standard should specify a relevant content area concept or topic of study chosen by curriculum developers and teachers which maximizes an ELL’s need for communication and social skills. To access an ELL supporting document which delineates performance definitions and descriptors, please click on the following link:
https://cpalmsmediaprod.blob.core.windows.net/uploads/docs/standards/eld/sc.pdf

Additional Instructional Resources:
A.V.E. for Success Collection is provided by the Florida Association of School Administrators: http://www.fasa.net/4DCGI/cms/review.html?
Action=CMS_Document&DocID=139. Please be aware that these resources have not been reviewed by CPALMS and there may be a charge for the use of some of them in this collection.

GENERAL INFORMATION

Course Number: 2001310
Course Path: Section: Grades PreK to 12 Education
Courses > Grade Group: Grades 9 to 12 and Adult
Education Courses > Subject: Science > SubSubject:
Earth/Space Sciences
Abbreviated Title: EARTH/SPA SCI
Course Length: Year (Y)
Course Level: 2
Grade Level(s): 9,10,11,12
Graduation Requirement: Equally Rigorous Science

Educator Certifications

<table>
<thead>
<tr>
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<td>SC.912.L.15.1</td>
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<td>SC.912.L.15.8</td>
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| SC.912.N.1.1 | Define a problem based on a specific body of knowledge, for example: biology, chemistry, physics, and earth/space science, and do the following:  
  1. Pose questions about the natural world, (Articulate the purpose of the investigation and identify the relevant scientific concepts).  
  2. Conduct systematic observations, (Write procedures that are clear and replicable. Identify observables and examine relationships between test (independent) variable and outcome (dependent) variable. Employ appropriate methods for accurate and consistent observations; conduct and record measurements at appropriate levels of precision. Follow safety guidelines).  
  3. Examine books and other sources of information to see what is already known,  
  4. Review what is known in light of empirical evidence, (Examine whether available empirical evidence can be interpreted in terms of existing knowledge and models, and if not, modify or develop new models).  
  5. Plan investigations, (Design and evaluate a scientific investigation).  
  6. Use tools to gather, analyze, and interpret data (this includes the use of measurement in metric and other systems, and also the generation and interpretation of graphical representations of data, including data tables and graphs), (Collect data or evidence in an organized way. Properly use instruments, equipment, and materials (e.g., scales, probeware, meter sticks, microscopes, computers) including set-up, calibration, technique, maintenance, and storage).  
  7. Pose answers, explanations, or descriptions of events,  
  8. Generate explanations that explicate or describe natural phenomena (inferences),  
  9. Use appropriate evidence and reasoning to justify these explanations to others,  
  10. Communicate results of scientific investigations, and  
  11. Evaluate the merits of the explanations produced by others. |
| SC.912.N.1.4 | Identify sources of information and assess their reliability according to the strict standards of scientific investigation. |
| SC.912.N.1.5 | Describe and provide examples of how similar investigations conducted in many parts of the world result in the same outcome. |
| SC.912.N.1.6 | Describe how scientific inferences are drawn from scientific observations and provide examples from the content being studied. |
| SC.912.N.2.4 | Explain that scientific knowledge is both durable and robust and open to change. Scientific knowledge can change because it is often examined and re-examined by new investigations and scientific argumentation. Because of these frequent examinations, scientific knowledge becomes stronger, leading to its durability. |
| SC.912.N.2.5 | Describe instances in which scientists’ varied backgrounds, talents, interests, and goals influence the inferences and thus the explanations that they make about observations of natural phenomena and describe that competing interpretations (explanations) of scientists are a strength of science as they are a source of new, testable ideas that have the potential to add new evidence to support one or another of the explanations. |
| SC.912.N.3.1 | Explain that a scientific theory is the culmination of many scientific investigations drawing together all the current evidence concerning a substantial range of phenomena; thus, a scientific theory represents the most powerful explanation scientists have to offer. |
| SC.912.N.3.5 | Describe the function of models in science, and identify the wide range of models used in science. |
Explain how scientific knowledge and reasoning provide an empirically-based perspective to inform society's decision making.

Describe the measurable properties of waves and explain the relationships among them and how these properties change when the wave moves from one medium to another.

Analyze the motion of an object in terms of its position, velocity, and acceleration (with respect to a frame of reference) as functions of time.

Describe how the gravitational force between two objects depends on their masses and the distance between them.

Develop students' ability to justify methods and compare their responses to the responses of their peers.

Justify results by explaining methods and processes.

Compare the magnitude and range of the four fundamental forces (gravitational, electromagnetic, weak nuclear, strong nuclear).

Compare nuclear reactions (radioactive decay, fission and fusion), the energy changes associated with them and their associated safety issues.

Explore the theory of electromagnetism by comparing and contrasting the different parts of the electromagnetic spectrum in terms of wavelength, frequency, and energy, and relate them to phenomena and applications.

Explain that all objects emit and absorb electromagnetic radiation and distinguish between objects that are blackbody radiators and those that are not.

Explain and compare nuclear reactions (radioactive decay, fission and fusion), the energy changes associated with them and their associated safety issues.

Explore the theory of electromagnetism by comparing and contrasting the different parts of the electromagnetic spectrum in terms of wavelength, frequency, and energy, and relate them to phenomena and applications.

Explain that all objects emit and absorb electromagnetic radiation and distinguish between objects that are blackbody radiators and those that are not.

Analyze the motion of an object in terms of its position, velocity, and acceleration (with respect to a frame of reference) as functions of time.

Describe the gravitational force between two objects depends on their masses and the distance between them.

Describe heat as the energy transferred by convection, conduction, and radiation, and explain the connection of heat to change in temperature or states of matter.

Explain and compare nuclear reactions (radioactive decay, fission and fusion), the energy changes associated with them and their associated safety issues.

Explore the theory of electromagnetism by comparing and contrasting the different parts of the electromagnetic spectrum in terms of wavelength, frequency, and energy, and relate them to phenomena and applications.

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Explain how scientific knowledge and reasoning provide an empirically-based perspective to inform society's decision making.
<table>
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</table>
| **MA.K12.MTR.5.1:** | Use patterns and structure to help understand and connect mathematical concepts. Mathematicians who use patterns and structure to help understand and connect mathematical concepts:  
  - Focus on relevant details within a problem.  
  - Create plans and procedures to logically order events, steps or ideas to solve problems.  
  - Decompose a complex problem into manageable parts.  
  - Relate previously learned concepts to new concepts.  
  - Look for similarities among problems.  
  - Connect solutions of problems to more complicated large-scale situations.  
  **Clarifications:** Teachers who encourage students to use patterns and structure to help understand and connect mathematical concepts:  
  - Help students recognize the patterns in the world around them and connect these patterns to mathematical concepts.  
  - Support students to develop generalizations based on the similarities found among problems.  
  - Provide opportunities for students to create plans and procedures to solve problems.  
  - Develop students' ability to construct relationships between their current understanding and more sophisticated ways of thinking. |
| **MA.K12.MTR.6.1:** | Assess the reasonableness of solutions. Mathematicians who assess the reasonableness of solutions:  
  - Estimate to discover possible solutions.  
  - Use benchmark quantities to determine if a solution makes sense.  
  - Check calculations when solving problems.  
  - Verify possible solutions by explaining the methods used.  
  - Evaluate results based on the given context.  
  **Clarifications:** Teachers who encourage students to assess the reasonableness of solutions:  
  - Have students estimate or predict solutions prior to solving.  
  - Prompt students to continually ask, “Does this solution make sense? How do you know?”  
  - Reinforce that students check their work as they progress within and after a task.  
  - Strengthen students' ability to verify solutions through justifications. |
| **MA.K12.MTR.7.1:** | Apply mathematics to real-world contexts. Mathematicians who apply mathematics to real-world contexts:  
  - Connect mathematical concepts to everyday experiences.  
  - Use models and methods to understand, represent and solve problems.  
  - Perform investigations to gather data or determine if a method is appropriate.  
  - Redesign models and methods to improve accuracy or efficiency.  
  **Clarifications:** Teachers who encourage students to apply mathematics to real-world contexts:  
  - Provide opportunities for students to create models, both concrete and abstract, and perform investigations.  
  - Challenge students to question the accuracy of their models and methods.  
  - Support students as they validate conclusions by comparing them to the given situation.  
  - Indicate how various concepts can be applied to other disciplines. |
| **ELA.K12.EE.1.1:** | Cite evidence to explain and justify reasoning.  
  **Clarifications:** K-1 Students include textual evidence in their oral communication with guidance and support from adults. The evidence can consist of details from the text without naming the text. During 1st grade, students learn how to incorporate the evidence in their writing.  
  2-3 Students include relevant textual evidence in their written and oral communication. Students should name the text when they refer to it. In 3rd grade, students should use a combination of direct and indirect citations.  
  4-5 Students continue with previous skills and reference comments made by speakers and peers. Students cite texts that they've directly quoted, paraphrased, or used for information. When writing, students will use the form of citation dictated by the instructor or the style guide referenced by the instructor.  
  6-8 Students continue with previous skills and use a style guide to create a proper citation.  
  9-12 Students continue with previous skills and should be aware of existing style guides and the ways in which they differ. |
| **ELA.K12.EE.2.1:** | Read and comprehend grade-level complex texts proficiently.  
  **Clarifications:** See Text Complexity for grade-level complexity bands and a text complexity rubric. |
| **ELA.K12.EE.3.1:** | Make inferences to support comprehension.  
  **Clarifications:** Students will make inferences before the words infer or inference are introduced. Kindergarten students will answer questions like “Why is the girl smiling?” or make predictions about what will happen based on the title page. Students will use the terms and apply them in 2nd grade and beyond. |
| **ELA.K12.EE.4.1:** | Use appropriate collaborative techniques and active listening skills when engaging in discussions in a variety of situations.  
  **Clarifications:** In kindergarten, students learn to listen to one another respectfully. In grades 1-2, students build upon these skills by justifying what they are thinking. For example: “I think _____ because _____.” The collaborative conversations are becoming academic conversations. In grades 3-12, students engage in academic conversations discussing claims and justifying their reasoning, refining and applying skills. Students build on ideas, propel the conversation, and support claims and counterclaims with evidence. |
General Course Information and Notes

VERSION DESCRIPTION

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- Constructing explanations (for science) and designing solutions (for engineering).
- Engaging in argument from evidence.
- Obtaining, evaluating, and communicating information.

GENERAL NOTES

Florida's Benchmarks for Excellent Student Thinking (B.E.S.T.) Standards

This course includes Florida's B.E.S.T. ELA Expectations (EE) and Mathematical Thinking and Reasoning Standards (MTRs) for students. Florida educators should intentionally embed these standards within the content and their instruction as applicable. For guidance on the implementation of the EE and MTRs, please visit https://www.cpalms.org/Standards/BEST_Standards.aspx and select the appropriate B.E.S.T. Standards package.

English Language Development ELD Standards Special Notes Section:

Teachers are required to provide listening, speaking, reading and writing instruction that allows English language learners (ELL) to communicate information, ideas and concepts for academic success in the content area of Science. For the given level of English language proficiency and with visual, graphic, or interactive support, students will interact with grade level words, expressions, sentences and discourse to process or produce language necessary for academic success. The ELD standard should specify a relevant content area concept or topic of study chosen by curriculum developers and teachers which maximizes an ELL's need for communication and social skills. To access an ELL supporting document which delineates performance definitions and descriptors, please click on the following link: https://cpalmsmediaprod.blob.core.windows.net/uploads/docs/standards/eld/sc.pdf

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## Course Standards

<table>
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<th>Name</th>
<th>Description</th>
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<tbody>
<tr>
<td>SC.912.E.5.1:</td>
<td>Cite evidence used to develop and verify the scientific theory of the Big Bang (also known as the Big Bang Theory) of the origin of the universe.</td>
</tr>
<tr>
<td>SC.912.E.5.2:</td>
<td>Identify patterns in the organization and distribution of matter in the universe and the forces that determine them.</td>
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<tr>
<td>SC.912.E.5.3:</td>
<td>Describe and predict how the initial mass of a star determines its evolution.</td>
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<tr>
<td>SC.912.E.5.4:</td>
<td>Explain the physical properties of the Sun and its dynamic nature and connect them to conditions and events on Earth.</td>
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<tr>
<td>SC.912.E.5.5:</td>
<td>Explain the formation of planetary systems based on our knowledge of our Solar System and apply this knowledge to newly discovered planetary systems.</td>
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<tr>
<td>SC.912.E.5.6:</td>
<td>Develop logical connections through physical principles, including Kepler’s and Newton’s Laws about the relationships and the effects of Earth, Moon, and Sun on each other.</td>
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<tr>
<td>SC.912.E.5.7:</td>
<td>Relate the history of and explain the justification for future space exploration and continuing technology development.</td>
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<tr>
<td>SC.912.E.5.8:</td>
<td>Connect the concepts of radiation and the electromagnetic spectrum to the use of historical and newly-developed observational tools.</td>
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<tr>
<td>SC.912.E.5.9:</td>
<td>Analyze the broad effects of space exploration on the economy and culture of Florida.</td>
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<tr>
<td>SC.912.E.5.10:</td>
<td>Describe and apply the coordinate system used to locate objects in the sky.</td>
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<td>SC.912.E.5.11:</td>
<td>Distinguish the various methods of measuring astronomical distances and apply each in appropriate situations.</td>
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<td>Describe and differentiate the layers of Earth and the interactions among them.</td>
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<td>Connect surface features to surface processes that are responsible for their formation.</td>
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<tr>
<td>SC.912.E.6.3:</td>
<td>Analyze the scientific theory of plate tectonics and identify related major processes and features as a result of moving plates.</td>
</tr>
<tr>
<td>SC.912.E.6.4:</td>
<td>Analyze how specific geologic processes and features are expressed in Florida and elsewhere.</td>
</tr>
<tr>
<td>SC.912.E.6.5:</td>
<td>Describe the geologic development of the present day oceans and identify commonly found features.</td>
</tr>
<tr>
<td>SC.912.E.7.1:</td>
<td>Analyze the movement of matter and energy through the different biogeochemical cycles, including water and carbon.</td>
</tr>
<tr>
<td>SC.912.E.7.2:</td>
<td>Analyze the causes of the various kinds of surface and deep water motion within the oceans and their impacts on the transfer of energy between the poles and the equator.</td>
</tr>
<tr>
<td>SC.912.E.7.3:</td>
<td>Differentiate and describe the various interactions among Earth systems, including: atmosphere, hydrosphere, cryosphere, geosphere, and biosphere.</td>
</tr>
<tr>
<td>SC.912.E.7.4:</td>
<td>Summarize the conditions that contribute to the climate of a geographic area, including the relationships to lakes and oceans.</td>
</tr>
<tr>
<td>SC.912.E.7.5:</td>
<td>Predict future weather conditions based on present observations and conceptual models and recognize limitations and uncertainties of such predictions.</td>
</tr>
<tr>
<td>SC.912.E.7.6:</td>
<td>Relate the formation of severe weather to the various physical factors.</td>
</tr>
<tr>
<td>SC.912.E.7.7:</td>
<td>Identify, analyze, and relate the internal (Earth system) and external (astronomical) conditions that contribute to global climate change.</td>
</tr>
<tr>
<td>SC.912.E.7.8:</td>
<td>Explain how various atmospheric, oceanic, and hydrologic conditions in Florida have influenced and can influence human behavior, both individually and collectively.</td>
</tr>
<tr>
<td>SC.912.E.7.9:</td>
<td>Cite evidence that the ocean has had a significant influence on climate change by absorbing, storing, and moving heat, carbon, and water.</td>
</tr>
<tr>
<td>SC.912.L.15.1:</td>
<td>Explain how the scientific theory of evolution is supported by the fossil record, comparative anatomy, comparative embryology, biogeography, molecular biology, and observed evolutionary change.</td>
</tr>
<tr>
<td>SC.912.L.15.8:</td>
<td>Describe the scientific explanations of the origin of life on Earth.</td>
</tr>
</tbody>
</table>

1. **Define a problem based on a specific body of knowledge, for example: biology, chemistry, physics, and earth/space science, and do the following:**
   1. **Pose questions about the natural world.** (Articulate the purpose of the investigation and identify the relevant scientific concepts).
   2. **Conduct systematic observations.** (Write procedures that are clear and replicable. Identify observables and examine relationships between test (independent) variable and outcome (dependent) variable. Employ appropriate methods for accurate and consistent observations; conduct and record measurements at appropriate levels of precision. Follow safety guidelines).
   3. **Examine books and other sources of information to see what is already known,**
   4. **Review what is known in light of empirical evidence,** (Examine whether available empirical evidence can be interpreted in terms of existing knowledge and models, and if not, modify or develop new models).
   5. **Plan investigations,** (Design and evaluate a scientific investigation).
   6. **Use tools to gather, analyze, and interpret data** (this includes the use of measurement in metric and other systems, and also the generation and interpretation of graphical representations of data, including data tables and graphs), (Collect data or evidence in an organized way. Properly use instruments, equipment, and materials (e.g., scales, probeware, meter sticks, microscopes, computers) including set-up, calibration, technique, maintenance, and storage).
   7. **Pose answers, explanations, or descriptions of events,**
   8. **Generate explanations that explicate or describe natural phenomena (inferences),**
   9. **Use appropriate evidence and reasoning to justify these explanations to others,**
   10. **Communicate results of scientific investigations,** and
   11. **Evaluate the merits of the explanations produced by others.**

**SC.912.N.1.1:** Recognize that the strength or usefulness of a scientific claim is evaluated through scientific argumentation, which depends on critical and logical thinking, and the active consideration of alternative scientific explanations to explain the data presented.

**SC.912.N.1.3:** Identify sources of information and assess their reliability according to the strict standards of scientific investigation.

**SC.912.N.1.5:** Describe and provide examples of how similar investigations conducted in many parts of the world result in the same outcome.

**SC.912.N.1.6:** Identify which questions can be answered through science and which questions are outside the boundaries of scientific investigation, such as questions addressed by other ways of knowing, such as art, philosophy, and religion.

**SC.912.N.2.1:** Identify what is science, what clearly is not science, and what superficially resembles science (but fails to meet the criteria for science).
SC.912.N.2.3: Identify examples of pseudoscience (such as astrology, phrenology) in society.

SC.912.N.2.4: Explain that scientific knowledge is both durable and robust and open to change. Scientific knowledge can change because it is often examined and re-examined by new investigations and scientific argumentation. Because of these frequent examinations, scientific knowledge becomes stronger, leading to its durability.

SC.912.N.2.5: Describe instances in which scientists’ varied backgrounds, talents, interests, and goals influence the inferences and thus the explanations that they make about observations of natural phenomena and describe that competing interpretations (explanations) of scientists are a strength of science as they are a source of new, testable ideas that have the potential to add new evidence to support one or another of the explanations.

SC.912.N.3.1: Explain that a scientific theory is the culmination of many scientific investigations drawing together all the current evidence concerning a substantial range of phenomena; thus, a scientific theory represents the most powerful explanation scientists have to offer.

SC.912.N.3.4: Recognize that theories do not become laws, nor do laws become theories; theories are well supported explanations and laws are well supported descriptions.

SC.912.N.3.5: Describe the function of models in science, and identify the wide range of models used in science.

SC.912.N.4.1: Explain how scientific knowledge and reasoning provide an empirically-based perspective to inform society’s decision making.

SC.912.N.4.2: Weigh the merits of alternative strategies for solving a specific societal problem by comparing a number of different costs and benefits, such as human, economic, and environmental.

SC.912.P.10.4: Describe heat as the energy transferred by convection, conduction, and radiation, and explain the connection of heat to change in temperature or states of matter.

SC.912.P.10.10: Compare the magnitude and range of the four fundamental forces (gravitational, electromagnetic, weak nuclear, strong nuclear).

SC.912.P.10.11: Explain and compare nuclear reactions (radioactive decay, fission, and fusion), the energy changes associated with them, and their associated safety issues.

SC.912.P.10.16: Explain the relationship between moving charges and magnetic fields, as well as changing magnetic fields and electric fields, and their application to modern technologies.

SC.912.P.10.18: Explore the theory of electromagnetism by comparing and contrasting the different parts of the electromagnetic spectrum in terms of wavelength, frequency, and energy, and relate them to phenomena and applications.

SC.912.P.10.19: Explain that all objects emit and absorb electromagnetic radiation and distinguish between objects that are blackbody radiators and those that are not.

SC.912.P.10.20: Describe the measurable properties of waves and explain the relationships among them and how these properties change when the wave moves from one medium to another.

SC.912.P.12.2: Analyze the motion of an object in terms of its position, velocity, and acceleration (with respect to a frame of reference) as functions of time.

SC.912.P.12.4: Describe how the gravitational force between two objects depends on their masses and the distance between them.

LAFS.910.RST.1.1: Cite specific textual evidence to support analysis of science and technical texts, attending to the precise details of explanations or descriptions.

LAFS.910.RST.1.2: Determine the central ideas or conclusions of a text; trace the text's explanation or depiction of a complex process, phenomenon, or concept; provide an accurate summary of the text.

LAFS.910.RST.1.3: Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks, attending to special cases or exceptions defined in the text.

LAFS.910.RST.2.4: Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 9–10 texts and topics.

LAFS.910.RST.2.5: Analyze the structure of the relationships among concepts in a text, including relationships among key terms (e.g., force, friction, reaction force, energy).

LAFS.910.RST.2.6: Analyze the author's purpose in providing an explanation, describing a procedure, or discussing an experiment in a text; defining the question the author seeks to address.

LAFS.910.RST.3.7: Translate quantitative or technical information expressed in words in a text into visual form (e.g., a table or chart) and translate information expressed visually or mathematically (e.g., in an equation) into words.

LAFS.910.RST.3.8: Assess the extent to which the reasoning and evidence in a text support the author's claim or a recommendation for solving a scientific or technical problem.

LAFS.910.RST.3.9: Compare and contrast findings presented in a text to those from other sources (including their own experiments), noting when the findings support or contradict previous or earlier explanations or accounts.

LAFS.910.RST.4.10: By the end of grade 10, read and comprehend science/technical texts in the grades 9–10 text complexity band independently and proficiently.

LAFS.910.SL.1.1: Initiate and participate effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grades 9–10 topics, texts, and issues, building on others’ ideas and expressing their own clearly and persuasively.

a. Come to discussions prepared, having read and researched material under study; explicitly draw on that preparation by referring to evidence from texts and other research on the topic or issue to stimulate a thoughtful, well-reasoned exchange of ideas.

b. Work with peers to set rules for collegial discussions and decision-making (e.g., informal consensus, taking votes on key issues, presentation of alternate views), clear goals and deadlines, and individual roles as needed.

c. Propel conversations by posing and responding to questions that relate the current discussion to broader themes or larger ideas; actively incorporate others into the discussion; and clarify, verify, or challenge ideas and conclusions.

d. Respond thoughtfully to diverse perspectives, summarize points of agreement and disagreement, and, when warranted, qualify or justify their own views and understanding and make new connections in light of the evidence and reasoning presented.

LAFS.910.SL.1.2: Integrate multiple sources of information presented in diverse media or formats (e.g., visually, quantitatively, orally) evaluating the credibility and accuracy of each source.

LAFS.910.SL.1.3: Evaluate a speaker's point of view, reasoning, and use of evidence and rhetoric, identifying any fallacious reasoning or exaggerated or distorted evidence.

LAFS.910.SL.2.4: Present information, findings, and supporting evidence clearly, concisely, and logically such that listeners can follow the line of reasoning and the organization, development, substance, and style are appropriate to purpose, audience, and task.

LAFS.910.SL.2.5: Make strategic use of digital media (e.g., textual, graphical, audio, visual, and interactive elements) in presentations to enhance understanding of findings, reasoning, and evidence and to add interest.

Write arguments focused on discipline-specific content.

a. Introduce precise claim(s), distinguish the claim(s) from alternate or opposing claims, and create an organization that establishes clear relationships among the claim(s), counterclaims, reasons, and evidence.

b. Develop claim(s) and counterclaims fairly, supplying data and evidence for each while pointing out the strengths and limitations of both claim(s)
Choose a level of accuracy appropriate to limitations on measurement when reporting quantities.

Use technology, including the Internet, to produce, publish, and update material. Focus on aspects of technology that are most appropriate to the discipline and specific goals of the research project. Use specialized terms and concepts appropriate to the discipline. Provide a concluding statement or section that follows from and supports the information or explanation presented (e.g., articulating implications or the significance of the topic).

Write informative/explanatory texts, including the narration of historical events, scientific procedures/experiments, or technical processes.

Introduce a topic and organize ideas, concepts, and information to make important connections and distinctions; include formatting (e.g., headings), graphics (e.g., figures, tables), and multimedia when useful to aiding comprehension.

Develop the topic with well-chosen, relevant, and sufficient facts, extended definitions, concrete details, quotations, or other information and examples appropriate to the audience's knowledge of the topic.

Use varied transitions and sentence structures to link the major sections of the text, create cohesion, and clarify the relationships among ideas and concepts.

Use precise language and domain-specific vocabulary to manage the complexity of the topic and convey a style appropriate to the discipline and context as well as to the expertise of likely readers.

Establish and maintain a formal style and objective tone while attending to the norms and conventions of the discipline in which they are writing.

Provide a concluding statement or section that follows from and supports the information or explanation presented (e.g., articulating implications or the significance of the topic).

Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.

Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience.

Use technology, including the Internet, to produce, publish, and update material. Focus on aspects of technology that are most appropriate to the discipline and specific goals of the research project. Use specialized terms and concepts appropriate to the discipline. Provide a concluding statement or section that follows from and supports the information or explanation presented (e.g., articulating implications or the significance of the topic).

LAFS.910.WHST.2.4: Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.

LAFS.910.WHST.2.5: Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience.

LAFS.910.WHST.2.6: Use technology, including the Internet, to produce, publish, and update individual or shared writing productions, taking advantage of technology's capacity to link to other information and to display information flexibly and dynamically.

LAFS.910.WHST.3.7: Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation.

LAFS.910.WHST.3.8: Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the usefulness of each source in answering the research question; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and following a standard format for citation.

LAFS.910.WHST.3.9: Draw evidence from informational texts to support analysis, reflection, and research.

LAFS.910.WHST.4.10: Write routinely over extended time frames (time for reflection and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences.

LAFS.912.F-IF.2.4: For a function that models a relationship between two quantities, interpret key features of graphs and tables in terms of the quantities, and sketch graphs showing key features given a verbal description of the relationship. Key features include: intercepts; intervals where the function is increasing, decreasing, positive, or negative; relative maximums and minimums; symmetries; end behavior; and periodicity.

Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases.

a. Graph linear and quadratic functions and show intercepts, maxima, and minima.

b. Graph square root, cube root, and piecewise-defined functions, including step functions and absolute value functions.

c. Graph polynomial functions, identifying zeros when suitable factorizations are available, and showing end behavior.

d. Graph rational functions, identifying zeros and asymptotes when suitable factorizations are available, and showing end behavior.

e. Graph exponential and logarithmic functions, showing intercepts and end behavior, and trigonometric functions, showing period, midline, and amplitude, and using phase shift.

LAFS.912.G-MG.1.2: Apply concepts of density based on area and volume in modeling situations (e.g., persons per square mile, BTUs per cubic foot).

LAFS.912.N-Q.1.1: Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays.

LAFS.912.N-Q.1.2: Choose a level of accuracy appropriate to limitations on measurement when reporting quantities.

LAFS.912.S-IC.2.6: Evaluate reports based on data.

LAFS.912.S-ID.1.1: Represent data with plots on the real number line (dot plots, histograms, and box plots).

Clarifications:
In grades 6–8, students describe center and spread in a data distribution. Here they choose a summary statistic appropriate to the characteristics of the data distribution, such as the shape of the distribution or the existence of extreme data points.

Use statistics appropriate to the shape of the data distribution to compare center (median, mean) and spread (interquartile range, standard deviation) of two or more different data sets.

LAFS.912.S-ID.1.2: Clarifications:
In grades 6–8, students describe center and spread in a data distribution. Here they choose a summary statistic appropriate to the characteristics of the data distribution, such as the shape of the distribution or the existence of extreme data points.

Interpret differences in shape, center, and spread in the context of the data sets, accounting for possible effects of extreme data points (outliers).

Clarifications:
In grades 6–8, students describe center and spread in a data distribution. Here they choose a summary statistic appropriate to the characteristics of the data distribution, such as the shape of the distribution or the existence of extreme data points.

LAFS.912.S-ID.1.3: Clarifications:
In grades 6–8, students describe center and spread in a data distribution. Here they choose a summary statistic appropriate to the characteristics of the data distribution, such as the shape of the distribution or the existence of extreme data points.

Use the mean and standard deviation of a data set to fit it to a normal distribution and to estimate population percentages. Recognize that there are data sets for which such a procedure is not appropriate. Use calculators, spreadsheets, and tables to estimate areas under the normal curve.

LAFS.912.S-ID.1.4: Summarize categorical data for two categories in two-way frequency tables. Interpret relative frequencies in the context of the data (including joint, marginal, and conditional relative frequencies). Recognize possible associations and trends in the data.

Represent data on two quantitative variables on a scatter plot, and describe how the variables are related.

a. Fit a function to the data; use functions fitted to data to solve problems in the context of the data. Use given functions or choose a function suggested by the context. Emphasize linear, and exponential models.

b. Informally assess the fit of a function by plotting and analyzing residuals.

c. Fit a linear function for a scatter plot that suggests a linear association.
MAFS.912.S-ID.2.6:

**Clarifications:**
Students take a more sophisticated look at using a linear function to model the relationship between two numerical variables. In addition to fitting a line to data, students assess how well the model fits by analyzing residuals.

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**MAFS.K12.MP.5.1:**
Reason abstractly and quantitatively.

Mathematically proficient students make sense of quantities and their relationships in problem situations. They bring two complementary abilities to bear on problems involving quantitative relationships: the ability to decontextualize—to abstract a given situation and represent it symbolically and manipulate the representing symbols as if they have a life of their own, without necessarily attending to their referents—and the ability to contextualize, to pause as needed during the manipulation process in order to probe into the referents for the symbols involved. Quantitative reasoning entails habits of creating a coherent representation of the problem at hand; considering the units involved; attending to the meaning of quantities, not just how to compute them; and knowing and flexibly using different properties of operations and objects.

**MAFS.K12.MP.4.1:**
Make sense of problems and persevere in solving them.

Mathematically proficient students start by explaining to themselves the meaning of a problem and looking for entry points to its solution. They analyze given, constraints, relationships, and goals. They make conjectures about the form and meaning of the solution and plan a solution pathway rather than simply jumping into a solution attempt. They consider analogous problems, and try special cases and simpler forms of the original problem in order to gain insight into its solution. They monitor and evaluate their progress and change course if necessary. Older students might, depending on the context of the problem, transform algebraic expressions or change the viewing window on their graphing calculator to get the information they need. Mathematically proficient students can explain correspondences between equations, verbal descriptions, tables, and graphs or draw diagrams of important features and relationships, graph data, and search for regularity or trends. Younger students might rely on using concrete objects or pictures to help conceptualize and solve a problem. Mathematically proficient students check their answers to problems using a different method, and they continually ask themselves, “Does this make sense?” They can understand the approaches of others to solving complex problems and identify correspondences between different approaches.

**Standard Relation to Course: Supporting**

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**MAFS.K12.MP.3.1:**
Construct viable arguments and critique the reasoning of others.

Mathematically proficient students understand and use stated assumptions, definitions, and previously established results in constructing arguments. They make conjectures and build a logical progression of statements to explore the truth of their conjectures. They are able to analyze situations by breaking them into cases, and can recognize and use counterexamples. They justify their conclusions, communicate them to others, and respond to the arguments of others. They reason inductively about data, making plausible arguments that take into account the context from which the data arose. Mathematically proficient students are also able to compare the effectiveness of two plausible arguments, distinguish correct logic or reasoning from that which is flawed, and—if there is a flaw in an argument—explain what it is. Elementary students can construct arguments using concrete referents such as objects, drawings, diagrams, and actions. Such arguments can make sense and be correct, even though they are not generalized or made formal until later grades. Later, students learn to determine domains to which an argument applies. Students at all grades can listen or read the arguments of others, decide whether they make sense, and ask useful questions to clarify or improve the arguments.

**Standard Relation to Course: Supporting**

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**MAFS.K12.MP.2.1:**
Model with mathematics.

Mathematically proficient students can apply the mathematics they know to solve problems arising in everyday life, society, and the workplace. In early grades, this might be as simple as writing an addition equation to describe a situation. In middle grades, a student might apply proportional reasoning to plan a school event or analyze a problem in the community. By high school, a student might use geometry solve a design problem or use a function to describe how one quantity of interest depends on another. Mathematically proficient students who can apply what they know are comfortable making assumptions and approximations to simplify a complicated situation, realizing that these may need revision later. They are able to identify important quantities in a practical situation and map their relationships using such tools as diagrams, two-way tables, graphs, flowcharts and formulas. They can analyze those relationships mathematically to draw conclusions. They routinely interpret their mathematical results in the context of the situation and reflect on whether the results make sense, possibly improving the model if it has not served its purpose.

**Standard Relation to Course: Supporting**

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**MAFS.K12.MP.1.1:**
Use appropriate tools strategically.

Mathematically proficient students consider the available tools when solving a mathematical problem. These tools might include pencil and paper, concrete models, a ruler, a protractor, a calculator, a spreadsheet, a computer algebra system, a statistical package, or dynamic geometry software. Proficient students are sufficiently familiar with tools appropriate for their grade or course to make sound decisions about when each of these tools might be helpful, recognizing both the insight to be gained and their limitations. For example, mathematically proficient high school students analyze graphs of functions and solutions generated using a graphing calculator. They detect possible errors by strategically using estimation and other mathematical knowledge. When making mathematical models, they know that technology can enable them to visualize the results of varying assumptions, explore consequences, and compare predictions with data. Mathematically proficient students at various grade levels are able to identify relevant external mathematical resources, such as digital content located on a website, and use them to pose or solve problems. They are able to use technological tools to explore and deepen their understanding of concepts.

**Standard Relation to Course: Supporting**

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**MAFS.K12.MP.6.1:**
Attend to precision.

Mathematically proficient students try to communicate precisely to others. They try to use clear definitions in discussion with others and in their own reasoning. They state the meaning of the symbols they choose, including using the equal sign consistently and appropriately. They are careful about specifying units of measure, and labeling axes to clarify the correspondence with quantities in a problem. They calculate accurately and efficiently, express numerical answers with a degree of precision appropriate for the problem context. In the elementary grades, students give carefully formulated explanations to each other. By the time they reach high school they have learned to examine claims and make explicit use of definitions.

**Standard Relation to Course: Supporting**

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**Look for and make use of structure.**

Mathematically proficient students look closely to discern a pattern or structure. Young students, for example, might notice that three and seven
MAFS.K12.MP.7.1: more is the same amount as seven and three more, or they may sort a collection of shapes according to how many sides the shapes have. Upper elementary students might notice when dividing 25 by 11 that they are repeating the same calculations over and over again, and conclude they have a repeating decimal. By paying attention to the calculation of slope as they repeatedly check whether points are on the line through (1, 2) with slope 3, middle school students might abstract the equation \(y = 2x + 5\) as \(3\) noticing the regularity in the way terms cancel when expanding \((x - 1)(x + 1)\), \((x - 1)x² + x + 1)\), and \((x - 1)x² + x + 1)\) might lead them to the general formula for the sum of a geometric series. As they work to solve a problem, mathematically proficient students maintain oversight of the process, while attending to the details. They continually evaluate the reasonableness of their intermediate results.

Standard Relation to Course: Supporting

Look for and express regularity in repeated reasoning.

MAFS.K12.MP.8.1: Mathematically proficient students notice if calculations are repeated, and look both for general methods and for shortcuts. Upper elementary students might notice when dividing 25 by 11 that they are repeating the same calculations over and over again, and conclude they have a repeating decimal. By paying attention to the calculation of slope as they repeatedly check whether points are on the line through (1, 2) with slope 3, middle school students might abstract the equation \(y = 2x + 5\) as \(3\) noticing the regularity in the way terms cancel when expanding \((x - 1)(x + 1)\), \((x - 1)x² + x + 1)\), and \((x - 1)x² + x + 1)\) might lead them to the general formula for the sum of a geometric series. As they work to solve a problem, mathematically proficient students maintain oversight of the process, while attending to the details. They continually evaluate the reasonableness of their intermediate results.

Standard Relation to Course: Supporting

English Language Learners Communicate Information, Ideas, and Concepts Necessary for Academic Success in the Content Area of Science.

ELD.K12.ELL.SI.1:

ELD.K12.ELL.SC.1:

ELD.K12.ELL.SI.1:

English language learners communicate for social and instructional purposes within the school setting.

General Course Information and Notes

GENERAL NOTES

While the content focus of this course is consistent with the Earth/Space Science course, students will explore these concepts in greater depth. In general, the academic pace and rigor will be greatly increased for honors level course work. Laboratory investigations that include the use of scientific inquiry, research, measurement, problem solving, laboratory apparatus and technologies, experimental procedures, and safety procedures are an integral part of this course. The National Science Teachers Association (NSTA) recommends that at the high school level, all students should be in the science lab or field, collecting data every week. School laboratory investigations (labs) are defined by the National Research Council (NRC) as an experience in the laboratory, classroom, or the field that provides students with opportunities to interact directly with natural phenomena or with data collected by others using tools, materials, data collection techniques, and models (NRC, 2006, p. 3). Laboratory investigations in the high school classroom should help all students develop a growing understanding of the complexity and ambiguity of empirical work, as well as the skills to calibrate and troubleshoot equipment used to make observations. Learners should understand measurement error; and have the skills to aggregate, interpret, and present the resulting data (National Research Council, 2006, p. 77; NSTA, 2007).

Honors and Advanced Level Course Note: Advanced courses require a greater demand on students through increased academic rigor. Academic rigor is obtained through the application, analysis, evaluation, and creation of complex ideas that are often abstract and multi-faceted. Students are challenged to think and collaborate critically on the content they are learning. Honors level rigor will be achieved by increasing text complexity through text selection, focus on high-level qualitative measures, and complexity of task. Instruction will be structured to give students a deeper understanding of conceptual themes and organization within and across disciplines. Academic rigor is more than simply assigning to students a greater quantity of work.

Special Notes:

Institutional Practices
Teaching from a range of complex text is optimized when teachers in all subject areas implement the following strategies on a routine basis:

1. Ensuring wide reading from complex text that varies in length.
2. Making close reading and rereading of texts central to lessons.
3. Emphasizing text-specific complex questions, and cognitively complex tasks, reinforce focus on the text and cultivate independence.
4. Emphasizing students supporting answers based upon evidence from the text.
5. Providing extensive research and writing opportunities (claims and evidence).


- Asking questions (for science) and defining problems (for engineering).
- Developing and using models.
- Planning and carrying out investigations.
- Analyzing and interpreting data.
- Using mathematics, information and computer technology, and computational thinking.
- Constructing explanations (for science) and designing solutions (for engineering).
- Engaging in argument from evidence.
- Obtaining, evaluating, and communicating information.

Literacy Standards in Science

Secondary science courses also include reading standards for literacy in science and technical subjects 6-12 and writing standards for literacy in history/social studies, science, and technical subjects 6-12. The courses also include speaking and listening standards. For a complete list of standards required for this course click on the blue tile labeled course standards. You may also download the complete course including all required standards and notes sections using the export function located at the top of this page.

English Language Development ELD Standards Special Notes Section:

Teachers are required to provide listening, speaking, reading and writing instruction that allows English language learners (ELL) to communicate information, ideas and concepts for academic success in the content area of Science. For the given level of English language proficiency and with visual, graphic, or interactive support, students will interact with grade level words, expressions, sentences and discourse to process or produce language necessary for academic success. The ELD standard should specify a relevant content area concept or topic of study chosen by curriculum developers and teachers which maximizes an ELL's need for communication and social skills. To access an ELL supporting document which delineates performance definitions and descriptors, please click on the following link:

https://cpalmsmediaprod.blob.core.windows.net/uploads/docs/standards/eld/sc.pdf
Educator Certifications

<p>| Science (Secondary Grades 7-12) |
| Chemistry (Grades 6-12) |
| Physics (Grades 6-12) |
| Earth/Space Science (Grades 6-12) |
| Middle Grades General Science (Middle Grades 5-9) |</p>
<table>
<thead>
<tr>
<th>Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>SC.912.E.5.1:</td>
<td>Cite evidence used to develop and verify the scientific theory of the Big Bang (also known as the Big Bang Theory) of the origin of the universe.</td>
</tr>
<tr>
<td>SC.912.E.5.2:</td>
<td>Identify patterns in the organization and distribution of matter in the universe and the forces that determine them.</td>
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<tr>
<td>SC.912.E.5.3:</td>
<td>Describe and predict how the initial mass of a star determines its evolution.</td>
</tr>
<tr>
<td>SC.912.E.5.4:</td>
<td>Explain the physical properties of the Sun and its dynamic nature and connect them to conditions and events on Earth.</td>
</tr>
<tr>
<td>SC.912.E.5.5:</td>
<td>Explain the formation of planetary systems based on our knowledge of our Solar System and apply this knowledge to newly discovered planetary systems.</td>
</tr>
<tr>
<td>SC.912.E.5.6:</td>
<td>Develop logical connections through physical principles, including Kepler's and Newton's Laws about the relationships and the effects of Earth, Moon, and Sun on each other.</td>
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<tr>
<td>SC.912.E.5.7:</td>
<td>Relate the history of and explain the justification for future space exploration and continuing technology development.</td>
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<tr>
<td>SC.912.E.5.8:</td>
<td>Connect the concepts of radiation and the electromagnetic spectrum to the use of historical and newly-developed observational tools.</td>
</tr>
<tr>
<td>SC.912.E.5.9:</td>
<td>Analyze the broad effects of space exploration on the economy and culture of Florida.</td>
</tr>
<tr>
<td>SC.912.E.5.10:</td>
<td>Describe and apply the coordinate system used to locate objects in the sky.</td>
</tr>
<tr>
<td>SC.912.E.5.11:</td>
<td>Distinguish the various methods of measuring astronomical distances and apply each in appropriate situations.</td>
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<tr>
<td>SC.912.E.6.1:</td>
<td>Describe and differentiate the layers of Earth and the interactions among them.</td>
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<td>SC.912.E.6.2:</td>
<td>Connect surface features to surface processes that are responsible for their formation.</td>
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<tr>
<td>SC.912.E.6.3:</td>
<td>Analyze the scientific theory of plate tectonics and identify related major processes and features as a result of moving plates.</td>
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<td>SC.912.E.6.4:</td>
<td>Analyze how specific geologic processes and features are expressed in Florida and elsewhere.</td>
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<td>SC.912.E.6.5:</td>
<td>Describe the geologic development of the present day oceans and identify commonly found features.</td>
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<tr>
<td>SC.912.E.7.1:</td>
<td>Analyze the movement of matter and energy through the different biogeochemical cycles, including water and carbon.</td>
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<td>SC.912.E.7.2:</td>
<td>Analyze the causes of the various kinds of surface and deep water motion within the ocean and their impacts on the transfer of energy between the poles and the equator.</td>
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<td>SC.912.E.7.3:</td>
<td>Differentiate and describe the various interactions among Earth systems, including: atmosphere, hydrosphere, cryosphere, geosphere, and biosphere.</td>
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<td>SC.912.E.7.4:</td>
<td>Summarize the conditions that contribute to the climate of a geographic area, including the relationships to lakes and oceans.</td>
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<td>SC.912.E.7.5:</td>
<td>Predict future weather conditions based on present observations and conceptual models and recognize limitations and uncertainties of such predictions.</td>
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<td>Relate the formation of severe weather to the various physical factors.</td>
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<td>Identify, analyze, and relate the internal (Earth system) and external (astronomical) conditions that contribute to global climate change.</td>
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<td>SC.912.E.7.8:</td>
<td>Explain how various atmospheric, oceanic, and hydrologic conditions in Florida have influenced and can influence human behavior, both individually and collectively.</td>
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<td>SC.912.E.7.9:</td>
<td>Cite evidence that the ocean has had a significant influence on climate change by absorbing, storing, and moving heat, carbon, and water.</td>
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<tr>
<td>SC.912.L.15.1:</td>
<td>Explain how the scientific theory of evolution is supported by the fossil record, comparative anatomy, comparative embryology, biogeography, molecular biology, and observed evolutionary change.</td>
</tr>
<tr>
<td>SC.912.L.15.8:</td>
<td>Describe the scientific explanations of the origin of life on Earth.</td>
</tr>
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</table>

**Course Standards**

**SC.912.E.5.1:** Pose questions about the natural world, (Articulate the purpose of the investigation and identify the relevant scientific concepts).

1. **SC.912.N.1.1:** Conduct systematic observations, (Write procedures that are clear and replicable. Identify observables and examine relationships between test (independent) variable and outcome (dependent) variable. Employ appropriate methods for accurate and consistent observations; conduct and record measurements at appropriate levels of precision. Follow safety guidelines).

2. **SC.912.N.1.2:** Examine books and other sources of information to see what is already known,

3. **SC.912.N.1.3:** Review what is known in light of empirical evidence, (Examine whether available empirical evidence can be interpreted in terms of existing knowledge and models, if not, modify or develop new models).

4. **SC.912.N.1.4:** Plan investigations, (Design and evaluate a scientific investigation).

5. **SC.912.N.1.5:** Use tools to gather, analyze, and interpret data (this includes the use of measurement in metric and other systems, and also the generation and interpretation of graphical representations of data, including data tables and graphs), (Collect data or evidence in an organized way. Properly use instruments, equipment, and materials (e.g., scales, probebare, meter sticks, microscopes, computers) including setup, calibration, technique, maintenance, and storage).

6. **SC.912.N.1.6:** Pose answers, explanations, or descriptions of events,

7. **SC.912.N.1.7:** Generate explanations that explicate or describe natural phenomena (inferences),

8. **SC.912.N.1.8:** Use appropriate evidence and reasoning to justify these explanations to others,

9. **SC.912.N.1.9:** Communicate results of scientific investigations, and

10. **SC.912.N.1.10:** Evaluate the merits of the explanations produced by others.

11. **SC.912.N.1.11:** Recognize that the strength or usefulness of a scientific claim is evaluated through scientific argumentation, which depends on critical and logical thinking, and the active consideration of alternative scientific explanations to explain the data presented.

12. **SC.912.N.1.12:** Identify sources of information and assess their reliability according to the strict standards of scientific investigation.

13. **SC.912.N.1.13:** Describe and provide examples of how similar investigations conducted in many parts of the world result in the same outcome.

14. **SC.912.N.1.14:** Describe how scientific inferences are drawn from scientific observations and provide examples from the content being studied.

15. **SC.912.N.1.15:** Identify what is science, what clearly is not science, and what superficially resembles science (but fails to meet the criteria for science).

16. **SC.912.N.1.16:** Identify which questions can be answered through science and which questions are outside the boundaries of scientific investigation, such as questions addressed by other ways of knowing, such as art, philosophy, and religion.
SC.912.N.2.3: Identify examples of pseudoscience (such as astrology, phrenology) in society.

SC.912.N.2.4: Explain that scientific knowledge is both durable and robust and open to change. Scientific knowledge can change because it is often examined and re-examined by new investigations and scientific argumentation. Because of these frequent examinations, scientific knowledge becomes stronger, leading to its durability.

SC.912.N.2.5: Describe instances in which scientists’ varied backgrounds, talents, interests, and goals influence the inferences and thus the explanations that they make about observations of natural phenomena and describe that competing interpretations (explanations) of scientists are a strength of science as they are a source of new, testable ideas that have the potential to add new evidence to support one or another of the explanations.

SC.912.N.3.1: Explain that a scientific theory is the culmination of many scientific investigations drawing together all the current evidence concerning a substantial range of phenomena; thus, a scientific theory represents the most powerful explanation scientists have to offer.

SC.912.N.3.2: Recognize that theories do not become laws, nor do laws become theories; theories are well supported explanations and laws are well supported descriptions.

SC.912.N.3.5: Describe the function of models in science, and identify the wide range of models used in science.

SC.912.N.3.6: Explain how scientific knowledge and reasoning provide an empirically-based perspective to inform society's decision making.

SC.912.N.4.1: Weigh the merits of alternative strategies for solving a specific societal problem by comparing a number of different costs and benefits, such as human, economic, and environmental.

SC.912.P.10.4: Describe heat as the energy transferred by convection, conduction, and radiation, and explain the connection of heat to change in temperature or states of matter.

SC.912.P.10.10: Compare the magnitude and range of the four fundamental forces (gravitational, electromagnetic, weak nuclear, strong nuclear).

SC.912.P.10.11: Explain and compare nuclear reactions (radioactive decay, fission and fusion), the energy changes associated with them and their associated safety issues.

SC.912.P.10.16: Explain the relationship between moving charges and magnetic fields, as well as changing magnetic fields and electric fields, and their application to modern technologies.

SC.912.P.10.18: Explore the theory of electromagnetism by comparing and contrasting the different parts of the electromagnetic spectrum in terms of wavelength, frequency, and energy, and relate them to phenomena and applications.

SC.912.P.10.19: Explain that all objects emit and absorb electromagnetic radiation and distinguish between objects that are blackbody radiators and those that are not.

SC.912.P.10.20: Describe the measurable properties of waves and explain the relationships among them and how these properties change when the wave moves from one medium to another.

SC.912.P.12.2: Analyze the motion of an object in terms of its position, velocity, and acceleration (with respect to a frame of reference) as functions of time.

SC.912.P.12.4: Describe how the gravitational force between two objects depends on their masses and the distance between them.

Mathematicians who participate in effortful learning both individually and with others:
- Analyze the problem in a way that makes sense given the task.
- Ask questions that will help with solving the task.
- Build perseverance by modifying methods as needed while solving a challenging task.
- Stay engaged and maintain a positive mindset when working to solve tasks.
- Help and support each other when attempting a new method or approach.

Clariﬁcations:
Teachers who encourage students to participate actively in effortful learning both individually and with others:
- Cultivate a community of growth mindset learners.
- Foster perseverance in students by choosing tasks that are challenging.
- Develop students’ ability to analyze and problem solve.
- Recognize students’ effort when solving challenging problems.

Demonstrate understanding by representing problems in multiple ways.
Mathematicians who demonstrate understanding by representing problems in multiple ways:
- Build understanding through modeling and using manipulatives.
- Represent solutions to problems in multiple ways using objects, drawings, tables, graphs and equations.
- Progress from modeling problems with objects and drawings to using algorithms and equations.
- Express connections between concepts and representations.
- Choose a representation based on the given context or purpose.

Clariﬁcations:
Teachers who encourage students to demonstrate understanding by representing problems in multiple ways:
- Help students make connections between concepts and representations.
- Provide opportunities for students to use manipulatives when investigating concepts.
- Guide students from concrete to pictorial to abstract representations as understanding progresses.
- Show students that various representations can have different purposes and can be useful in different situations.

Complete tasks with mathematical ﬂuency.
Mathematicians who complete tasks with mathematical ﬂuency:
- Select efficient and appropriate methods for solving problems within the given context.
- Maintain ﬂexibility and accuracy while performing procedures and mental calculations.
- Complete tasks accurately and with conﬁdence.
- Adapt procedures to apply them to a new context.
- Use feedback to improve efﬁciency when performing calculations.

Clariﬁcations:
Teachers who encourage students to complete tasks with mathematical ﬂuency:
- Provide students with the ﬂexibility to solve problems by selecting a procedure that allows them to solve efﬁciently and accurately.
- Offer multiple opportunities for students to practice efﬁcient and generalizable methods.
- Provide opportunities for students to reﬂect on the method they used and determine if a more efﬁcient method could have been used.

Engage in discussions that reﬂect on the mathematical thinking of self and others.
Mathematicians who engage in discussions that reﬂect on the mathematical thinking of self and others:
MA.K12.MTR.4.1:
Communicate mathematical ideas, vocabulary and methods effectively.
Analyze the mathematical thinking of others.
Compare the efficiency of a method to those expressed by others.
Recognize errors and suggest how to correctly solve the task.
Justify results by explaining methods and processes.
Construct possible arguments based on evidence.

Clarifications:
Teachers who encourage students to engage in discussions that reflect on the mathematical thinking of self and others:
- Establish a culture in which students ask questions of the teacher and their peers, and error is an opportunity for learning.
- Create opportunities for students to discuss their thinking with peers.
- Select, sequence and present student work to advance and deepen understanding of correct and increasingly efficient methods.
- Develop students' ability to justify methods and compare their responses to the responses of their peers.

MA.K12.MTR.5.1:
Use patterns and structure to help understand and connect mathematical concepts.
Mathematicians who use patterns and structure to help understand and connect mathematical concepts:
- Focus on relevant details within a problem.
- Create plans and procedures to logically order events, steps or ideas to solve problems.
- Decompose a complex problem into manageable parts.
- Relate previously learned concepts to new concepts.
- Look for similarities among problems.
- Connect solutions of problems to more complicated large-scale situations.

Clarifications:
Teachers who encourage students to use patterns and structure to help understand and connect mathematical concepts:
- Help students recognize the patterns in the world around them and connect these patterns to mathematical concepts.
- Support students to develop generalizations based on the similarities found among problems.
- Provide opportunities for students to create plans and procedures to solve problems.
- Develop students' ability to construct relationships between their current understanding and more sophisticated ways of thinking.

MA.K12.MTR.6.1:
Assess the reasonableness of solutions.
Mathematicians who assess the reasonableness of solutions:
- Estimate to discover possible solutions.
- Use benchmark quantities to determine if a solution makes sense.
- Check calculations when solving problems.
- Verify possible solutions by explaining the methods used.
- Evaluate results based on the given context.

Clarifications:
Teachers who encourage students to assess the reasonableness of solutions:
- Have students estimate or predict solutions prior to solving.
- Prompt students to continually ask, "Does this solution make sense? How do you know?" 
- Reinforce that students check their work as they progress within and after a task.
- Strengthen students' ability to verify solutions through justifications.

MA.K12.MTR.7.1:
Apply mathematics to real-world contexts.
Mathematicians who apply mathematics to real-world contexts:
- Connect mathematical concepts to everyday experiences.
- Use models and methods to understand, represent and solve problems.
- Perform investigations to gather data or determine if a method is appropriate. • Redesign models and methods to improve accuracy or efficiency.

Clarifications:
Teachers who encourage students to apply mathematics to real-world contexts:
- Provide opportunities for students to create models, both concrete and abstract, and perform investigations.
- Challenge students to question the accuracy of their models and methods.
- Support students as they validate conclusions by comparing them to the given situation.
- Indicate how various concepts can be applied to other disciplines.

ELA.K12.EE.1.1:
Cite evidence to explain and justify reasoning.

Clarifications:
K-3 Students include textual evidence in their oral communication with guidance and support from adults. The evidence can consist of details from the text without naming the text. During 1st grade, students learn how to incorporate the evidence in their writing.
2-3 Students include relevant textual evidence in their written and oral communication. Students should name the text when they refer to it. In 3rd grade, students should use a combination of direct and indirect citations.
4-5 Students continue with previous skills and reference comments made by speakers and peers. Students cite texts that they've directly quoted, paraphrased, or used for information. When writing, students will use the form of citation dictated by the instructor or the style guide referenced by the instructor.
6-8 Students continue with previous skills and use a style guide to create a proper citation.
9-12 Students continue with previous skills and should be aware of existing style guides and the ways in which they differ.

ELA.K12.EE.2.1:
Read and comprehend grade-level complex texts proficiently.

Clarifications:
General Course Information and Notes

GENERAL NOTES

While the content focus of this course is consistent with the Earth/Space Science course, students will explore these concepts in greater depth. In general, the academic pace and rigor will be greatly increased for honors level course work. Laboratory investigations that include the use of scientific inquiry, research, measurement, problem solving, laboratory apparatus and technologies, experimental procedures, and safety procedures are an integral part of this course. The National Science Teachers Association (NSTA) recommends that at the high school level, all students should be in the science lab or field, collecting data every week. School laboratory investigations (labs) are defined by the National Research Council (NRC) as an experience in the laboratory, classroom, or the field that provides students with opportunities to interact directly with natural phenomena or with data collected by others using tools, materials, data collection techniques, and models (NRC, 2006, p. 3). Laboratory investigations in the high school classroom should help all students develop a growing understanding of the complexity and ambiguity of empirical work, as well as the skills to calibrate and troubleshoot equipment used to make observations. Learners should understand measurement error; and have the skills to aggregate, interpret, and present the resulting data (National Research Council, 2006, p. 77; NSTA, 2007).

Honors and Advanced Level Course Note: Advanced courses require a greater demand on students through increased academic rigor. Academic rigor is obtained through the application, analysis, evaluation, and creation of complex ideas that are often abstract and multi-faceted. Students are challenged to think and collaborate critically on the content they are learning. Honors level rigor will be achieved by increasing text complexity through text selection, focus on high-level qualitative measures, and complexity of task. Instruction will be structured to give students a deeper understanding of conceptual themes and organization within and across disciplines. Academic rigor is more than simply assigning to students a greater quantity of work.

Special Notes:

Instructional Practices

Teaching from a range of complex text is optimized when teachers in all subject areas implement the following strategies on a routine basis:

1. Ensuring wide reading from complex text that varies in length.
2. Making close reading and rereading of texts central to lessons.
3. Emphasizing text-specific complex questions, and cognitively complex tasks, reinforce focus on the text and cultivate independence.
4. Emphasizing students supporting answers based upon evidence from the text.
5. Providing extensive research and writing opportunities (claims and evidence).


- Asking questions (for science) and defining problems (for engineering).
- Developing and using models.
- Planning and carrying out investigations.
- Analyzing and interpreting data.
- Using mathematics, information and computer technology, and computational thinking.
- Constructing explanations (for science) and designing solutions (for engineering).
- Engaging in argument from evidence.
- Obtaining, evaluating, and communicating information.

Florida's Benchmarks for Excellent Student Thinking (B.E.S.T.) Standards

This course includes Florida's B.E.S.T. ELA Expectations (EE) and Mathematical Thinking and Reasoning Standards (MTRs) for students. Florida educators should intentionally embed these standards within the content and their instruction as applicable. For guidance on the implementation of the EE and MTRs, please visit https://www.cpalms.org/Standards/BEST_Standards.aspx and select the appropriate B.E.S.T. Standards package.
Educator Certifications

Science (Secondary Grades 7-12)
Chemistry (Grades 6-12)
Physics (Grades 6-12)
Earth/Space Science (Grades 6-12)
Middle Grades General Science (Middle Grades 5-9)
Course Standards

<table>
<thead>
<tr>
<th>Name</th>
<th>Description</th>
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<tbody>
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<td>Analyze and manipulate data collected by a variety of data collection techniques to support a hypothesis.</td>
</tr>
<tr>
<td>SC.912.CS-CP.1.4:</td>
<td>Collect real-time data from sources such as simulations, scientific and robotic sensors, and device emulators, using this data to formulate strategies or algorithms to solve advanced problems.</td>
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<td>SC.912.CS-CP.1.1:</td>
<td>Analyze data and identify real-world patterns through modeling and simulation.</td>
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<td>Explain how data analysis is used to enhance the understanding of complex natural and human systems.</td>
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<td>Explain the physical properties of the Sun and its dynamic nature and connect them to conditions and events on Earth.</td>
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<td>Analyze past, present, and potential future consequences to the environment resulting from various energy production technologies.</td>
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<td>Analyze the movement of matter and energy through the different biogeochemical cycles, including water and carbon.</td>
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<td>Cite evidence that the ocean has had a significant influence on climate change by absorbing, storing, and moving heat, carbon, and water.</td>
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<td>SC.912.L.17.3:</td>
<td>Discuss how the various geographic processes, such as currents, tides, and waves, affect the abundance of aquatic organisms.</td>
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<td>SC.912.L.17.4:</td>
<td>Describe changes in ecosystems resulting from seasonal variations, climate change and succession.</td>
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<td>Recognize the consequences of the losses of biodiversity due to catastrophic events, climate changes, human activity, and the introduction of invasive, non-native species.</td>
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<td>SC.912.L.17.10:</td>
<td>Diagram and explain the biogeochemical cycles of an ecosystem, including water, carbon, and nitrogen cycle.</td>
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<td>SC.912.L.17.11:</td>
<td>Evaluate the costs and benefits of renewable and nonrenewable resources, such as water, energy, fossil fuels, wildlife, and forests.</td>
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<td>SC.912.L.17.12:</td>
<td>Discuss the political, social, and environmental consequences of sustainable use of land.</td>
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<td>Discuss the need for adequate monitoring of environmental parameters when making policy decisions.</td>
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<td>SC.912.L.17.15:</td>
<td>Discuss the effects of technology on environmental quality.</td>
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<td>SC.912.L.17.16:</td>
<td>Discuss the large-scale environmental impacts resulting from human activity, including waste spills, oil spills, runoff, greenhouse gases, ozone depletion, and surface and groundwater pollution.</td>
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<td>SC.912.L.18.12:</td>
<td>Discuss the special properties of water that contribute to Earth's suitability as an environment for life: cohesive behavior, ability to moderate temperature, expansion upon freezing, and versatility as a solvent.</td>
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<td>SC.912.N.1.1:</td>
<td>Define a problem based on a specific body of knowledge, for example: biology, chemistry, physics, and earth/space science, and do the following:</td>
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<td>SC.912.N.1.1:</td>
<td>1. Pose questions about the natural world, (Articulate the purpose of the investigation and identify the relevant scientific concepts).</td>
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<td>SC.912.N.1.1:</td>
<td>2. Conduct systematic observations, (Write procedures that are clear and replicable. Identify observables and examine relationships between test (independent) variable and outcome (dependent) variable. Employ appropriate methods for accurate and consistent observations; conduct and record measurements at appropriate levels of precision. Follow safety guidelines).</td>
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<td>3. Examine books and other sources of information to see what is already known,</td>
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<td>SC.912.N.1.2:</td>
<td>4. Review what is known in light of empirical evidence, (Examine whether available empirical evidence can be interpreted in terms of existing knowledge and models, and if not, modify or develop new models).</td>
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<td>SC.912.N.1.2:</td>
<td>5. Plan investigations, (Design and evaluate a scientific investigation).</td>
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<td>SC.912.N.1.2:</td>
<td>6. Use tools to gather, analyze, and interpret data (this includes the use of measurement in other systems, and also the generation and interpretation of graphical representations of data, including data tables and graphs), (Collect data or evidence in an organized way. Properly use instruments, equipment, and materials (e.g., scales, probeware, meter sticks, microscopes, computers) including set-up, calibration, and storage).</td>
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<td>9. Use appropriate evidence and reasoning to justify these explanations to others,</td>
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<td>11. Evaluate the merits of the explanations produced by others.</td>
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<td>SC.912.N.1.3:</td>
<td>Describe and explain what characterizes science and its methods.</td>
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<td>SC.912.N.1.4:</td>
<td>Recognize that the strength or usefulness of a scientific claim is evaluated through scientific argumentation, which depends on critical and logical thinking, and the active consideration of alternative scientific explanations to explain the data presented.</td>
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<td>SC.912.N.1.5:</td>
<td>Identify sources of information and assess their reliability according to the strict standards of scientific investigation.</td>
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<td>SC.912.N.1.6:</td>
<td>Describe how scientific inferences are drawn from scientific observations and provide examples from the content being studied.</td>
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<tr>
<td>SC.912.N.1.7:</td>
<td>Recognize the role of creativity in constructing scientific questions, methods and explanations.</td>
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Describe instances in which scientists’ varied backgrounds, talents, interests, and goals influence the inferences and thus the explanations that they make about observations of natural phenomena and describe that competing interpretations (explanations) of scientists are a strength of science as they are a source of new, testable ideas that have the potential to add new evidence to support one or another of the explanations.

Differentiate among the various forms of energy and recognize that they can be transformed from one form to others.

Explore the Law of Conservation of Energy by differentiating among open, closed, and isolated systems and explain that the total energy in an isolated system is a conserved quantity.

Describe heat as the energy transferred by convection, conduction, and radiation, and explain the connection of heat to change in temperature or states of matter.

Relate temperature to the average molecular kinetic energy.

Explore the theory of electromagnetism by comparing and contrasting the different parts of the electromagnetic spectrum in terms of wavelength, frequency, and energy, and relate them to phenomena and applications.

Cite specific textual evidence to support analysis of science and technical texts, attending to important distinctions the author makes and to any gaps or inconsistencies in the account.

Initiate and participate effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grades 11–12 topics, issues, texts, or problems, building on others’ ideas and expressing their own clearly and persuasively.

a. Come to discussions prepared, having read and researched material under study; explicitly draw on that preparation by referring to evidence from texts and other research on the topic or issue to stimulate a thoughtful, well-reasoned exchange of ideas.

b. Work with peers to promote collaborative, democratic discussions and decision-making; set clear goals and deadlines, and establish individual roles as needed.

c. Propose conversations by posing and responding to questions that probe reasoning and evidence; ensure a hearing for a full range of positions on a topic or issue; clarify, verify, or challenge ideas and conclusions; and promote divergent and creative perspectives.

d. Respond thoughtfully to diverse perspectives; synthesize comments, claims, and evidence made on all sides of an issue; resolve contradictions when possible; and determine what additional information or research is required to deepen the investigation or complete the task.

Integrate multiple sources of information presented in diverse formats and media (e.g., quantitative data, video, multimedia) in order to address a question or solve a problem.

Integrate multiple sources of information presented in diverse formats and media (e.g., visually, quantitatively, orally) in order to make informed decisions and solve problems, evaluating the credibility and accuracy of each source and noting any discrepancies among the data.

a. Introduce a topic and organize complex ideas, concepts, and information so that each new element builds on that which precedes it to create a unified whole; include formatting (e.g., headings), graphics (e.g., figures, tables), and multimedia when useful to aiding comprehension.

b. Develop the topic thoroughly by selecting the most significant and relevant facts, extended definitions, concrete details, quotations, or other information and examples appropriate to the audience's knowledge of the topic.

c. Use varied transitions and sentence structures to link the major sections of the text, create cohesion, and clarify the relationships among complex ideas and concepts.

d. Use precise language, domain-specific vocabulary and techniques such as metaphor, simile, and analogy to manage the complexity of the topic; convey a knowledgeable stance in a style that responds to the discipline and context as well as to the expertise of likely readers.

e. Provide a concluding statement or section that follows from and supports the information or explanation provided (e.g., articulating implications or the significance of the topic).

Draw evidence from informational texts to support analysis, reflection, and research.

Cite specific textual evidence to support analysis of science and technical texts, attending to the precise details of explanations or descriptions.

Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks, attending to special cases or exceptions defined in the text.

Translate quantitative or technical information expressed in words in a text into visual form (e.g., a table or chart) and translate information expressed visually or mathematically (e.g., in an equation) into words.

a. Come to discussions prepared, having read and researched material under study; explicitly draw on that preparation by referring to evidence from texts and other research on the topic or issue to stimulate a thoughtful, well-reasoned exchange of ideas.

b. Work with peers to set rules for collegial discussions and decision-making (e.g., informal consensus, taking votes on key issues, presentation of alternate views), clear goals and deadlines, and individual roles as needed.

c. Propose conversations by posing and responding to questions that relate the current discussion to broader themes or larger ideas; actively incorporate others into the discussion; and clarify, verify, or challenge ideas and conclusions.

d. Respond thoughtfully to diverse perspectives, summarize points of agreement and disagreement, and, when warranted, qualify or justify their own views and understanding and make new connections in light of the evidence and reasoning presented.

Integrate multiple sources of information presented in diverse media or formats (e.g., visually, quantitatively, orally) evaluating the credibility and accuracy of each source.

Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes.

a. Introduce a topic and organize ideas, concepts, and information to make important connections and distinctions; include formatting (e.g., headings), graphics (e.g., figures, tables), and multimedia when useful to aiding comprehension.
b. Develop the topic with well-chosen, relevant, and sufficient facts, extended definitions, concrete details, quotations, or other information and examples appropriate to the audience's knowledge of the topic.

c. Use varied transitions and sentence structures to link the major sections of the text, create cohesion, and clarify the relationships among ideas and concepts.

d. Use precise language and domain-specific vocabulary to manage the complexity of the topic and convey a style appropriate to the discipline and context as well as to the expertise of likely readers.

e. Establish and maintain a formal style and objective tone while attending to the norms and conventions of the discipline in which they are writing.

f. Provide a concluding statement or section that follows from and supports the information or explanation presented (e.g., articulating implications or the significance of the topic).
**General Course Information and Notes**

**VERSION DESCRIPTION**

This interdisciplinary science course covers the fundamentals of meteorology, emphasizing the physical and chemical processes that control Earth’s weather and climate. Course topics include solar energy, atmospheric and oceanic movement, and energy transfer. Students will study and practice weather prediction using technology, data, and models. In addition, students will learn the tools that allow them to study the formation of severe weather events. The course will cover the history of Earth’s climate and the practices and tools that will allow students to study meteorology as well as the forces behind fluctuations in Earth’s weather and climate over time such as Milankovich Cycles, and ice ages. Students have the opportunity to access real-world empirical data to study weather patterns both globally and locally, model the processes that impact changes using basic mathematical expressions, and test the relationship between predictions and observations. The course also includes opportunities to practice science literacy by teaching from a range of complex texts that vary in length and complexity.

**Honors and Advanced Level Course Note:** Advanced courses require a greater demand on students through increased academic rigor. Academic rigor is obtained through the application, analysis, evaluation, and creation of complex ideas that are often abstract and multi-faceted. Students are challenged to think and collaborate critically on the content they are learning. Honors level rigor will be achieved by increasing the complexity of the content. Students will be given the opportunity to develop a deeper understanding of the conceptual themes and organization within and across disciplines.

Academic rigor is more than simply assigning to students a greater quantity of work.

This course has been designed for the teacher to select and teach only the appropriate standards corresponding to a student’s grade level and/or instructional needs.

**English Language Development ELD Standards Special Notes Section:**

Teachers are required to provide listening, speaking, reading and writing instruction that allows English learners (ELL) to communicate information, ideas, and concepts for academic success in the content area of science. For the given level of English proficiency and with visual, graphic, or interactive support, students will interact with grade level words, expressions, sentences and discourse to process or produce language necessary for academic success. The ELD standard should specify a relevant content area concept or topic of study chosen by curriculum developers and teachers which maximizes an ELL’s need for communication and social skills.

To access an ELL supporting document which delineates performance definitions and descriptors, please click on the following link: https://cpalmsmediaprod.blob.core.windows.net/uploads/docs/standards/eld/sc.pdf.

For additional information on the development and implementation of the ELD standards, please contact the Bureau of Student Achievement through Language Acquisition at sala@fldoe.org.

**GENERAL INFORMATION**

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<thead>
<tr>
<th>Course Number:</th>
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<tr>
<td>Course Type:</td>
<td>Elective Course</td>
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<td>Course Path:</td>
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<td>Meteorology Honors</td>
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### Educator Certifications

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<th>Subject</th>
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<tbody>
<tr>
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<td>Grades 6-12</td>
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<tr>
<td>Earth/Space Science</td>
<td>Grades 6-12</td>
</tr>
</tbody>
</table>

**Course Status:** Course Approved
Discuss the political, social, and environmental consequences of sustainable use of land.

Relate the formation of severe weather to the various physical factors.

Analyze past, present, and potential future consequences to the environment resulting from various energy production technologies.

Analyze the movement of matter and energy through the different biogeochemical cycles, including water and carbon.

Analyze the causes of the various kinds of surface and deep water motion within the oceans and their impacts on the transfer of energy between the poles and the equator.

Diagram and explain the biogeochemical cycles of an ecosystem, including water, carbon, and nitrogen cycle.

Describe and provide examples of how similar investigations conducted in many parts of the world result in the same outcome.

Discuss how scientific inferences are drawn from scientific observations and provide examples from the content being studied.

Recognize the role of creativity in constructing scientific questions, methods and explanations.

Summarize the conditions that contribute to the climate of a geographic area, including the relationships to lakes and oceans.

Discuss the effects of technology on environmental quality.

Collect real-time data from sources such as simulations, scientific and robotic sensors, and device emulators, using this data to formulate strategies or algorithms to solve advanced problems.

Analyze scientific data and identify real-world patterns through modeling and simulation.

Describe how scientific inferences are drawn from scientific observations and provide examples from the content being studied.

Discuss the need for adequate monitoring of environmental parameters when making policy decisions.

Relate the history of and explain the justification for future space exploration and continuing technology development.

Discuss the large-scale environmental impacts resulting from human activity, including waste spills, oil spills, runoff, greenhouse gases, ozone depletion, and surface groundwater pollution.

Discuss how scientific inferences are drawn from scientific observations and provide examples from the content being studied.

Identify sources of information and assess their reliability according to the strict standards of scientific investigation.

Evaluate the merits of the explanations produced by others.

Pose answers, explanations, or descriptions of events, set-up, conduct systematic observations, examine books and other sources of information to see what is already known, examine relationships between consistent observations; conduct and record measurements at appropriate levels of precision. Follow safety guidelines).

Conduct investigations, (Design and evaluate a scientific investigation).

Use tools to gather, analyze, and interpret data (this includes the use of measurement in metric and other systems, and also the generation and interpretation of graphical representations of data, including data tables and graphs), (Collect data or evidence in an organized way. Properly use instruments, equipment, and materials (e.g., scales, probeware, meter sticks, microscopes, computers) including set-up, calibration, technique, and environmental maintenance, and storage).

Evaluate the merits of the explanations produced by others.

Evaluate the costs and benefits of renewable and nonrenewable resources, such as water, energy, fossil fuels, wildlife, and forests.

Discuss the political, social, and environmental consequences of sustainable use of land.

Discuss the large-scale environmental impacts resulting from human activity, including waste spills, oil spills, runoff, greenhouse gases, ozone depletion, and surface groundwater pollution.

Discuss the special properties of water that contribute to Earth's suitability as an environment for life: cohesive behavior, ability to moderate temperature, expansion upon freezing, and versatility as a solvent.

Define a problem based on a specific body of knowledge, for example: biology, chemistry, physics, and earth/space science, and do the following:

1. Pose questions about the natural world. (Articulate the purpose of the investigation and identify the relevant scientific concepts).

2. Conduct systematic observations. (Write procedures that are clear and replicable. Identify observables and examine relationships between test (independent) variable and outcome (dependent) variable. Employ appropriate methods for accurate and consistent observations; conduct and record measurements at appropriate levels of precision. Follow safety guidelines).

3. Examine books and other sources of information to see what is already known.

4. Review what is known in light of empirical evidence. (Examine whether available empirical evidence can be interpreted in terms of existing knowledge and models, and if not, modify or develop new models).

5. Plan investigations. (Design and evaluate a scientific investigation).

6. Use tools to gather, analyze, and interpret data (this includes the use of measurement in metric and other systems, and also the generation and interpretation of graphical representations of data, including data tables and graphs), (Collect data or evidence in an organized way. Properly use instruments, equipment, and materials (e.g., scales, probeware, meter sticks, microscopes, computers) including set-up, calibration, technique, and environmental maintenance, and storage).

7. Pose answers, explanations, or descriptions of events.

8. Generate explanations that explicate or describe natural phenomena (inferences).

9. Use appropriate evidence and reasoning to justify these explanations to others.

10. Communicate results of scientific investigations, and

11. Evaluate the merits of the explanations produced by others.
Describe the function of models in science, and identify the wide range of models used in science.

Explain how scientific knowledge and reasoning provide an empirically-based perspective to inform society’s decision making.

Describe heat as the energy transferred by convection, conduction, and radiation, and explain the connection of heat to change in temperature or states of matter.

Differentiate among the various forms of energy and recognize that they can be transformed from one form to others.

Explore the theory of electromagnetism by comparing and contrasting the different parts of the electromagnetic spectrum in terms of wavelength, frequency, and energy, and relate them to phenomena and applications.

Mathematicians who engage in discussions that reflect on the mathematical thinking of self and others:
- Analyze the problem in a way that makes sense given the task.
- Ask questions that will help with solving the task.
- Build perseverance by modifying methods as needed while solving a challenging task.
- Stay engaged and maintain a positive mindset when working to solve tasks.
- Help and support each other when attempting a new method or approach.

Mathematicians who complete tasks with mathematical fluency:
- Choose a representation based on the given context or purpose.
- Express connections between concepts and representations.
- Demonstrate understanding by representing problems in multiple ways.
- Progress from modeling problems with objects and drawings to using algorithms and equations.
- Represent solutions to problems in multiple ways using objects, drawings, tables, graphs, and equations.
- Build understanding through modeling and using manipulatives.

Mathematicians who demonstrate understanding by representing problems in multiple ways:
- Help students make connections between concepts and representations.
- Provide opportunities for students to use manipulatives when investigating concepts.
- Guide students from concrete to pictorial to abstract representations as understanding progresses.
- Show students that various representations can have different purposes and can be useful in different situations.

Teachers who encourage students to demonstrate understanding by representing problems in multiple ways:
- Guide students from concrete to pictorial to abstract representations as understanding progresses.
- Help students make connections between concepts and representations.
- Provide opportunities for students to use manipulatives when investigating concepts.
- Show students that various representations can have different purposes and can be useful in different situations.

Complete tasks with mathematical fluency:
- Use feedback to improve efficiency when performing calculations.
- Maintain flexibility and accuracy while performing procedures and mental calculations.
- Select efficient and appropriate methods for solving problems within the given context.
- Adapt procedures to apply them to a new context.
- Complete tasks accurately and with confidence.

Engage in discussions that reflect on the mathematical thinking of self and others:
- Communicate mathematical ideas, vocabulary and methods effectively.
- Analyze the mathematical thinking of others.
- Compare the efficiency of a method to those expressed by others.
- Establish a culture in which students ask questions of the teacher and their peers, and error is an opportunity for learning.

Communicate mathematical ideas, vocabulary and methods effectively.
- Analyze the mathematical thinking of others.
- Compare the efficiency of a method to those expressed by others.
- Recognize errors and suggest how to correctly solve the task.
- Justify results by explaining methods and processes.
- Construct possible arguments based on evidence.

Teachers who encourage students to engage in discussions that reflect on the mathematical thinking of self and others:
- Establish a culture in which students ask questions of the teacher and their peers, and error is an opportunity for learning.

Provide opportunities for students to reflect on the method they used and determine if a more efficient method could have been used.

Provide multiple opportunities for students to practice efficient and generalizable methods.

Provide opportunities for students to reflect on the method they used and determine if a more efficient method could have been used.
Create opportunities for students to discuss their thinking with peers.
Select, sequence and present student work to advance and deepen understanding of correct and increasingly efficient methods.
Develop students’ ability to justify methods and compare their responses to the responses of their peers.

Use patterns and structure to help understand and connect mathematical concepts.
Mathematicians who use patterns and structure to help understand and connect mathematical concepts:

- Focus on relevant details within a problem.
- Create plans and procedures to logically order events, steps or ideas to solve problems.
- Decompose a complex problem into manageable parts.
- Relate previously learned concepts to new concepts.
- Look for similarities among problems.
- Connect solutions of problems to more complicated large-scale situations.

Clarifications:
Teachers who encourage students to use patterns and structure to help understand and connect mathematical concepts:

- Help students recognize the patterns in the world around them and connect these patterns to mathematical concepts.
- Support students to develop generalizations based on the similarities found among problems.
- Provide opportunities for students to create plans and procedures to solve problems.
- Develop students’ ability to construct relationships between their current understanding and more sophisticated ways of thinking.

Assess the reasonableness of solutions.
Mathematicians who assess the reasonableness of solutions:

- Estimate to discover possible solutions.
- Use benchmark quantities to determine if a solution makes sense.
- Check calculations when solving problems.
- Verify possible solutions by explaining the methods used.
- Evaluate results based on the given context.

Clarifications:
Teachers who encourage students to assess the reasonableness of solutions:

- Have students estimate or predict solutions prior to solving.
- Prompt students to continually ask, “Does this solution make sense? How do you know?”
- Reinforce that students check their work as they progress within and after a task.
- Strengthen students’ ability to verify solutions through justifications.

Apply mathematics to real-world contexts.
Mathematicians who apply mathematics to real-world contexts:

- Connect mathematical concepts to everyday experiences.
- Use models and methods to understand, represent and solve problems.
- Perform investigations to gather data or determine if a method is appropriate. • Redesign models and methods to improve accuracy or efficiency.

Clarifications:
Teachers who encourage students to apply mathematics to real-world contexts:

- Provide opportunities for students to create models, both concrete and abstract, and perform investigations.
- Challenge students to question the accuracy of their models and methods.
- Support students as they validate conclusions by comparing them to the given situation.
- Indicate how various concepts can be applied to other disciplines.

Cite evidence to explain and justify reasoning.

Clarifications:
K-1 Students include textual evidence in their oral communication with guidance and support from adults. The evidence can consist of details from the text without naming the text. During 1st grade, students learn how to incorporate the evidence in their writing. 2-3 Students include relevant textual evidence in their written and oral communication. Students should name the text when they refer to it. In 3rd grade, students should use a combination of direct and indirect citations.
4-5 Students continue with previous skills and reference comments made by speakers and peers. Students cite texts that they've directly quoted, paraphrased, or used for information. When writing, students will use the form of citation dictated by the instructor or the style guide referenced by the instructor.
6-8 Students continue with previous skills and use a style guide to create a proper citation.
9-12 Students continue with previous skills and should be aware of existing style guides and the ways in which they differ.

Read and comprehend grade-level complex texts proficiently.

Clarifications:
See Text Complexity for grade-level complexity bands and a text complexity rubric.

Make inferences to support comprehension.

Clarifications:
Students will make inferences before the words infer or inference are introduced. Kindergarten students will answer questions like “Why is the girl smiling?” or make predictions about what will happen based on the title page. Students will use the terms and apply them in 2nd grade and beyond.

Use appropriate collaborative techniques and active listening skills when engaging in discussions in a variety of situations.

Clarifications:
In kindergarten, students learn to listen to one another respectfully.
In grades 1-2, students build upon these skills by justifying what they are thinking. For example: “I think _______ because _______.” The collaborative conversations are becoming academic conversations.

In grades 3-12, students engage in academic conversations discussing claims and justifying their reasoning, refining and applying skills. Students build on ideas, propel the conversation, and support claims and counterclaims with evidence.

Use the accepted rules governing a specific format to create quality work.

Clarifications:
Students will incorporate skills learned into work products to produce quality work. For students to incorporate these skills appropriately, they must receive instruction. A 3rd grade student creating a poster board display must have instruction in how to effectively present information to do quality work.

Use appropriate voice and tone when speaking or writing.

Clarifications:
In kindergarten and 1st grade, students learn the difference between formal and informal language. For example, the way we talk to our friends differs from the way we speak to adults. In 2nd grade and beyond, students practice appropriate social and academic language to discuss texts.

Evaluate how environment and personal health are interrelated.

Clarifications:
Food options within a community; prenatal-care services; availability of recreational facilities; air quality; weather-safety awareness; and weather, air, and water conditions.

Propose strategies to reduce or prevent injuries and health problems.

Clarifications:
Mandatory passenger-restraint/helmet laws, refusal skills, mandatory immunizations, healthy relationship skills, and improved inspection of food sources.

General Course Information and Notes

VERSION DESCRIPTION

This interdisciplinary science course covers the fundamentals of meteorology, emphasizing the physical and chemical processes that control Earth’s weather and climate. Course topics include solar energy, atmospheric and oceanic movement, and energy transfer. Students will study and practice weather prediction using technology, data and models. In addition, students will learn the forces behind the formation of severe weather events. The course will cover the history of Earth’s climate and the practices and tools used to study meteorology as well as the forces behind fluctuations in the Earth’s weather and climate over time such as Milankovitch Cycles, and ice ages. Students have the opportunity to access real-world empirical data to study weather patterns both globally and locally, model the processes that impact changes using basic mathematical expressions, graphing and statistics, and test the relationship between predictions and observations. The course also includes opportunities to practice science literacy by teaching from a range of complex texts that vary in length, and feature empirical evidence. Students will also be provided extensive research and writing opportunities (claims and evidence).

Honors and Advanced Level Course Note: Advanced courses require a greater demand on students through increased academic rigor. Academic rigor is obtained through the application, analysis, evaluation, and creation of complex ideas that are often abstract and multi-faceted. Students are challenged to think and collaborate critically on the content they are learning. Honors level rigor will be achieved by increasing text complexity through text selection, focus on high-level qualitative measures, and complexity of task. Instruction will be structured to give students a deeper understanding of conceptual themes and organization within and across disciplines. Academic rigor is more than simply assigning to students a greater quantity of work.

This course has been designed for the teacher to select and teach only the appropriate standards corresponding to a student’s grade level and/or instructional needs.

English Language Development ELD Standards Special Notes Section:

Teachers are required to provide listening, speaking, reading and writing instruction that allows English language learners (ELL) to communicate information, ideas and concepts for academic success in the content area of Science. For the given level of English language proficiency and with visual, graphic, or interactive support, students will interact with grade level words, expressions, sentences and discourse to process or produce language necessary for academic success. The ELD standard should specify a relevant content area concept or topic of study chosen by curriculum developers and teachers which maximizes an ELL’s need for communication and social skills. To access an ELL supporting document which delineates performance definitions and descriptors, please click on the following link: https://cpalmsmediaprod.blob.core.windows.net/uploads/docs/standards/eld/sc.pdf.

GENERAL INFORMATION

Course Number: 2001330
Course Type: Elective Course
Course Attributes: Honors
Course Status: State Board Approved
Course Level: 3

Course Path: Section: Grades PreK to 12 Education
Courses > Grade Group: Grades 9 to 12 and Adult
Education Courses > Subject: Science > SubSubject: Earth/Space Sciences
Abbreviated Title: Meteorology Honors

Number of Credits: One (1) credit
Course Length: Year (Y)

Course Status: State Board Approved

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<tr>
<td>Chemistry (Grades 6-12)</td>
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<td>Physics (Grades 6-12)</td>
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<td>Biology (Grades 6-12)</td>
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### Course Standards

<table>
<thead>
<tr>
<th>Name</th>
<th>Description</th>
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<tr>
<td>SC.912.E.6.6:</td>
<td>Analyze past, present, and potential future consequences to the environment resulting from various energy production technologies.</td>
</tr>
<tr>
<td>SC.912.E.7.7:</td>
<td>Identify, analyze, and relate the internal (Earth system) and external (astronomical) conditions that contribute to global climate change.</td>
</tr>
<tr>
<td>SC.912.E.7.8:</td>
<td>Explain how various atmospheric, oceanic, and hydrologic conditions in Florida have influenced and can influence human behavior, both individually and collectively.</td>
</tr>
<tr>
<td>SC.912.E.7.9:</td>
<td>Cite evidence that the ocean has had a significant influence on climate change by absorbing, storing, and moving heat, carbon, and water.</td>
</tr>
<tr>
<td>SC.912.L.14.6:</td>
<td>Explain the significance of genetic factors, environmental factors, and pathogenic agents to health from the perspectives of both individual and public health.</td>
</tr>
<tr>
<td>SC.912.L.15.3:</td>
<td>Describe how biological diversity is increased by the origin of new species and how it is decreased by the natural process of extinction.</td>
</tr>
<tr>
<td>SC.912.L.15.13:</td>
<td>Describe the conditions required for natural selection, including: overproduction of offspring, inherited variation, and the struggle to survive, which result in differential reproductive success.</td>
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<tr>
<td>SC.912.L.16.10:</td>
<td>Evaluate the impact of biotechnology on the individual, society and the environment, including medical and ethical issues.</td>
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<tr>
<td>SC.912.L.17.1:</td>
<td>Discuss the characteristics of populations, such as number of individuals, age structure, density, and pattern of distribution.</td>
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<tr>
<td>SC.912.L.17.4:</td>
<td>Describe changes in ecosystems resulting from seasonal variations, climate change and succession.</td>
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<tr>
<td>SC.912.L.17.5:</td>
<td>Analyze how population size is determined by births, deaths, immigration, emigration, and limiting factors (biotic and abiotic) that determine carrying capacity.</td>
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<td>SC.912.L.17.6:</td>
<td>Compare and contrast the relationships among organisms, including predation, parasitism, competition, commensalism, and mutualism.</td>
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<td>SC.912.L.17.7:</td>
<td>Characterize the biotic and abiotic components that define freshwater systems, marine systems and terrestrial systems.</td>
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<tr>
<td>SC.912.L.17.8:</td>
<td>Recognize the consequences of the losses of biodiversity due to catastrophic events, climate changes, human activity, and the introduction of invasive, non-native species.</td>
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<tr>
<td>SC.912.L.17.9:</td>
<td>Use a food web to identify and distinguish producers, consumers, and decomposers. Explain the pathway of energy transfer through trophic levels and the reduction of available energy at successive trophic levels.</td>
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<tr>
<td>SC.912.L.17.10:</td>
<td>Diagram and explain the biogeochemical cycles of an ecosystem, including water, carbon, and nitrogen cycle.</td>
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<td>SC.912.L.17.11:</td>
<td>Evaluate the costs and benefits of renewable and nonrenewable resources, such as water, energy, fossil fuels, wildlife, and forests.</td>
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<tr>
<td>SC.912.L.17.12:</td>
<td>Discuss the political, social, and environmental consequences of sustainable use of land.</td>
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<tr>
<td>SC.912.L.17.13:</td>
<td>Discuss the need for adequate monitoring of environmental parameters when making policy decisions.</td>
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<tr>
<td>SC.912.L.17.14:</td>
<td>Assess the need for adequate waste management strategies.</td>
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<td>SC.912.L.17.15:</td>
<td>Discuss the effects of technology on environmental quality.</td>
</tr>
<tr>
<td>SC.912.L.17.16:</td>
<td>Discuss the large-scale environmental impacts resulting from human activity, including waste spills, oil spills, runoff, greenhouse gases, ozone depletion, and surface and groundwater pollution.</td>
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<tr>
<td>SC.912.L.17.18:</td>
<td>Describe how human population size and resource use relate to environmental quality.</td>
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<tr>
<td>SC.912.L.17.19:</td>
<td>Describe how different natural resources are produced and how their rates of use and renewal limit availability.</td>
</tr>
<tr>
<td>SC.912.L.17.20:</td>
<td>Predict the impact of individuals on environmental systems and examine how human lifestyles affect sustainability.</td>
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</table>

**SC.912.N.1.1:**

- Define a problem based on a specific body of knowledge, for example: biology, chemistry, physics, and earth/space science, and do the following:
  1. Pose questions about the natural world, (Articulate the purpose of the investigation and identify the relevant scientific concepts).
  2. Conduct systematic observations, (Write procedures that are clear and replicable. Identify observables and examine relationships between test (independent) variable and outcome (dependent) variable. Employ appropriate methods for accurate and consistent observations; conduct and record measurements at appropriate levels of precision. Follow safety guidelines).
  3. Examine books and other sources of information to see what is already known,
  4. Review what is known in light of empirical evidence, (Examine whether available empirical evidence can be interpreted in terms of existing knowledge and models, and if not, modify or develop new models).
  5. Plan investigations, (Design and evaluate a scientific investigation).
  6. Use tools to gather, analyze, and interpret data (this includes the use of measurement in metric and other systems, and also the generation and interpretation of graphical representations of data, including data tables and graphs), (Collect data or evidence in an organized way. Properly use instruments, equipment, and materials (e.g., scales, probeware, meter sticks, microscopes, computers) including set-up, calibration, technique, maintenance, and storage).
  7. Pose answers, explanations, or descriptions of events,
  8. Generate explanations that explicate or describe natural phenomena (inferences),
  9. Use appropriate evidence and reasoning to justify these explanations to others,
  10. Communicate results of scientific investigations, and
  11. Evaluate the merits of the explanations produced by others.

**SC.912.N.1.2:**

- Describe and explain what characterizes science and its methods.

**SC.912.N.1.3:**

- Recognize that the strength or usefulness of a scientific claim is evaluated through scientific argumentation, which depends on critical and logical thinking, and the active consideration of alternative scientific explanations to explain the data presented.

**SC.912.N.1.4:**

- Identify sources of information and assess their reliability according to the strict standards of scientific investigation.

**SC.912.N.1.5:**

- Describe and provide examples of how similar investigations conducted in many parts of the world result in the same outcome.

**SC.912.N.1.6:**

- Describe how scientific inferences are drawn from scientific observations and provide examples from the content being studied.

**SC.912.N.2.1:**

- Identify what is science, what clearly is not science, and what superficially resembles science (but fails to meet the criteria for science).

**SC.912.N.2.2:**

- Explain that scientific knowledge is both durable and robust and open to change. Scientific knowledge can change because it is often examined and...
SC.912.N.2.4: re-examined by new investigations and scientific argumentation. Because of these frequent examinations, scientific knowledge becomes stronger, leading to its durability.

SC.912.N.3.1: Explain that a scientific theory is the culmination of many scientific investigations drawing together all the current evidence concerning a substantial range of phenomena; thus, a scientific theory represents the most powerful explanation scientists have to offer.

SC.912.N.3.5: Describe the function of models in science, and identify the wide range of models used in science.

SC.912.N.4.1: Explain how scientific knowledge and reasoning provide an empirically-based perspective to inform society's decision making.

SC.912.P.10.1: Differentiate among the various forms of energy and recognize that they can be transformed from one form to others.

SC.912.P.10.2: Explore the Law of Conservation of Energy by differentiating among open, closed, and isolated systems and explain that the total energy in an isolated system is a conserved quantity.

LAFS.1112.RST.1.1: Cite specific textual evidence to support analysis of science and technical texts, attending to important distinctions the author makes and to any gaps or inconsistencies in the account.

LAFS.1112.RST.1.2: Determine the central ideas or conclusions of a text; summarize complex processes, or information presented in a text by paraphrasing them in simpler but still accurate terms.

LAFS.1112.RST.1.3: Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks; analyze the specific results based on explanations in the text.

LAFS.1112.RST.2.4: Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 11–12 texts and topics.

LAFS.1112.RST.2.5: Analyze how the text structures information or ideas into categories or hierarchies, demonstrating understanding of the information or ideas.

LAFS.1112.RST.2.6: Analyze the author's purpose in providing an explanation, describing a procedure, or discussing an experiment in a text, identifying important issues that remain unresolved.

LAFS.1112.RST.3.7: Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g., quantitative data, video, multimedia) in order to address a question or solve a problem.

LAFS.1112.RST.3.8: Evaluate the hypotheses, data, analysis, and conclusions in a science or technical text, verifying the data when possible and corroborating or challenging conclusions with other sources of information.

LAFS.1112.RST.3.9: Synthesize information from a variety of sources (e.g., texts, experiments, simulations) into a coherent understanding of a process, phenomenon, or concept, resolving conflicting information when possible.

LAFS.1112.RST.4.10: By the end of grade 12, read and comprehend science/technical texts in the grades 11–12 text complexity band independently and proficiently initiate and participate effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grades 11–12 topics, texts, and issues, building on others' ideas and expressing their own clearly and persuasively.

LAFS.1112.SL.1.1: a. Come to discussions prepared, having read and researched material under study; explicitly draw on that preparation by referring to evidence from texts and other research on the topic or issue to stimulate a thoughtful, well-reasoned exchange of ideas.

b. Work with peers to promote civil, democratic discussions and decision-making, set clear goals and deadlines, and establish individual roles as needed.

c. Propose conversations by posing and responding to questions that probe reasoning and evidence; ensure a hearing for a full range of positions on a topic or issue; clarify, verify, or challenge ideas and conclusions; and promote divergent and creative perspectives.

d. Respond thoughtfully to diverse perspectives; synthesize comments, claims, and evidence made on all sides of an issue; resolve contradictions when possible; and determine what additional information or research is required to deepen the investigation or complete the task.

LAFS.1112.SL.1.2: Integrate multiple sources of information presented in diverse formats and media (e.g., visually, quantitatively, orally) in order to make informed decisions and solve problems, evaluating the credibility and accuracy of each source and noting any discrepancies among the data.

LAFS.1112.SL.1.3: Evaluate a speaker's point of view, reasoning, and use of evidence and rhetoric; assessing the stance, premises, links among ideas, word choice, points of emphasis, and tone used.

LAFS.1112.SL.2.4: Present information, findings, and supporting evidence, conveying a clear and distinct perspective, such that listeners can follow the line of reasoning, alternative or opposing perspectives are addressed, and the organization, development, substance, and style are appropriate to purpose, audience, and a range of formal and informal tasks.

LAFS.1112.SL.2.5: Make strategic use of digital media (e.g., textual, graphical, audio, visual, and interactive elements) in presentations to enhance understanding of findings, reasoning, and evidence and to add interest.

LAFS.1112.WHST.1.1: Write arguments focused on discipline-specific content.

a. Introduce precise, knowledgeable claim(s), establish the significance of the claim(s), distinguish the claim(s) from alternate or opposing claims, and create an organization that logically sequences the claim(s), counterclaims, reasons, and evidence.

b. Develop claim(s) and counterclaims fairly and thoroughly, supplying the most relevant data and evidence for each while pointing out the strengths and limitations of both claim(s) and counterclaims in a discipline-appropriate form that anticipates the audience's knowledge level, concerns, values, and possible biases.

c. Use words, phrases, and clauses as well as varied syntax to link the major sections of the text, create cohesion, and clarify the relationships between claim(s) and reasons, between reasons and evidence, and between claim(s) and counterclaims.

d. Establish and maintain a formal style and objective tone while attending to the norms and conventions of the discipline in which they are writing.

e. Provide a concluding statement or section that follows from or supports the argument presented.

LAFS.1112.WHST.1.2: Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes.

a. Introduce a topic and organize complex ideas, concepts, and information so that each new element builds on that which precedes it to create a unified whole; include formatting (e.g., headings), graphics (e.g., figures, tables), and multimedia when useful to aiding comprehension.

b. Develop the topic thoroughly by selecting the most significant and relevant facts, extended definitions, concrete details, quotations, or other information and examples appropriate to the audience's knowledge of the topic.

c. Use varied transitions and sentence structures to link the major sections of the text, create cohesion, and clarify the relationships among complex ideas and concepts.

d. Use precise language, domain-specific vocabulary and techniques such as metaphor, simile, and analogy to manage the complexity of the topic; convey a knowledgeable stance in a style that responds to the discipline and context as well as to the expertise of likely readers.

e. Provide a concluding statement or section that follows from and supports the information or explanation provided (e.g., articulating implications or the significance of the topic).

LAFS.1112.WHST.2.4: Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.

LAFS.1112.WHST.2.5: Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience.
LAFS.1112.WHST.2.6: Use technology, including the Internet, to produce, publish, and update individual or shared writing products in response to ongoing feedback, including new arguments or information.

LAFS.1112.WHST.3.7: Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation.

LAFS.1112.WHST.3.8: Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the strengths and limitations of each source in terms of the specific task, purpose, and audience; integrate information into the text selectively to maintain the flow of ideas within an argument, explaining any gaps or differences in meaning or purpose.

LAFS.1112.WHST.3.9: Draw evidence from informational texts to support analysis, reflection, and research.

LAFS.1112.WHST.4.10: Write routinely over extended time frames (time for reflection and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences.

MAFS.912.F-IF.2.4: For a function that models a relationship between two quantities, interpret key features of graphs and tables in terms of the quantities, and sketch graphs showing key features given a verbal description of the relationship. Key features include: intercepts; intervals where the function is increasing, decreasing, positive, or negative; relative maximums and minimums; symmetries; end behavior; and periodicity. ★

Clariﬁcations: Represent data with plots on the real number line (dot plots, histograms, and box plots). ★

MAFS.912.S-ID.1.1: Use statistics appropriate to the shape of the data distribution to compare center (median, mean) and spread (interquartile range, standard deviation) of two or more different data sets. ★

Clariﬁcations: In grades 6 – 8, students describe center and spread in a data distribution. Here they choose a summary statistic appropriate to the characteristics of the data distribution, such as the shape of the distribution or the existence of extreme data points.

MAFS.912.S-ID.1.2: Interpret differences in shape, center, and spread in the context of the data sets, accounting for possible effects of extreme data points (outliers). ★

Clariﬁcations: In grades 6 – 8, students describe center and spread in a data distribution. Here they choose a summary statistic appropriate to the characteristics of the data distribution, such as the shape of the distribution or the existence of extreme data points.

MAFS.912.S-ID.1.3: Summarize categorical data for two categories in two-way frequency tables. Interpret relative frequencies in the context of the data (including joint, marginal, and conditional relative frequencies). Recognize possible associations and trends in the data. ★

MAFS.912.S-ID.2.5: Make sense of problems and persevere in solving them.

Mathematically proficient students start by explaining to themselves the meaning of a problem and looking for entry points to its solution. They analyze givens, constraints, relationships, and goals. They make conjectures about the form and meaning of the solution and plan a solution pathway rather than simply jumping into a solution attempt. They consider analogous problems, and try special cases and simpler forms of the original problem in order to gain insight into its solution. They monitor and evaluate their progress and change course if necessary. Older students might rely on using concrete objects or pictures to help conceptualize and solve a problem. Mathematically proficient students check their answers to problems using different methods, and they continually ask themselves, “Does this make sense?” They can understand the approaches of others to solving complex problems and identify correspondences between different approaches.

Clariﬁcations: Reason abstractly and quantitatively.

Mathematically proficient students make sense of quantities and their relationships in problem situations. They bring two complementary abilities to bear on problems involving quantitative relationships: the ability to decontextualize—to abstract a given situation and represent it symbolically and manipulate the representing symbols as if they have a life of their own, without necessarily attending to their referents—and the ability to contextualize, to pause as needed during the manipulation process in order to probe into the referents for the symbols involved. Quantitative reasoning entails habits of creating a coherent representation of the problem at hand; considering the units involved; attending to the meaning of quantities, not just how to compute them; and knowing and flexibly using different properties of operations and objects.

MAFS.912.XMP.1.1: Construct viable arguments and critique the reasoning of others.

Mathematically proficient students understand and use stated assumptions, definitions, and previously established results in constructing arguments. They make conjectures and build a logical progression of statements to explore the truth of their conjectures. They are able to analyze situations by breaking them into cases, and can recognize and use counterexamples. They justify their conclusions, communicate them to others, and respond to the arguments of others. They reason inductively about data, making plausible arguments that take into account the context from which the data arose. Mathematically proficient students are also able to compare the effectiveness of two plausible arguments, distinguish correct logic or reasoning from that which is flawed, and—if there is a flaw in an argument—explain what it is. Elementary students can construct arguments using concrete referents such as objects, drawings, diagrams, and actions. Such arguments can make sense and be correct, even though they are not generalized or made formal until later grades. Later, students learn to determine domains to which an argument applies. Students at all grades can listen or read the arguments of others, decide whether they make sense, and ask useful questions to clarify or improve the arguments.

MAFS.912.XMP.3.1: Model with mathematics.

Mathematically proficient students can apply the mathematics they know to solve problems arising in everyday life, society, and the workplace. In early grades, this might be as simple as writing an addition equation to describe a situation. In middle grades, a student might apply proportional reasoning to plan a school event or analyze a problem in the community. By high school, a student might use geometry to solve a design problem or use a function to describe how one quantity of interest depends on another. Mathematically proficient students who can apply what they know are comfortable making assumptions and approximations to simplify a complicated situation, realizing that these may need revision later. They are able to identify important quantities in a practical situation and map their relationships using such tools as diagrams, two-way tables, graphs, flowcharts and formulas. They can analyze those relationships mathematically to draw conclusions. They routinely interpret their mathematical results in the context of the situation and reflect on whether the results make sense, possibly improving the model if it has not served its purpose.
**Standard Relation to Course: Supporting**

Use appropriate tools strategically.

MAFS.K12.MP.5.1:

Mathematically proficient students consider the available tools when solving a mathematical problem. These tools might include pencil and paper, concrete models, a ruler, a protractor, a calculator, a spreadsheet, a computer algebra system, a statistical package, or dynamic geometry software. Proficient students are sufficiently familiar with tools appropriate for their grade or course to make sound decisions about when each of these tools might be helpful, recognizing both the insight to be gained and their limitations. For example, mathematically proficient high school students analyze graphs of functions and solutions generated using a graphing calculator. They detect possible errors by strategically using estimation and other mathematical knowledge. When making mathematical models, they know that technology can enable them to visualize the results of varying assumptions, explore consequences, and compare predictions with data. Mathematically proficient students at various grade levels are able to identify relevant external mathematical resources, such as digital content located on a website, and use them to pose or solve problems. They are able to use technological tools to explore and deepen their understanding of concepts.

**Standard Relation to Course: Supporting**

Attend to precision.

MAFS.K12.MP.6.1:

Mathematically proficient students try to communicate precisely to others. They try to use clear definitions in discussion with others and in their own reasoning. They state the meaning of the symbols they choose, including using the equal sign consistently and appropriately. They are careful about specifying units of measure, and labeling axes to clarify the correspondence with quantities in a problem. They calculate accurately and efficiently, express numerical answers with a degree of precision appropriate for the problem context. In the elementary grades, students give carefully formulated explanations to each other. By the time they reach high school they have learned to examine claims and make explicit use of definitions.

**Standard Relation to Course: Supporting**

Look for and make use of structure.

MAFS.K12.MP.7.1:

Mathematically proficient students look closely to discern a pattern or structure. Young students, for example, might notice that three and seven more is the same amount as seven and three more, or they may sort a collection of shapes according to how many sides the shapes have. Later, students will see 7 + 8 equals the well remembered 7 + 5 + 3, in preparation for learning about the distributive property. In the expression x² + 9x + 14, older students can see the 14 as 2 × 7 and the 9 as 2 + 7. They recognize the significance of an existing line in a geometric figure and can use the strategy of drawing an auxiliary line for solving problems. They also can step back for an overview and shift perspective. They can see complicated things, such as some algebraic expressions, as single objects or as being composed of several objects. For example, they can see 5 – 3(x – y)² as 5 minus a positive number times a square and use that to realize that its value cannot be more than 5 for any real numbers x and y.

**Standard Relation to Course: Supporting**

Look for and express regularity in repeated reasoning.

MAFS.K12.MP.8.1:

Mathematically proficient students notice when calculations are repeated, and look both for general methods and for shortcuts. Upper elementary students might notice when dividing 25 by 11 that they are repeating the same calculations over and over again, and conclude they have a repeating decimal. By paying attention to the calculation of slope as they repeatedly check whether points are on the line through (1, 2) with slope 3, middle school students might abstract the equation y – 2)/(x – 1) = 3. Noticing the regularity in the way terms cancel when expanding the expression x² + (x – 1)(x + 1), (x – 1)(x² + x + 1), and (x – 1)(x² + x + 1) might lead them to the general formula for the sum of a geometric series. As they work to solve a problem, mathematically proficient students maintain oversight of the process, while attending to the details. They continually evaluate the reasonableness of their intermediate results.

**Standard Relation to Course: Supporting**

ELD.K12.ELL.SC.1:

English language learners communicate information, ideas and concepts necessary for academic success in the content area of Science.

ELD.K12.ELL.SI.1:

English language learners communicate for social and instructional purposes within the school setting.

HE.912.C.1.3:

Evaluate how environment and personal health are interrelated.

**Clarifications:**

Food options within a community; prenatal-care services; availability of recreational facilities; air quality; weather-safety awareness; and weather, air, and water conditions.

HE.912.C.1.7:

Analyze how heredity and family history can impact personal health.

**Clarifications:**

Drug use, family obesity, heart disease, mental health, and non-communicable illness or disease.

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**GENERAL NOTES**

Laboratory investigations that include the use of scientific inquiry, research, measurement, problem solving, laboratory apparatus and technologies, experimental procedures, and safety procedures are an integral part of this course. The National Science Teachers Association (NSTA) recommends that at the high school level, all students should be in the science lab or field, collecting data every week. School laboratory investigations (labs) are defined by the National Research Council (NRC) as an experience in the laboratory, classroom, or the field that provides students with opportunities to interact directly with natural phenomena or with data collected by others using tools, materials, data collection techniques, and models (NRC, 2006, p. 3). Laboratory investigations in the high school classroom should help all students develop a growing understanding of the complexity and ambiguity of empirical work, as well as the skills to calibrate and troubleshoot equipment used to make observations. Learners should understand measurement error; and have the skills to aggregate, interpret, and present the resulting data (National Research Council, 2006, p. 77; NSTA, 2007).

**Special Notes:**

**Instructional Practices**

Teaching from a range of complex text is optimized when teachers in all subject areas implement the following strategies on a routine basis:

1. Ensuring wide reading from complex text that varies in length.
2. Making close reading and rereading of texts central to lessons.
3. Emphasizing text-specific complex questions, and cognitively complex tasks, reinforce focus on the text and cultivate independence.
4. Emphasizing students supporting answers based upon evidence from the text.

- Asking questions (for science) and defining problems (for engineering).
- Developing and using models.
- Planning and carrying out investigations.
- Analyzing and interpreting data.
- Using mathematics, information and computer technology, and computational thinking.
- Constructing explanations (for science) and designing solutions (for engineering).
- Engaging in argument from evidence.
- Obtaining, evaluating, and communicating information.

English Language Development ELD Standards Special Notes Section:
Teachers are required to provide listening, speaking, reading and writing instruction that allows English language learners (ELL) to communicate information, ideas and concepts for academic success in the content area of Science. For the given level of English language proficiency and with visual, graphic, or interactive support, students will interact with grade level words, expressions, sentences and discourse to process or produce language necessary for academic success. The ELD standard should specify a relevant content area concept or topic of study chosen by curriculum developers and teachers which maximizes an ELL's need for communication and social skills. To access an ELL supporting document which delineates performance definitions and descriptors, please click on the following link:
https://cpalmsmediaprod.blob.core.windows.net/uploads/docs/standards/eld/sc.pdf

Additional Instructional Resources:
A.V.E for Success Collection is provided by the Florida Association of School Administrators: http://www.fasa.net/4DCGI/cms/review.html?
Action=CMS_Document&DocID=139. Please be aware that these resources have not been reviewed by CPALMS and there may be a charge for the use of some of them in this collection.

GENERAL INFORMATION

Course Number: 2001340
Course Path: Section: Grades PreK to 12 Education Courses > Grade Group: Grades 9 to 12 and Adult Education Courses > Subject: Science > SubSubject: Environmental Science
Abbreviated Title: ENV SCI
Course Length: Year (Y)
Course Level: 2
Graduation Requirement: Equally Rigorous Science

Educator Certifications

| Science (Secondary Grades 7-12) |
| Biology (Grades 6-12) |
| Chemistry (Grades 6-12) |
| Earth/Space Science (Grades 6-12) |
| Middle Grades General Science (Middle Grades 5-9) |
**Course Standards**

<table>
<thead>
<tr>
<th>Name</th>
<th>Description</th>
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<tbody>
<tr>
<td>SC.912.E.6.6:</td>
<td>Analyze past, present, and potential future consequences to the environment resulting from various energy production technologies.</td>
</tr>
<tr>
<td>SC.912.E.7.7:</td>
<td>Identify, analyze, and relate the internal (Earth system) and external (astronomical) conditions that contribute to global climate change.</td>
</tr>
<tr>
<td>SC.912.E.7.8:</td>
<td>Explain how various atmospheric, oceanic, and hydrologic conditions in Florida have influenced and can influence human behavior, both individually and collectively.</td>
</tr>
<tr>
<td>SC.912.E.7.9:</td>
<td>Cite evidence that the ocean has had a significant influence on climate change by absorbing, storing, and moving heat, carbon, and water.</td>
</tr>
<tr>
<td>SC.912.L.14.6:</td>
<td>Explain the significance of genetic factors, environmental factors, and pathogenic agents to health from the perspectives of both individual and public health.</td>
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<tr>
<td>SC.912.L.15.3:</td>
<td>Describe how biological diversity is increased by the origin of new species and how it is decreased by the natural process of extinction.</td>
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<tr>
<td>SC.912.L.15.13:</td>
<td>Describe the conditions required for natural selection, including: overproduction of offspring, inherited variation, and the struggle to survive, which result in differential reproductive success.</td>
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<tr>
<td>SC.912.L.16.10:</td>
<td>Evaluate the impact of biotechnology on the individual, society and the environment, including medical and ethical issues.</td>
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<tr>
<td>SC.912.L.17.1:</td>
<td>Discuss the characteristics of populations, such as number of individuals, age structure, density, and pattern of distribution.</td>
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<tr>
<td>SC.912.L.17.4:</td>
<td>Describe changes in ecosystems resulting from seasonal variations, climate change and succession.</td>
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<td>SC.912.L.17.5:</td>
<td>Analyze how population size is determined by births, deaths, immigration, emigration, and limiting factors (biotic and abiotic) that determine carrying capacity.</td>
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<tr>
<td>SC.912.L.17.6:</td>
<td>Compare and contrast the relationships among organisms, including predation, parasitism, competition, commensalism, and mutualism.</td>
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<tr>
<td>SC.912.L.17.7:</td>
<td>Characterize the biotic and abiotic components that define freshwater systems, marine systems and terrestrial systems.</td>
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<tr>
<td>SC.912.L.17.8:</td>
<td>Recognize the consequences of the losses of biodiversity due to catastrophic events, climate changes, human activity, and the introduction of invasive, non-native species.</td>
</tr>
<tr>
<td>SC.912.L.17.9:</td>
<td>Use a food web to identify and distinguish producers, consumers, and decomposers. Explain the pathway of energy transfer through trophic levels and the reduction of available energy at successive trophic levels.</td>
</tr>
<tr>
<td>SC.912.L.17.10:</td>
<td>Diagram and explain the biogeochemical cycles of an ecosystem, including water, carbon, and nitrogen cycle.</td>
</tr>
<tr>
<td>SC.912.L.17.11:</td>
<td>Evaluate the costs and benefits of renewable and nonrenewable resources, such as water, energy, fossil fuels, wildlife, and forests.</td>
</tr>
<tr>
<td>SC.912.L.17.12:</td>
<td>Discuss the political, social, and environmental consequences of sustainable use of land.</td>
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<tr>
<td>SC.912.L.17.13:</td>
<td>Discuss the need for adequate monitoring of environmental parameters when making policy decisions.</td>
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<tr>
<td>SC.912.L.17.14:</td>
<td>Assess the need for adequate waste management strategies.</td>
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<tr>
<td>SC.912.L.17.15:</td>
<td>Discuss the effects of technology on environmental quality.</td>
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<tr>
<td>SC.912.L.17.16:</td>
<td>Discuss the large-scale environmental impacts resulting from human activity, including waste spills, oil spills, runoff, greenhouse gases, ozone depletion, and surface and groundwater pollution.</td>
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<tr>
<td>SC.912.L.17.18:</td>
<td>Describe how human population size and resource use relate to environmental quality.</td>
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<tr>
<td>SC.912.L.17.19:</td>
<td>Describe how different natural resources are produced and how their rates of use and renewal limit availability.</td>
</tr>
<tr>
<td>SC.912.L.17.20:</td>
<td>Predict the impact of individuals on environmental systems and examine how human lifestyles affect sustainability.</td>
</tr>
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</table>

**SC.912.N.1.1:**

- Define a problem based on a specific body of knowledge, for example: biology, chemistry, physics, and earth/space science, and do the following:
  1. Pose questions about the natural world. (Articulate the purpose of the investigation and identify the relevant scientific concepts).
  2. Conduct systematic observations. (Write procedures that are clear and replicable. Identify observables and examine relationships between test (independent) variable and outcome (dependent) variable. Employ appropriate methods for accurate and consistent observations; conduct and record measurements at appropriate levels of precision. Follow safety guidelines).
  3. Examine books and other sources of information to see what is already known.
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  7. Pose answers, explanations, or descriptions of events,
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- Describe and explain what characterizes science and its methods.

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- Recognize that the strength or usefulness of a scientific claim is evaluated through scientific argumentation, which depends on critical and logical thinking, and the active consideration of alternative scientific explanations to explain the data presented.

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- Describe and provide examples of how similar investigations conducted in many parts of the world result in the same outcome.

**SC.912.N.1.6:**

- Describe how scientific inferences are drawn from scientific observations and provide examples from the content being studied.

**SC.912.N.2.1:**

- Identify what is science, what clearly is not science, and what superficially resembles science (but fails to meet the criteria for science).

**SC.912.N.2.2:**

- Identify which questions can be answered through science and which questions are outside the boundaries of scientific investigation, such as questions addressed by other ways of knowing, such as art, philosophy, and religion.

**Environmental Science (#2001340) 2022 - And Beyond**

- Evaluate the impact of biotechnology on the individual, society and the environment, including medical and ethical issues.
- Identify sources of information and assess their reliability according to the strict standards of scientific investigation.
- Describe and provide examples of how similar investigations conducted in many parts of the world result in the same outcome.
- Discuss the large-scale environmental impacts resulting from human activity, including waste spills, oil spills, runoff, greenhouse gases, ozone depletion, and surface and groundwater pollution.
- Describe how different natural resources are produced and how their rates of use and renewal limit availability.
- Assess the need for adequate waste management strategies.
Differentiate among the various forms of energy and recognize that they can be transformed from one form to others.

Explore the Law of Conservation of Energy by differentiating among open, closed, and isolated systems and explain that the total energy in an isolated system is a conserved quantity.

Mathematicians who participate in effortful learning both individually and with others:
- Analyze the problem in a way that makes sense given the task.
- Ask questions that will help with solving the task.
- Build perseverance by modifying methods as needed while solving a challenging task.
- Stay engaged and maintain a positive mindset when working to solve tasks.
- Help and support each other when attempting a new method or approach.

Mathematicians who use patterns and structure to help understand and connect mathematical concepts:
- Use patterns and structure to help understand and connect mathematical concepts.

Mathematicians who engage in discussions that reflect on the mathematical thinking of self and others:
- Clarifications:
  - Help students make connections between concepts and representations.
  - Provide opportunities for students to use manipulatives when investigating concepts.
  - Guide students from concrete to pictorial to abstract representations as understanding progresses.
  - Show students that various representations can have different purposes and can be useful in different situations.

Mathematicians who demonstrate understanding by representing problems in multiple ways:
- Build understanding through modeling and using manipulatives.
- Represent solutions to problems in multiple ways using objects, drawings, tables, graphs and equations.
- Progress from modeling problems with objects and drawings to using algorithms and equations.
- Express connections between concepts and representations.
- Choose a representation based on the given context or purpose.

Mathematicians who complete tasks with mathematical fluency:
- Select efficient and appropriate methods for solving problems within the given context.
- Maintain flexibility and accuracy while performing procedures and mental calculations.
- Complete tasks accurately and with confidence.
- Adapt procedures to apply them to a new context.
- Use feedback to improve efficiency when performing calculations.

Mathematicians who engage in discussions that reflect on the mathematical thinking of self and others:
- Clarifications:
  - Establish a culture in which students ask questions of the teacher and their peers, and error is an opportunity for learning.
  - Create opportunities for students to discuss their thinking with peers.
  - Select, sequence and present student work to advance and deepen understanding of correct and increasingly efficient methods.
  - Develop students’ ability to justify methods and compare their responses to the responses of their peers.

Mathematicians who use patterns and structure to help understand and connect mathematical concepts:
- Focus on relevant details within a problem.
- Create plans and procedures to logically order events, steps or ideas to solve problems.
- Decompose a complex problem into manageable parts.
- Relate previously learned concepts to new concepts.
<table>
<thead>
<tr>
<th>ELA.K12.EE.1.1:</th>
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</thead>
<tbody>
<tr>
<td><strong>Clarifications:</strong></td>
</tr>
<tr>
<td>Teachers who encourage students to apply mathematics to real-world contexts:</td>
</tr>
<tr>
<td>- Provide opportunities for students to create models, both concrete and abstract, and perform investigations.</td>
</tr>
<tr>
<td>- Challenge students to question the accuracy of their models and methods.</td>
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<tr>
<td>- Support students as they validate conclusions by comparing them to the given situation.</td>
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<tr>
<td>- Indicate how various concepts can be applied to other disciplines.</td>
</tr>
<tr>
<td><strong>K-1 Students include textual evidence in their oral communication with guidance and support from adults. The evidence can consist of details from the text without naming the text. During 1st grade, students learn how to incorporate the evidence in their writing.</strong></td>
</tr>
<tr>
<td><strong>2-3 Students include relevant textual evidence in their written and oral communication. Students should name the text when they refer to it. In 3rd grade, students should use a combination of direct and indirect citations.</strong></td>
</tr>
<tr>
<td><strong>4-5 Students continue with previous skills and reference comments made by speakers and peers. Students cite texts that they've directly quoted, paraphrased, or used for information. When writing, students will use the form of citation dictated by the instructor or the style guide referenced by the instructor.</strong></td>
</tr>
<tr>
<td><strong>6-8 Students continue with previous skills and use a style guide to create a proper citation.</strong></td>
</tr>
<tr>
<td><strong>9-12 Students continue with previous skills and should be aware of existing style guides and the ways in which they differ.</strong></td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>ELA.K12.EE.2.1:</th>
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<tbody>
<tr>
<td><strong>Clarifications:</strong></td>
</tr>
<tr>
<td>See Text Complexity for grade-level complexity bands and a text complexity rubric.</td>
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</tbody>
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<tr>
<th>ELA.K12.EE.3.1:</th>
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<tbody>
<tr>
<td><strong>Clarifications:</strong></td>
</tr>
<tr>
<td>Students will make inferences before the words infer or inference are introduced. Kindergarten students will answer questions like &quot;Why is the girl smiling?&quot; or make predictions about what will happen based on the title page. Students will use the terms and apply them in 2nd grade and beyond.</td>
</tr>
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<tr>
<th>ELA.K12.EE.4.1:</th>
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<tbody>
<tr>
<td><strong>Clarifications:</strong></td>
</tr>
<tr>
<td>In grades 1-2, students build upon these skills by justifying what they are thinking. For example: &quot;I think ______ because ______.&quot; The collaborative conversations are becoming academic conversations.</td>
</tr>
<tr>
<td>In grades 3-12, students engage in academic conversations discussing claims and justifying their reasoning, refining and applying skills. Students build on ideas, propel the conversation, and support claims and counterclaims with evidence.</td>
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<tr>
<th>ELA.K12.EE.5.1:</th>
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<tbody>
<tr>
<td><strong>Clarifications:</strong></td>
</tr>
<tr>
<td>Students will incorporate skills learned into work products to produce quality work. For students to incorporate these skills appropriately, they must receive instruction. A 3rd grade student creating a poster board display must have instruction in how to effectively present information to do quality work.</td>
</tr>
</tbody>
</table>
General Course Information and Notes

**GENERAL NOTES**

Laboratory investigations that include the use of scientific inquiry, research, measurement, problem solving, laboratory apparatus and technologies, experimental procedures, and safety procedures are an integral part of this course. The National Science Teachers Association (NSTA) recommends that at the high school level, all students should be in the science lab or field, collecting data every week. School laboratory investigations (labs) are defined by the National Research Council (NRC) as an experience in the laboratory, classroom, or the field that provides students with opportunities to interact directly with natural phenomena or with data collected by others using tools, materials, data collection techniques, and models (NRC, 2006, p. 3). Laboratory investigations in the high school classroom should help all students develop a growing understanding of the complexity and ambiguity of empirical work, as well as the skills to calibrate and troubleshoot equipment used to make observations. Learners should understand measurement error; and have the skills to aggregate, interpret, and present the resulting data (National Research Council, 2006, p.77; NSTA, 2007).

**Special Notes:**

**Instructional Practices**

Teaching from a range of complex text is optimized when teachers in all subject areas implement the following strategies on a routine basis:

1. Ensuring wide reading from complex text that varies in length.
2. Making close reading and rereading of texts central to lessons.
3. Emphasizing text-specific complex questions, and cognitively complex tasks, reinforce focus on the text and cultivate independence.
4. Emphasizing students supporting answers based upon evidence from the text.
5. Providing extensive research and writing opportunities (claims and evidence).

**Science and Engineering Practices (NRC Framework for K-12 Science Education, 2010)**

- Asking questions (for science) and defining problems (for engineering).
- Developing and using models.
- Planning and carrying out investigations.
- Analyzing and interpreting data.
- Using mathematics, information and computer technology, and computational thinking.
- Constructing explanations (for science) and designing solutions (for engineering).
- Engaging in argument from evidence.
- Obtaining, evaluating, and communicating information.

**Florida's Benchmarks for Excellent Student Thinking (B.E.S.T.) Standards**

This course includes Florida’s B.E.S.T. ELA Expectations (EE) and Mathematical Thinking and Reasoning Standards (MTRs) for students. Florida educators should intentionally embed these standards within the content and their instruction as applicable. For guidance on the implementation of the EEs and MTRs, please visit https://www.cpalms.org/Standards/BEST_Standards.aspx and select the appropriate B.E.S.T. Standards package.

**English Language Development ELD Standards Special Notes Section:**

Teachers are required to provide listening, speaking, reading and writing instruction that allows English language learners (ELL) to communicate information, ideas and concepts for academic success in the content area of Science. For the given level of English language proficiency and with visual, graphic, or interactive support, students will interact with grade level words, expressions, sentences and discourse to process or produce language necessary for academic success. The ELD standard should specify a relevant content area concept or topic of study chosen by curriculum developers and teachers which maximizes an ELL’s need for communication and social skills. To access an ELL supporting document which delineates performance definitions and descriptors, please click on the following link: https://cpalmsmediaprod.blob.core.windows.net/uploads/docs/standards/eld/sc.pdf

**Additional Instructional Resources:**

A.V.E. for Success Collection is provided by the Florida Association of School Administrators: http://www.fasa.net/4DCGI/cms/review.html?

Action=IMS_Document&DocID=339. Please be aware that these resources have not been reviewed by CPALMS and there may be a charge for the use of some of them in this collection.

**GENERAL INFORMATION**

**Course Path: Section:** Grades PreK to 12 Education
Course Number: 2001340

Number of Credits: One (1) credit
Course Type: Core Academic Course
Course Status: State Board Approved
Grade Level(s): 9,10,11,12
Graduation Requirement: Equally Rigorous Science

Educator Certifications

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<tr>
<th>Subject</th>
<th>SubSubject</th>
<th>Grade Group</th>
<th>Courses</th>
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<tbody>
<tr>
<td>Science</td>
<td></td>
<td>Grades 9 to 12 and Adult</td>
<td>Grades 7-12</td>
</tr>
<tr>
<td>Biology</td>
<td></td>
<td></td>
<td>Biology (Grades 6-12)</td>
</tr>
<tr>
<td>Chemistry</td>
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<td>Chemistry (Grades 6-12)</td>
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<tr>
<td>Earth/Space Science</td>
<td></td>
<td></td>
<td>Earth/Space Science (Grades 6-12)</td>
</tr>
<tr>
<td>Middle Grades General Science</td>
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<td>Middle Grades General Science (Middle Grades 5-9)</td>
</tr>
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</table>
Course Standards

<table>
<thead>
<tr>
<th>Name</th>
<th>Description</th>
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<tbody>
<tr>
<td>SC.912.E.6.6:</td>
<td>Analyze past, present, and potential future consequences to the environment resulting from various energy production technologies.</td>
</tr>
<tr>
<td>SC.912.E.7.4:</td>
<td>Summarize the conditions that contribute to the climate of a geographic area, including the relationships to lakes and oceans.</td>
</tr>
<tr>
<td>SC.912.E.7.7:</td>
<td>Identify, analyze, and relate the internal (Earth system) and external (astronomical) conditions that contribute to global climate change.</td>
</tr>
<tr>
<td>SC.912.E.7.8:</td>
<td>Explain how various atmospheric, oceanic, and hydrologic conditions in Florida have influenced and can influence human behavior, both individually and collectively.</td>
</tr>
<tr>
<td>SC.912.E.7.9:</td>
<td>Cite evidence that the ocean has had a significant influence on climate change by absorbing, storing, and moving heat, carbon, and water.</td>
</tr>
<tr>
<td>SC.912.L.14.6:</td>
<td>Explain the significance of genetic factors, environmental factors, and pathogenic agents to health from the perspectives of both individual and public health.</td>
</tr>
<tr>
<td>SC.912.L.15.3:</td>
<td>Describe how biological diversity is increased by the origin of new species and how it is decreased by the natural process of extinction.</td>
</tr>
<tr>
<td>SC.912.L.15.13:</td>
<td>Describe the conditions required for natural selection, including: overproduction of offspring, inherited variation, and the struggle to survive, which result in differential reproductive success.</td>
</tr>
<tr>
<td>SC.912.L.16.10:</td>
<td>Evaluate the impact of biotechnology on the individual, society and the environment, including medical and ethical issues.</td>
</tr>
<tr>
<td>SC.912.L.17.1:</td>
<td>Discuss the characteristics of populations, such as number of individuals, age structure, density, and pattern of distribution.</td>
</tr>
<tr>
<td>SC.912.L.17.4:</td>
<td>Describe changes in ecosystems resulting from seasonal variations, climate change and succession.</td>
</tr>
<tr>
<td>SC.912.L.17.5:</td>
<td>Analyze how population size is determined by births, deaths, immigration, emigration, and limiting factors (biotic and abiotic) that determine carrying capacity.</td>
</tr>
<tr>
<td>SC.912.L.17.6:</td>
<td>Compare and contrast the relationships among organisms, including predation, parasitism, competition, commensalism, and mutualism.</td>
</tr>
<tr>
<td>SC.912.L.17.7:</td>
<td>Characterize the biotic and abiotic components that define freshwater systems, marine systems and terrestrial systems.</td>
</tr>
<tr>
<td>SC.912.L.17.8:</td>
<td>Recognize the consequences of the losses of biodiversity due to catastrophic events, climate changes, human activity, and the introduction of invasive, non-native species.</td>
</tr>
<tr>
<td>SC.912.L.17.9:</td>
<td>Use a food web to identify and distinguish producers, consumers, and decomposers. Explain the pathway of energy transfer through trophic levels and the reduction of available energy at successive trophic levels.</td>
</tr>
<tr>
<td>SC.912.L.17.10:</td>
<td>Diagram and explain the biogeochemical cycles of an ecosystem, including water, carbon, and nitrogen cycle.</td>
</tr>
<tr>
<td>SC.912.L.17.11:</td>
<td>Evaluate the costs and benefits of renewable and nonrenewable resources, such as water, energy, fossil fuels, wildlife, and forests.</td>
</tr>
<tr>
<td>SC.912.L.17.12:</td>
<td>Discuss the political, social, and environmental consequences of sustainable use of land.</td>
</tr>
<tr>
<td>SC.912.L.17.13:</td>
<td>Discuss the need for adequate monitoring of environmental parameters when making policy decisions.</td>
</tr>
<tr>
<td>SC.912.L.17.14:</td>
<td>Assess the need for adequate waste management strategies.</td>
</tr>
<tr>
<td>SC.912.L.17.15:</td>
<td>Discuss the effects of technology on environmental quality.</td>
</tr>
<tr>
<td>SC.912.L.17.16:</td>
<td>Discuss the large-scale environmental impacts resulting from human activity, including waste spills, oil spills, runoff, greenhouse gases, ozone depletion, and surface and groundwater pollution.</td>
</tr>
<tr>
<td>SC.912.L.17.17:</td>
<td>Assess the effectiveness of innovative methods of protecting the environment.</td>
</tr>
<tr>
<td>SC.912.L.17.18:</td>
<td>Describe how human population size and resource use relate to environmental quality.</td>
</tr>
<tr>
<td>SC.912.L.17.19:</td>
<td>Describe how different natural resources are produced and how their rates of use and renewal limit availability.</td>
</tr>
<tr>
<td>SC.912.L.17.20:</td>
<td>Predict the impact of individuals on environmental systems and examine how human lifestyles affect sustainability.</td>
</tr>
<tr>
<td>SC.912.L.18.12:</td>
<td>Discuss the special properties of water that contribute to Earth's suitability as an environment for life: cohesive behavior, ability to moderate temperature, expansion upon freezing, and versatility as a solvent.</td>
</tr>
</tbody>
</table>

SC.912.N.1.1: Define a problem based on a specific body of knowledge, for example: biology, chemistry, physics, and earth/space science, and do the following:

1. Pose questions about the natural world, (Articulate the purpose of the investigation and identify the relevant scientific concepts).
2. Conduct systematic observations, (Write procedures that are clear and replicable. Identify observables and examine relationships between test (independent) variable and outcome (dependent) variable. Employ appropriate methods for accurate and consistent observations; conduct and record measurements at appropriate levels of precision. Follow safety guidelines).
3. Examine books and other sources of information to see what is already known, 
4. Review what is known in light of empirical evidence, (Examine whether available empirical evidence can be interpreted in terms of existing knowledge and models, and if not, modify or develop new models).
5. Plan investigations, (Design and evaluate a scientific investigation).
6. Use tools to gather, analyze, and interpret data (this includes the use of measurement in metric and other systems, and also the generation and interpretation of graphical representations of data, including data tables and graphs), (Collect data or evidence in an organized way. Properly use instruments, equipment, and materials (e.g., scales, probeware, meter sticks, microscopes, computers) including set-up, calibration, technique, maintenance, and storage).
7. Pose answers, explanations, or descriptions of events, 
8. Generate explanations that explicate or describe natural phenomena (inferences),
9. Use appropriate evidence and reasoning to justify these explanations to others, 
10. Communicate results of scientific investigations, and 
11. Evaluate the merits of the explanations produced by others.

SC.912.N.1.2: Describe and explain what characterizes science and its methods.

SC.912.N.1.3: Recognize that the strength or usefulness of a scientific claim is evaluated through scientific argumentation, which depends on critical and logical thinking, and the active consideration of alternative scientific explanations to explain the data presented.

SC.912.N.1.4: Identify sources of information and assess their reliability according to the strict standards of scientific investigation.

SC.912.N.1.5: Describe and provide examples of how similar investigations conducted in many parts of the world result in the same outcome.

SC.912.N.1.6: Describe how scientific inferences are drawn from scientific observations and provide examples from the content being studied.
Identify what is science, what clearly is not science, and what superficially resembles science (but fails to meet the criteria for science).

Explain that scientific knowledge is both durable and robust and open to change. Scientific knowledge can change because it is often examined and re-examined by new investigations and scientific argumentation. Because of these frequent examinations, scientific knowledge becomes stronger, leading to its durability.

SC.912.N.2.1: Identify what is science, what clearly is not science, and what superficially resembles science (but fails to meet the criteria for science).

SC.912.N.2.2: Identify which questions can be answered through science and which questions are outside the boundaries of scientific investigation, such as questions addressed by other ways of knowing, such as art, philosophy, and religion.

SC.912.N.2.4: Explain that scientific knowledge is both durable and robust and open to change. Scientific knowledge can change because it is often examined and re-examined by new investigations and scientific argumentation. Because of these frequent examinations, scientific knowledge becomes stronger, leading to its durability.

SC.912.N.3.1: Explain that a scientific theory is the culmination of many scientific investigations drawing together all the current evidence concerning a substantial range of phenomena; thus, a scientific theory represents the most powerful explanation scientists have to offer.

SC.912.N.3.5: Describe the function of models in science, and identify the wide range of models used in science.

SC.912.N.4.1: Explain how scientific knowledge and reasoning provide an empirically-based perspective to inform society's decision making.

Weigh the merits of alternative strategies for solving a specific societal problem by comparing a number of different costs and benefits, such as human, economic, and environmental.

SC.912.P.10.1: Differentiate among the various forms of energy and recognize that they can be transformed from one form to others.

Explore the Law of Conservation of Energy by differentiating among open, closed, and isolated systems and explain that the total energy in an isolated system is a conserved quantity.

SC.912.P.10.2: Explore the Law of Conservation of Energy by differentiating among open, closed, and isolated systems and explain that the total energy in an isolated system is a conserved quantity.

SC.912.P.10.4: Describe heat as the energy transferred by convection, conduction, and radiation, and explain the occupation of heat to change in temperature or states of matter.

LAFS.1112.WHST.3.8: Develop and strengthen writing as needed by planning, revising, and editing, using a variety of strategies and techniques that work well for them. For example, for a text derived from research or other sources, they can use information that is relevant to the text's organization and purpose, that is free of irrelevant detail, and that is not repetitive. They can also develop claim(s) and counterclaims fairly and thoroughly, supplying the most relevant data and evidence. They can give the audience of the text details that are well-reasoned and sound, and illustrate their points with relevant evidence and examples. Their writing is organized and structured clearly, is well-supported, and reaches a logical conclusion.

LAFS.1112.WHST.3.7: Develop and strengthen writing as needed by planning, revising, and editing, using a variety of strategies and techniques that work well for them. For example, for a text derived from research or other sources, they can use information that is relevant to the text's organization and purpose, that is free of irrelevant detail, and that is not repetitive. They can also develop claim(s) and counterclaims fairly and thoroughly, supplying the most relevant data and evidence. They can give the audience of the text details that are well-reasoned and sound, and illustrate their points with relevant evidence and examples. Their writing is organized and structured clearly, is well-supported, and reaches a logical conclusion.

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LAFS.1112.WHST.3.4: Develop and strengthen writing as needed by planning, revising, and editing, using a variety of strategies and techniques that work well for them. For example, for a text derived from research or other sources, they can use information that is relevant to the text's organization and purpose, that is free of irrelevant detail, and that is not repetitive. They can also develop claim(s) and counterclaims fairly and thoroughly, supplying the most relevant data and evidence. They can give the audience of the text details that are well-reasoned and sound, and illustrate their points with relevant evidence and examples. Their writing is organized and structured clearly, is well-supported, and reaches a logical conclusion.

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LAFS.1112.WHST.2.10: Write routinely over extended time frames (time for reflection and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences.
LAFS.910.RST.1.1: Determine the central ideas or conclusions of a text; trace the text's explanation or depiction of a complex process, phenomenon, or concept; provide an accurate summary of the text.

LAFS.910.RST.4.10: By the end of grade 10, read and comprehend science/technical texts in the grades 9–10 text complexity band independently and proficiently.

Initiate and participate effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grades 9–10 topics, texts, and issues, building on others' ideas and expressing own clearly and persuasively.

a. Come to discussions prepared, having read and researched material under study; explicitly draw on that preparation by referring to evidence from texts and other research on the topic or issue to stimulate a thoughtful, well-reasoned exchange of ideas.

b. Work with peers to set rules for collegial discussions and decision-making (e.g., informal consensus, taking votes on key issues, presentation of alternate views), clear goals and deadlines, and individual roles as needed.

c. Propose conversations by posing and responding to questions that relate the current discussion to broader themes or larger ideas; actively incorporate others into the discussion; and clarify, verify, or challenge ideas and conclusions.

d. Respond thoughtfully to diverse perspectives, summarize points of agreement and disagreement, and, when warranted, qualify or justify their own views and understanding and make new connections in light of the evidence and reasoning presented.

LAFS.910.RST.2.5: Make strategic use of digital media (e.g., textual, graphical, audio, visual, and interactive elements) in presentations to enhance understanding of findings, reasoning, and evidence and to add interest.

LAFS.910.RST.3.9: Analyze case studies of how the Earth's physical systems affect humans.

LAFS.910.RST.4.9: Analyze case studies of how human use of technology on the environment of places.

SS.912.G.3.1: Use geographic terms to locate and describe major ecosystems of Earth.

SS.912.G.3.2: Use geographic terms and tools to explain how weather and climate influence the natural character of a place.

SS.912.G.3.3: Use geographic terms and tools to explain differing perspectives on the use of renewable and non-renewable resources in Florida, the United States, and the world.

SS.912.G.3.5: Use geographic terms and tools to explain how hydrology influences the physical character of a place.

SS.912.G.5.1: Analyze case studies of how the Earth's physical systems affect humans.

SS.912.G.5.2: Analyze case studies of how changes in the physical environment of a place can increase or diminish its capacity to support human activity.

SS.912.G.5.3: Analyze case studies of the effects of human use of technology on the environment of places.

SS.912.G.5.4: Analyze case studies of how humans impact the diversity and productivity of ecosystems.

MAFS.912.F-IF.2.4: For a function that models a relationship between two quantities, interpret key features of graphs and tables in terms of the quantities, and sketch graphs showing key features given a verbal description of the relationship. Key features include: intercepts; intervals where the function is increasing, decreasing, positive, or negative; relative maximums and minimums; symmetries; end behavior; and periodicity.

Represent data with plots on the real number line (dot plots, histograms, and box plots). ★

Clarifications:
Examples are thematic, contour, and dot-density.
MAFS.912.S-ID.1.1: Clarifications: In grades 6 – 8, students describe center and spread in a data distribution. Here they choose a summary statistic appropriate to the characteristics of the data distribution, such as the shape of the distribution or the existence of extreme data points.

MAFS.912.S-ID.1.2: Clarifications: Use statistics appropriate to the shape of the data distribution to compare center (median, mean) and spread (interquartile range, standard deviation) of two or more different data sets. ★

MAFS.912.S-ID.1.3: Clarifications: Interpret differences in shape, center, and spread in the context of the data sets, accounting for possible effects of extreme data points (outliers). ★

MAFS.912.S-ID.2.5: Summarize categorical data for two categories in two-way frequency tables. Interpret relative frequencies in the context of the data (including joint, marginal, and conditional relative frequencies). Recognize possible associations and trends in the data. ★

ELD.K12.ELL.SI.1: English language learners communicate information, ideas and concepts necessary for academic success in the content area of Science.

ELD.K12.ELL.SL.1: English language learners communicate for social and instructional purposes within the school setting.

HE.912.C.1.3: Clarifications: Food options within a community; prenatal-care services; availability of recreational facilities; air quality; weather-safety awareness; and weather, air, and water conditions.

General Course Information and Notes

General Notes

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Special Notes:

Instructional Practices
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1. Ensuring wide reading from complex text that varies in length.
2. Making close reading and rereading of texts central to lessons.
3. Emphasizing text-specific complex questions, and cognitively complex tasks, reinforce focus on the text and cultivate independence.
4. Emphasizing students supporting answers based upon evidence from the text.
5. Providing extensive research and writing opportunities (claims and evidence).

- Asking questions (for science) and defining problems (for engineering).
- Developing and using models.
- Planning and carrying out investigations.
- Analyzing and interpreting data.
- Using mathematics, information and computer technology, and computational thinking.
- Constructing explanations (for science) and designing solutions (for engineering).
- Engaging in argument from evidence.
- Obtaining, evaluating, and communicating information.

Honors and Advanced Level Course Note: Advanced courses require a greater demand on students through increased academic rigor. Academic rigor is obtained through the application, analysis, evaluation, and creation of complex ideas that are often abstract and multi-faceted. Students are challenged to think and collaborate critically on the content they are learning. Honors level rigor will be achieved by increasing text complexity through text selection, focus on high-level qualitative measures, and complexity of task. Instruction will be structured to give students a deeper understanding of conceptual themes and organization within and across disciplines. Academic rigor is more than simply assigning to students a greater quantity of work.

Literacy Standards in Science
Secondary science courses include reading standards for literacy in science and technical subjects 6-12 and writing standards for literacy in history/social studies, science, and technical subjects 6-12. The courses also include speaking and listening standards. For a complete list of standards required for this course click on the blue tile labeled course standards. You may also download the complete course including all required standards and notes sections using the export function located at the top of this page.

English Language Development (ELD) Standards Special Notes Section:
Teachers are required to provide listening, speaking, reading and writing instruction that allows English language learners (ELL) to communicate information, ideas and concepts for academic success in the content area of Science. For the given level of English language proficiency and with visual, graphic, or interactive support, students will interact with grade level words, expressions, sentences and discourse to process or produce language necessary for academic success. The ELD standard should specify a relevant content area concept or topic of study chosen by curriculum developers and teachers which maximizes an ELL’s need for communication and social skills.
To access an ELL supporting document which delineates performance definitions and descriptors, please click on the following link: https://cpalmsmediaprod.blob.core.windows.net/uploads/docs/standards/eld/sc.pdf.

GENERAL INFORMATION

Course Number: 2001341
Number of Credits: One (1) credit

Course Path: Section: Grades PreK to 12 Education Courses > Grade Group: Grades 9 to 12 and Adult Education Courses > Subject: Science > SubSubject: Environmental Science
Abbreviated Title: ENV SCI HON
Course Length: Year (Y)

Course Attributes:
- Honors

Course Level: 3

Grade Level(s): 9,10,11,12
Graduation Requirement: Equally Rigorous Science

Educator Certifications

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<td>Earth/Space Science (Grades 6-12)</td>
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### Environmental Science Honors (#2001341) 2022 - And Beyond

#### Course Standards

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<tr>
<th>Name</th>
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<tr>
<td>SC.912.E.6.6</td>
<td>Analyze past, present, and potential future consequences to the environment resulting from various energy production technologies.</td>
</tr>
<tr>
<td>SC.912.E.7.4</td>
<td>Summarize the conditions that contribute to the climate of a geographic area, including the relationships to lakes and oceans.</td>
</tr>
<tr>
<td>SC.912.E.7.7</td>
<td>Identify, analyze, and relate the internal (Earth system) and external (astronomical) conditions that contribute to global climate change.</td>
</tr>
<tr>
<td>SC.912.E.7.8</td>
<td>Explain how various atmospheric, oceanic, and hydrologic conditions in Florida have influenced and can influence human behavior, both individually and collectively.</td>
</tr>
<tr>
<td>SC.912.E.7.9</td>
<td>Cite evidence that the ocean has had a significant influence on climate change by absorbing, storing, and moving heat, carbon, and water.</td>
</tr>
<tr>
<td>SC.912.L.14.6</td>
<td>Explain the significance of genetic factors, environmental factors, and pathogenic agents to health from the perspectives of both individual and public health.</td>
</tr>
<tr>
<td>SC.912.L.15.3</td>
<td>Describe how biological diversity is increased by the origin of new species and how it is decreased by the natural process of extinction.</td>
</tr>
<tr>
<td>SC.912.L.15.13</td>
<td>Describe the conditions required for natural selection, including: overproduction of offspring, inherited variation, and the struggle to survive, which result in differential reproductive success.</td>
</tr>
<tr>
<td>SC.912.L.16.10</td>
<td>Evaluate the impact of biotechnology on the individual, society and the environment, including medical and ethical issues.</td>
</tr>
<tr>
<td>SC.912.L.17.1</td>
<td>Discuss the characteristics of populations, such as number of individuals, age structure, density, and pattern of distribution.</td>
</tr>
<tr>
<td>SC.912.L.17.4</td>
<td>Describe changes in ecosystems resulting from seasonal variations, climate change and succession.</td>
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<tr>
<td>SC.912.L.17.5</td>
<td>Analyze how population size is determined by births, deaths, immigration, emigration, and limiting factors (biotic and abiotic) that determine carrying capacity.</td>
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<tr>
<td>SC.912.L.17.6</td>
<td>Compare and contrast the relationships among organisms, including predation, parasitism, competition, commensalism, and mutualism.</td>
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<tr>
<td>SC.912.L.17.7</td>
<td>Characterize the biotic and abiotic components that define freshwater systems, marine systems and terrestrial systems.</td>
</tr>
<tr>
<td>SC.912.L.17.8</td>
<td>Recognize the consequences of the losses of biodiversity due to catastrophic events, climate changes, human activity, and the introduction of invasive, non-native species.</td>
</tr>
<tr>
<td>SC.912.L.17.9</td>
<td>Use a food web to identify and distinguish producers, consumers, and decomposers. Explain the pathway of energy transfer through trophic levels and the reduction of available energy at successive trophic levels.</td>
</tr>
<tr>
<td>SC.912.L.17.10</td>
<td>Diagram and explain the biogeochemical cycles of an ecosystem, including water, carbon, and nitrogen cycle.</td>
</tr>
<tr>
<td>SC.912.L.17.11</td>
<td>Evaluate the costs and benefits of renewable and nonrenewable resources, such as water, energy, fossil fuels, wildlife, and forests.</td>
</tr>
<tr>
<td>SC.912.L.17.12</td>
<td>Discuss the political, social, and environmental consequences of sustainable use of land.</td>
</tr>
<tr>
<td>SC.912.L.17.13</td>
<td>Discuss the need for adequate monitoring of environmental parameters when making policy decisions.</td>
</tr>
<tr>
<td>SC.912.L.17.14</td>
<td>Assess the need for adequate waste management strategies.</td>
</tr>
<tr>
<td>SC.912.L.17.15</td>
<td>Discuss the effects of technology on environmental quality.</td>
</tr>
<tr>
<td>SC.912.L.17.16</td>
<td>Discuss the large-scale environmental impacts resulting from human activity, including waste spills, oil spills, runoff, greenhouse gases, ozone depletion, and surface and groundwater pollution.</td>
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<td>SC.912.L.17.17</td>
<td>Assess the effectiveness of innovative methods of protecting the environment.</td>
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<td>SC.912.L.17.18</td>
<td>Describe how human population size and resource use relate to environmental quality.</td>
</tr>
<tr>
<td>SC.912.L.17.19</td>
<td>Describe how different natural resources are produced and how their rates of use and renewal limit availability.</td>
</tr>
<tr>
<td>SC.912.L.17.20</td>
<td>Predict the impact of individuals on environmental systems and examine how human lifestyles affect sustainability.</td>
</tr>
<tr>
<td>SC.912.L.18.12</td>
<td>Discuss the special properties of water that contribute to Earth's suitability as an environment for life: cohesive behavior, ability to moderate temperature, expansion upon freezing, and versatility as a solvent.</td>
</tr>
<tr>
<td>SC.912.N.1.1</td>
<td>Define a problem based on a specific body of knowledge, for example: biology, chemistry, physics, and earth/space science, and do the following:</td>
</tr>
<tr>
<td>SC.912.N.1.2</td>
<td>Plan investigations, (Design and evaluate a scientific investigation).</td>
</tr>
<tr>
<td>SC.912.N.1.3</td>
<td>Use tools to gather, analyze, and interpret data (this includes the use of measurement in metric and other systems, and also the generation and interpretation of graphical representations of data, including data tables and graphs). (Collect data or evidence in an organized way. Properly use instruments, equipment, and materials (e.g., scales, probeware, meter sticks, microscopes, computers) including set-up, calibration, technique, maintenance, and storage).</td>
</tr>
<tr>
<td>SC.912.N.1.4</td>
<td>Use appropriate evidence and reasoning to justify these explanations to others.</td>
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<td>SC.912.N.1.5</td>
<td>Communicate results of scientific investigations, and</td>
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<td>SC.912.N.1.6</td>
<td>Evaluate the merits of the explanations produced by others.</td>
</tr>
<tr>
<td>SC.912.N.1.7</td>
<td>Review what is known in light of empirical evidence, (Examine whether available empirical evidence can be interpreted in terms of existing knowledge and models, and if not, modify or develop new models).</td>
</tr>
<tr>
<td>SC.912.N.1.8</td>
<td>Use data to support an explanation, and identify the source of data (this includes the use of measurement in metric and other systems, and also the generation and interpretation of graphical representations of data, including data tables and graphs). (Collect data or evidence in an organized way. Properly use instruments, equipment, and materials (e.g., scales, probeware, meter sticks, microscopes, computers) including set-up, calibration, technique, maintenance, and storage).</td>
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<td>SC.912.N.1.9</td>
<td>Communicate results of scientific investigations, and</td>
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<td>SC.912.N.1.10</td>
<td>Evaluate the merits of the explanations produced by others.</td>
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<tr>
<td>SC.912.N.1.11</td>
<td>Pose answers, explanations, or descriptions of events,</td>
</tr>
<tr>
<td>SC.912.N.1.12</td>
<td>Generate explanations that explicate or describe natural phenomena (inferences),</td>
</tr>
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<td>Evaluate the merits of the explanations produced by others.</td>
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</table>
Identify what is science, what clearly is not science, and what superficially resembles science (but fails to meet the criteria for science).

Identify which questions can be answered through science and which questions are outside the boundaries of scientific investigation, such as questions addressed by other ways of knowing, such as art, philosophy, and religion.

Explain that scientific knowledge is both durable and robust and open to change. Scientific knowledge can change because it is often examined and re-examined by new investigations and scientific argumentation. Because of these frequent examinations, scientific knowledge becomes stronger, leading to its durability.

Explain that a scientific theory is the culmination of many scientific investigations drawing together all the current evidence concerning a substantial range of phenomena; thus, a scientific theory represents the most powerful explanation scientists have to offer.

Describe the function of models in science, and identify the wide range of models used in science.

Analyze case studies of how the Earth’s physical systems affect humans.

Analyze case studies of the effects of human use of technology on the environment of places.

Explain how scientific knowledge and reasoning provide an empirically-based perspective to inform society’s decision making.

Use geographic terms and tools to explain how hydrology influences the physical character of a place.

Analyze case studies of how changes in the physical environment of a place can increase or diminish its capacity to support human activity.

Explore the Law of Conservation of Energy by differentiating among open, closed, and isolated systems and explain that the total energy in an isolated system is a conserved quantity.

Analyze case studies of how the diversity and productivity of ecosystems.

Analyze case studies of how changes in the physical environment of a place can increase or diminish its capacity to support human activity.

Explain that a scientific theory is the culmination of many scientific investigations drawing together all the current evidence concerning a substantial range of phenomena; thus, a scientific theory represents the most powerful explanation scientists have to offer.

Use geographic terms and tools to explain differing perspectives on the use of renewable and non-renewable resources in Florida, the United States, and the world.

Mathematicians who participate in effortful learning both individually and with others:

- Analyze the problem in a way that makes sense given the task.
- Ask questions that will help with solving the task.
- Build perseverance by modifying methods as needed while solving a challenging task.
- Stay engaged and maintain a positive mindset when working to solve tasks.
- Help and support each other when attempting a new method or approach.

Mathematicians who complete tasks with mathematical fluency:

- Complete tasks with mathematical fluency.
- Offer multiple opportunities for students to practice efficient and generalizable methods.
- Provide opportunities for students to reflect on the method they used and determine if a more efficient method could have been used.

Complete tasks with mathematical fluency.

Mathematicians who complete tasks with mathematical fluency:

- Select efficient and appropriate methods for solving problems within the given context.
- Maintain flexibility and accuracy while performing procedures and mental calculations.
- Complete tasks accurately and with confidence.
- Adapt procedures to apply them to a new context.
- Use feedback to improve efficiency when performing calculations.

Teachers who encourage students to complete tasks with mathematical fluency:

- Provide students with the flexibility to solve problems by selecting a procedure that allows them to solve efficiently and accurately.
- Provide multiple opportunities for students to practice efficient and generalizable methods.
- Guide students from concrete to pictorial to abstract representations as understanding progresses.
- Show students that various representations can have different purposes and can be useful in different situations.

Provide multiple opportunities for students to practice efficient and generalizable methods.

Provide opportunities for students to reflect on the method they used and determine if a more efficient method could have been used.
### MA.K12.MTR.4.1
Engage in discussions that reflect on the mathematical thinking of self and others.

Mathematicians who engage in discussions that reflect on the mathematical thinking of self and others:
- Communicate mathematical ideas, vocabulary and methods effectively.
- Analyze the mathematical thinking of others.
- Compare the efficiency of a method to those expressed by others.
- Recognize errors and suggest how to correctly solve the task.
- Justify results by explaining methods and processes.
- Construct possible arguments based on evidence.

**Clarifications:**
Teachers who encourage students to engage in discussions that reflect on the mathematical thinking of self and others:
- Establish a culture in which students ask questions of the teacher and their peers, and error is an opportunity for learning.
- Create opportunities for students to discuss their thinking with peers.
- Select, sequence and present student work to advance and deepen understanding of correct and increasingly efficient methods.
- Develop students' ability to justify methods and compare their responses to the responses of their peers.

### MA.K12.MTR.5.1
Use patterns and structure to help understand and connect mathematical concepts.

Mathematicians who use patterns and structure to help understand and connect mathematical concepts:
- Focus on relevant details within a problem.
- Create plans and procedures to logically order events, steps or ideas to solve problems.
- Decompose a complex problem into manageable parts.
- Relate previously learned concepts to new concepts.
- Look for similarities among problems.
- Connect solutions of problems to more complicated large-scale situations.

**Clarifications:**
Teachers who encourage students to use patterns and structure to help understand and connect mathematical concepts:
- Help students recognize the patterns in the world around them and connect these patterns to mathematical concepts.
- Support students to develop generalizations based on the similarities found among problems.
- Provide opportunities for students to create plans and procedures to solve problems.
- Develop students' ability to construct relationships between their current understanding and more sophisticated ways of thinking.

### MA.K12.MTR.6.1
Assess the reasonableness of solutions.

Mathematicians who assess the reasonableness of solutions:
- Estimate to discover possible solutions.
- Use benchmark quantities to determine if a solution makes sense.
- Check calculations when solving problems.
- Verify possible solutions by explaining the methods used.
- Evaluate results based on the given context.

**Clarifications:**
Teachers who encourage students to assess the reasonableness of solutions:
- Have students estimate or predict solutions prior to solving.
- Prompt students to continually ask, "Does this solution make sense? How do you know?"
- Reinforce that students check their work as they progress within and after a task.
- Strengthen students' ability to verify solutions through justifications.

### MA.K12.MTR.7.1
Apply mathematics to real-world contexts.

Mathematicians who apply mathematics to real-world contexts:
- Connect mathematical concepts to everyday experiences.
- Use models and methods to understand, represent and solve problems.
- Perform investigations to gather data or determine if a method is appropriate. • Redesign models and methods to improve accuracy or efficiency.

**Clarifications:**
Teachers who encourage students to apply mathematics to real-world contexts:
- Provide opportunities for students to create models, both concrete and abstract, and perform investigations.
- Challenge students to question the accuracy of their models and methods.
- Support students as they validate conclusions by comparing them to the given situation.
- Indicate how various concepts can be applied to other disciplines.

### ELA.K12.EE.1.1
Cite evidence to explain and justify reasoning.

**Clarifications:**
- K-1 Students include textual evidence in their oral communication with guidance and support from adults. The evidence can consist of details from the text without naming the text. During 1st grade, students learn how to incorporate the evidence in their writing.
- 2-3 Students include relevant textual evidence in their written and oral communication. Students should name the text when they refer to it. In 3rd grade, students should use a combination of direct and indirect citations.
- 4-5 Students continue with previous skills and reference comments made by speakers and peers. Students cite texts that they've directly quoted, paraphrased, or used for information. When writing, students will use the form of citation dictated by the instructor or the style guide referenced by the instructor.
- 6-8 Students continue with previous skills and use a style guide to create a proper citation.
- 9-12 Students continue with previous skills and should be aware of existing style guides and the ways in which they differ.
ELA.K12.EE.2.1: 
Clarifications: See Text Complexity for grade-level complexity bands and a text complexity rubric.

ELA.K12.EE.3.1: 
Clarifications: 
Students will make inferences before the words infer or inference are introduced. Kindergarten students will answer questions like “Why is the girl smiling?” or make predictions about what will happen based on the title page. Students will use the terms and apply them in 2nd grade and beyond.

ELA.K12.EE.4.1: 
Clarifications: 
In kindergarten, students learn to listen to one another respectfully. In grades 1-2, students build upon these skills by justifying what they are thinking. For example: “I think ______ because ______.” The collaborative conversations are becoming academic conversations. In grades 3-12, students engage in academic conversations discussing claims and justifying their reasoning, refining and applying skills. Students build on ideas, propel the conversation, and support claims and counterclaims with evidence.

ELA.K12.EE.5.1: 
Clarifications: 
Students will incorporate skills learned into work products to produce quality work. For students to incorporate these skills appropriately, they must receive instruction. A 3rd grade student creating a poster board display must have instruction in how to effectively present information to do quality work.

ELA.K12.EE.6.1: 
Clarifications: 
In kindergarten and 1st grade, students learn the difference between formal and informal language. For example, the way we talk to our friends differs from the way we speak to adults. In 2nd grade and beyond, students practice appropriate social and academic language to discuss texts.

General Course Information and Notes

GENERAL NOTES

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- Planning and carrying out investigations.
- Analyzing and interpreting data.
- Using mathematics, information and computer technology, and computational thinking.
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- Obtaining, evaluating, and communicating information.

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General Course Information and Notes

GENERAL NOTES


GENERAL INFORMATION

Course Number: 2001342
Number of Credits: One (1) credit
Course Type: Core Academic Course
Course Status: Course Approved
Grade Level(s): 9, 10, 11, 12
Graduation Requirement: Equally Rigorous Science

Course Path: Section: Grades PreK to 12 Education Courses > Grade Group: Grades 9 to 12 and Adult Education Courses > Subject: Science > SubSubject: Environmental Science
Abbreviated Title: PRE-AICE ENV MGMT IG
Course Length: Year (Y)
Course Attributes:
- Advanced International Certificate of Education (AICE)
Course Level: 3

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<tr>
<td><strong>Name</strong></td>
<td><strong>Description</strong></td>
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<tr>
<td>SC.912.E.5.6:</td>
<td>Develop logical connections through physical principles, including Kepler's and Newton's Laws about the relationships and the effects of Earth, Moon, and Sun on each other.</td>
</tr>
<tr>
<td>SC.912.E.5.7:</td>
<td>Relate the history of and explain the justification for future space exploration and continuing technology development.</td>
</tr>
<tr>
<td>SC.912.E.5.8:</td>
<td>Connect the concepts of radiation and the electromagnetic spectrum to the use of historical and newly-developed observational tools.</td>
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| | 1. Pose questions about the natural world, (Articulate the purpose of the investigation and identify the relevant scientific concepts). |
| | 2. Conduct systematic observations, (Write procedures that are clear and replicable. Identify observables and examine relationships between test (independent) variable and outcome (dependent) variable. Employ appropriate methods for accurate and consistent observations; conduct and record measurements at appropriate levels of precision. Follow safety guidelines). |
| | 3. Examine books and other sources of information to see what is already known, |
| | 4. Review what is known in light of empirical evidence, (Examine whether available empirical evidence can be interpreted in terms of existing knowledge and models, and if not, modify or develop new models). |
| | 5. Plan investigations, (Design and evaluate a scientific investigation). |
| | 6. Use tools to gather, analyze, and interpret data (this includes the use of measurement in metric and other systems, and also the generation and interpretation of graphical representations of data, including data tables and graphs), (Collect data or evidence in an organized way. Properly use instruments, equipment, and materials (e.g., scales, probeware, meter sticks, microscopes, computers) including set-up, calibration, technique, maintenance, and storage). |
| | 7. Pose answers, explanations, or descriptions of events, |
| | 8. Generate explanations that explicate or describe natural phenomena (inferences), |
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| | 10. Communicate results of scientific investigations, and |
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SC.912.P.10.20: Describe the measurable properties of waves and explain the relationships among them and how these properties change when the wave moves from one medium to another.

SC.912.P.10.21: Qualitatively describe the shift in frequency in sound or electromagnetic waves due to the relative motion of a source or a receiver.

SC.912.P.10.22: Construct ray diagrams and use thin lens and mirror equations to locate the images formed by lenses and mirrors.

SC.912.P.12.2: Analyze the motion of an object in terms of its position, velocity, and acceleration (with respect to a frame of reference) as functions of time.

SC.912.P.12.4: Describe how the gravitational force between two objects depends on their masses and the distance between them.

SC.912.P.12.6: Qualitatively apply the concept of angular momentum.

SC.912.P.12.7: Recognize that nothing travels faster than the speed of light in vacuum which is the same for all observers no matter how they or the light source are moving.

LAFS.910.RST.2.5: Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 9–10 texts and topics.

LAFS.910.RST.2.6: Analyze the structure of the relationships among concepts in a text, including relationships among key terms (e.g., force, friction, reaction force, energy).

LAFS.910.RST.3.9: Compare and contrast findings presented in a text to those from other sources (including their own experiments), noting when the findings support or contradict previous explanations or accounts.

LAFS.910.RST.4.10: By the end of grade 10, read and comprehend science/technical texts in the grades 9–10 text complexity band independently and proficiently.

LAFS.910.RST.1.1.1: Initiate and participate effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grades 9–10 topics, texts, and issues, building on others’ ideas and expressing their own clearly and persuasively.

LAFS.910.RST.1.2: Integrate multiple sources of information presented in diverse media or formats (e.g., visually, quantitatively, orally) evaluating the credibility and accuracy of each source.

LAFS.910.RST.3.7: Translate quantitative or technical information expressed in words in a text into visual form (e.g., a table or chart) and translate information expressed visually or mathematically (e.g., in an equation) into words.

LAFS.910.RST.3.8: Assess the extent to which the reasoning and evidence in a text support the author’s claim or a recommendation for solving a scientific or technical problem.

LAFS.910.RST.3.9: Present information, findings, and supporting evidence clearly, concisely, and logically such that listeners can follow the line of reasoning and the organization, development, substance, and style are appropriate to purpose, audience, and task.

LAFS.910.RST.3.10: Make strategic use of digital media (e.g., textual, graphical, audio, visual, and interactive elements) in presentations to enhance understanding of findings, reasoning, and evidence to add interest.

LAFS.910.RST.1.2: Write arguments focused on discipline-specific content.

LAFS.910.RST.1.3: Write informative/explanatory texts, including the narration of historical events, scientific procedures/experiments, or technical processes.

LAFS.910.RST.1.4: Provide a concluding statement or section that follows from and supports the argument presented.

LAFS.910.RST.1.5: Introduce precise claim(s), distinguish the claim(s) from alternate or opposing claims, and create an organization that establishes clear relationships among the claim(s), counterclaims, reasons, and evidence.

LAFS.910.RST.1.6: Develop claim(s) and counterclaims fairly, supplying data and evidence for each while pointing out the strengths and limitations of both claim(s) and counterclaims in a discipline-appropriate form and in a manner that anticipates the audience’s knowledge level and concerns.

LAFS.910.RST.1.7: Use words, phrases, and clauses to link the major sections of the text, create cohesion, and clarify the relationships between claim(s) and reasons, between reasons and evidence, and between claim(s) and counterclaims.

LAFS.910.RST.1.8: Establish and maintain a formal style and objective tone while attending to the norms and conventions of the discipline in which they are writing.

LAFS.910.RST.1.9: Provide a concluding statement or section that follows from and supports the information or explanation presented (e.g., articulating implications or the significance of the topic).
Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.

Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience.

Use technology, including the Internet, to produce, publish, and update individual or shared writing products, taking advantage of technology's capacity to link to other information and to display information flexibly and dynamically.

Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation.

Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the usefulness of each source in answering the research question; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and following a standard format for citation.

Write routinely over extended time frames (time for reflection and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences.

Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases.

- Graph linear and quadratic functions and show intercepts, maxima, and minima.
- Graph square root, cube root, and piecewise-defined functions, including step functions and absolute value functions.
- Graph polynomial functions, identifying zeros when suitable factorizations are available, and showing end behavior.
- Graph rational functions, identifying zeros and asymptotes when suitable factorizations are available, and showing end behavior.
- Graph exponential and logarithmic functions, showing intercepts and end behavior, and trigonometric functions, showing period, midline, and amplitude, and using phase shift.

Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays.

Choose a level of accuracy appropriate to limitations on measurement when reporting quantities.

Make sense of problems and persevere in solving them.

Mathematically proficient students start by explaining to themselves the meaning of a problem and looking for entry points to its solution. They analyze given conditions, constraints, relationships, and goals. They make conjectures about the form and meaning of the solution and plan a solution pathway rather than simply jumping into a solution attempt. They consider analogous problems and try special cases and simpler forms of the original problem in order to gain insight into its solution. They monitor and evaluate their progress and change course if necessary. Older students might, depending on the context of the problem, transform algebraic expressions or change the viewing window on their graphing calculator to get the information they need. Mathematically proficient students can explain correspondences between equations, verbal descriptions, tables, and graphs or draw diagrams of important features and relationships, graph data, and search for regularity or trends. Younger students might rely on using concrete objects or pictures to help conceptualize and solve a problem. Mathematically proficient students check their answers to problems using a different method, and they continually ask themselves, "Does this make sense?" They can understand the approaches of others to solving complex problems and identify correspondences between different approaches.

Reason abstractly and quantitatively.

Mathematically proficient students make sense of quantities and their relationships in problem situations. They bring two complementary abilities to bear on problems involving quantitative relationships: the ability to decontextualize—to abstract a given situation and represent it symbolically and manipulate the representing symbols as if they have a life of their own, without necessarily attending to their referents—and the ability to contextualize, to pause as needed during the manipulation process in order to probe into the referents for the symbols involved. Quantitative reasoning entails habits of creating a coherent representation of the problem at hand; considering the units involved; attending to the meaning of quantities, not just how to compute them; and knowing and flexibly using different properties of operations and objects.

Construct viable arguments and critique the reasoning of others.

Mathematically proficient students understand and use stated assumptions, definitions, and previously established results in constructing arguments. They make conjectures and build a logical progression of statements to explore the truth of their conjectures. They are able to analyze situations by breaking them into cases, and can recognize and use counterexamples. They justify their conclusions, communicate them to others, and respond to the arguments of others. They reason inductively about data, making plausible arguments that take into account the context from which the data arose. Mathematically proficient students are also able to compare the effectiveness of two plausible arguments, distinguish correct logic or reasoning from that which is flawed, and—if there is a flaw in an argument—explain what it is. Elementary students can construct arguments using concrete referents such as objects, drawings, diagrams, and actions. Such arguments can make sense and be correct, even though they are not generalized or made formal until later grades. Later, students learn to determine domains to which an argument applies. Students at all grades can listen or read the arguments of others, decide whether they make sense, and ask useful questions to clarify or improve the arguments.

Model with mathematics.

Mathematically proficient students can apply the mathematics they know to solve problems arising in everyday life, society, and the workplace. In early grades, this might be as simple as writing an addition equation to describe a situation. In middle grades, a student might apply proportional reasoning to plan a school event or analyze a problem in the community. By high school, a student might use geometry to solve a design problem or use a function to describe how one quantity of interest depends on another. Mathematically proficient students who can apply what they know are comfortable making assumptions and approximations to simplify a complicated situation, realizing that these may need revision later. They are able to identify important quantities in a practical situation and map their relationships using such tools as diagrams, two-way tables, graphs, flowcharts and formulas. They can analyze those relationships mathematically to draw conclusions. They routinely interpret their mathematical results in the context of the situation and reflect on whether the results make sense, possibly improving the model if it has not served its purpose.

Use appropriate tools strategically.

Mathematically proficient students consider the available tools when solving a mathematical problem. These tools might include pencil and paper,
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<td><strong>MAFS.K12.MP.5.1:</strong></td>
<td>Concrete models, a ruler, a protractor, a calculator, a spreadsheet, a computer algebra system, a statistical package, or dynamic geometry software. Students are sufficiently familiar with tools appropriate for their grade or course to make sound decisions about which of these tools might be helpful, recognizing both the insight to be gained and their limitations. For example, mathematically proficient high school students analyze graphs of functions and solutions generated using a graphing calculator. They detect possible errors by strategically using estimation and other mathematical knowledge. When making mathematical models, they know that technology can enable them to visualize the results of varying assumptions, explore consequences, and compare predictions with data. Mathematically proficient students at various grade levels are able to identify relevant external mathematical resources, such as digital content located on a website, and use them to pose or solve problems. They are able to use technological tools to explore and deepen their understanding of concepts. <strong>Standard Relation to Course:</strong> Supporting</td>
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<td><strong>MAFS.K12.MP.6.1:</strong></td>
<td>Mathematically proficient students try to communicate precisely to others. They try to use clear definitions in discussion with others and in their own reasoning. They state the meaning of the symbols they choose, including using the equal sign consistently and appropriately. They are careful about specifying units of measure, and labeling axes to clarify the correspondence with quantities in a problem. They calculate accurately and efficiently, express numerical answers with a degree of precision appropriate for the problem context. In the elementary grades, students give carefully formulated explanations to each other. By the time they reach high school they have learned to examine claims and make explicit use of definitions. <strong>Standard Relation to Course:</strong> Supporting</td>
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<td><strong>MAFS.K12.MP.7.1:</strong></td>
<td>Mathematically proficient students look closely to discern a pattern or structure. Young students, for example, might notice that three and seven more is the same amount as seven and three more, or they may sort a collection of shapes according to how many sides the shapes have. Later, students will see 7 × 8 equals the well remembered 7 × 5 + 7, in preparation for learning about the distributive property. In the expression x² + 9x + 14, older students can see the 14 as 2 × 7 and the 9 as 2 × 7. They recognize the significance of an existing line in a geometric figure and use the strategy of drawing an auxiliary line for solving problems. They also can step back for an overview and shift perspective. They can see complicated things, such as some algebraic expressions, as single objects or as being composed of several objects. For example, they can see 5 – 3(x – y)² as 5 minus a positive number times a square and use that to realize that its value cannot be more than 5 for any real numbers x and y. <strong>Standard Relation to Course:</strong> Supporting</td>
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<td>Mathematically proficient students notice if calculations are repeated, and look both for general methods and for shortcuts. Upper elementary students might notice when dividing 25 by 11 that they are repeating the same calculations over and over again, and conclude they have a repeating decimal. By paying attention to the calculation of slope as they repeatedly check whether points are on the line through (1, 2) with slope 3, middle school students might abstract the equation (y – 2)/(x – 1) = 3. Noticing the regularity in the way terms cancel when expanding (x – 1)(x + 1), (x – 1)(x² + x + 1), and (x – 1)(x³ + x² + x + 1) might lead them to the general formula for the sum of a geometric series. As they work to solve a problem, mathematically proficient students maintain oversight of the process, while attending to the details. They continually evaluate the reasonableness of their intermediate results. <strong>Standard Relation to Course:</strong> Supporting</td>
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**General Course Information and Notes**

**GENERAL NOTES**

Laboratory investigations that include the use of scientific inquiry, research, measurement, problem solving, laboratory apparatus and technologies, experimental procedures, and safety procedures are an integral part of this course. The National Science Teachers Association (NSTA) recommends that at the high school level, all students should be in the science lab or field, collecting data every week. School laboratory investigations (labs) are defined by the National Research Council (NRC) as an experience in the laboratory, classroom, or the field that provides students with opportunities to interact directly with natural phenomena or with data collected by others using tools, materials, data collection techniques, and models (NRC, 2006, p. 3). Laboratory investigations in the high school classroom should help all students develop a growing understanding of the complexity and ambiguity of empirical work, as well as the skills to calibrate and troubleshoot equipment used to make observations. Learners should understand measurement error; and have the skills to aggregate, interpret, and present the resulting data (National Research Council, 2006, p. 77; NSTA, 2007).

**Special Notes:**

**Institutional Practices**

Teaching from a range of complex text is optimized when teachers in all subject areas implement the following strategies on a routine basis:

1. Ensuring wide reading from complex text that varies in length.
2. Making close reading and rereading of texts central to lessons.
3. Emphasizing text-specific complex questions, and cognitively complex tasks, reinforce focus on the text and cultivate independence.
4. Emphasizing students supporting answers based upon evidence from the text.
5. Providing extensive research and writing opportunities (claims and evidence).

**Science and Engineering Practices (NRC Framework for K-12 Science Education, 2010)**

- Asking questions (for science) and defining problems (for engineering).
- Developing and using models.
- Planning and carrying out investigations.
- Analyzing and interpreting data.
- Using mathematics, information and computer technology, and computational thinking.
- Constructing explanations (for science) and designing solutions (for engineering).

- Engaging in argument from evidence.
- Obtaining, evaluating, and communicating information.
Educator Certifications

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<td>SC.912.P.10.21</td>
<td>Qualitatively describe the shift in frequency in sound or electromagnetic waves due to the relative motion of a source or a receiver.</td>
</tr>
<tr>
<td>SC.912.P.10.22</td>
<td>Construct ray diagrams and use thin lens and mirror equations to locate the images formed by lenses and mirrors.</td>
</tr>
<tr>
<td>SC.912.P.12.2</td>
<td>Analyze the motion of an object in terms of its position, velocity, and acceleration (with respect to a frame of reference) as functions of time.</td>
</tr>
<tr>
<td>SC.912.P.12.4</td>
<td>Describe how the gravitational force between two objects depends on their masses and the distance between them.</td>
</tr>
<tr>
<td>SC.912.P.12.6</td>
<td>Qualitatively apply the concept of angular momentum.</td>
</tr>
<tr>
<td>SC.912.P.12.7</td>
<td>Recognize that nothing travels faster than the speed of light in vacuum which is the same for all observers no matter how they or the light source are moving.</td>
</tr>
</tbody>
</table>

### MA.K12.MTR.1.1:
Mathematicians who participate in effortful learning both individually and with others:
- Analyze the problem in a way that makes sense given the task.
- Ask questions that will help with solving the task.
- Build perseverance by modifying methods as needed while solving a challenging task.
- Stay engaged and maintain a positive mindset when working to solve tasks.
- Help and support each other when attempting a new method or approach.

### Clarifications:
Teachers who encourage students to participate actively in effortful learning both individually and with others:
- Cultivate a community of growth mindset learners.
- Foster perseverance in students by choosing tasks that are challenging.
- Develop students' ability to analyze and problem solve.
- Recognize students' effort when solving challenging problems.

### MA.K12.MTR.2.1:
Demonstrate understanding by representing problems in multiple ways.
Mathematicians who demonstrate understanding by representing problems in multiple ways:
- Build understanding through modeling and using manipulatives.
- Represent solutions to problems in multiple ways using objects, drawings, tables, graphs and equations.
- Progress from modeling problems with objects and drawings to using algorithms and equations.
- Express connections between concepts and representations.
- Choose a representation based on the given context or purpose.

### Clarifications:
Teachers who encourage students to demonstrate understanding by representing problems in multiple ways:
- Help students make connections between concepts and representations.
- Provide opportunities for students to use manipulatives when investigating concepts.
- Guide students from concrete to pictorial to abstract representations as understanding progresses.
- Show students that various representations can have different purposes and can be useful in different situations.

### MA.K12.MTR.3.1:
Complete tasks with mathematical fluency.
Mathematicians who complete tasks with mathematical fluency:
- Select efficient and appropriate methods for solving problems within the given context.
- Maintain flexibility and accuracy while performing procedures and mental calculations.
- Complete tasks accurately and with confidence.
- Adapt procedures to apply them to a new context.
- Use feedback to improve efficiency when performing calculations.

### Clarifications:
Teachers who encourage students to complete tasks with mathematical fluency:
- Offer multiple opportunities for students to practice efficient and generalizable methods.
- Provide opportunities for students to reflect on the method they used and determine if a more efficient method could have been used.

### MA.K12.MTR.4.1:
Engage in discussions that reflect on the mathematical thinking of self and others.
Mathematicians who engage in discussions that reflect on the mathematical thinking of self and others:
- Communicate mathematical ideas, vocabulary and methods effectively.
- Analyze the mathematical thinking of others.
- Compare the efficiency of a method to those expressed by others.
- Recognize errors and suggest how to correctly solve the task.
- Justify results by explaining methods and processes.
- Construct possible arguments based on evidence.

### Clarifications:
Teachers who encourage students to engage in discussions that reflect on the mathematical thinking of self and others:
- Establish a culture in which students ask questions of the teacher and their peers, and error is an opportunity for learning.
- Create opportunities for students to discuss their thinking with peers.
- Select, sequence and present student work to advance and deepen understanding of correct and increasingly efficient methods.
- Develop students' ability to justify methods and compare their responses to the responses of their peers.

### Clarifications:
Use patterns and structure to help understand and connect mathematical concepts.
Mathematicians who use patterns and structure to help understand and connect mathematical concepts:
- Focus on relevant details within a problem.
**MA.K12.MTR.5.1:**
- Create plans and procedures to logically order events, steps or ideas to solve problems.
- Decompose a complex problem into manageable parts.
- Relate previously learned concepts to new concepts.
- Look for similarities among problems.
- Connect solutions of problems to more complicated large-scale situations.

**Clarifications:**
Teachers who encourage students to use patterns and structure to help understand and connect mathematical concepts:
- Help students recognize the patterns in the world around them and connect these patterns to mathematical concepts.
- Support students to develop generalizations based on the similarities found among problems.
- Provide opportunities for students to create plans and procedures to solve problems.
- Develop students' ability to construct relationships between their current understanding and more sophisticated ways of thinking.

**MA.K12.MTR.6.1:**
Assess the reasonableness of solutions.
Mathematicians who assess the reasonableness of solutions:
- Estimate to discover possible solutions.
- Use benchmark quantities to determine if a solution makes sense.
- Check calculations when solving problems.
- Verify possible solutions by explaining the methods used.
- Evaluate results based on the given context.

**Clarifications:**
Teachers who encourage students to assess the reasonableness of solutions:
- Have students estimate or predict solutions prior to solving.
- Prompt students to continually ask, "Does this solution make sense? How do you know?"
- Reinforce that students check their work as they progress within and after a task.
- Strengthen students' ability to verify solutions through justifications.

**MA.K12.MTR.7.1:**
Apply mathematics to real-world contexts.
Mathematicians who apply mathematics to real-world contexts:
- Connect mathematical concepts to everyday experiences.
- Use models and methods to understand, represent and solve problems.
- Perform investigations to gather data or determine if a method is appropriate.
- Redesign models and methods to improve accuracy or efficiency.

**Clarifications:**
Teachers who encourage students to apply mathematics to real-world contexts:
- Provide opportunities for students to create models, both concrete and abstract, and perform investigations.
- Challenge students to question the accuracy of their models and methods.
- Support students as they validate conclusions by comparing them to the given situation.
- Indicate how various concepts can be applied to other disciplines.

**ELA.K12.EE.1.1:**
Cite evidence to explain and justify reasoning.

**Clarifications:**
K-1 Students include textual evidence in their oral communication with guidance and support from adults. The evidence can consist of details from the text without naming the text. During 1st grade, students learn how to incorporate the evidence in their writing. 2-3 Students include relevant textual evidence in their written and oral communication. Students should name the text when they refer to it. In 3rd grade, students should use a combination of direct and indirect citations.
4-5 Students continue with previous skills and reference comments made by speakers and peers. Students cite texts that they've directly quoted, paraphrased, or used for information. When writing, students will use the form of citation dictated by the instructor or the style guide referenced by the instructor.
6-8 Students continue with previous skills and use a style guide to create a proper citation.
9-12 Students continue with previous skills and should be aware of existing style guides and the ways in which they differ.

**ELA.K12.EE.2.1:**
Read and comprehend grade-level complex texts proficiently.

**Clarifications:**
See Text Complexity for grade-level complexity bands and a text complexity rubric.

**ELA.K12.EE.3.1:**
Make inferences to support comprehension.

**Clarifications:**
Students will make inferences before the words infer or inference are introduced. Kindergarten students will answer questions like "Why is the girl smiling?" or make predictions about what will happen based on the title page. Students will use the terms and apply them in 2nd grade and beyond.

**ELA.K12.EE.4.1:**
Use appropriate collaborative techniques and active listening skills when engaging in discussions in a variety of situations.

**Clarifications:**
In kindergarten, students learn to listen to one another respectfully. In grades 1-2, students build upon these skills by justifying what they are thinking. For example: "I think ______ because ______." The collaborative conversations are becoming academic conversations.
In grades 3-12, students engage in academic conversations discussing claims and justifying their reasoning, refining and applying skills.
Students build on ideas, propel the conversation, and support claims and counterclaims with evidence.

**Clarifications:**
Use the accepted rules governing a specific format to create quality work.
Students will incorporate skills learned into work products to produce quality work. For students to incorporate these skills appropriately, they must receive instruction. A 3rd grade student creating a poster board display must have instruction in how to effectively present information to do quality work.

Use appropriate voice and tone when speaking or writing.

In kindergarten and 1st grade, students learn the difference between formal and informal language. For example, the way we talk to our friends differs from the way we speak to adults. In 2nd grade and beyond, students practice appropriate social and academic language to discuss texts.

English language learners communicate for social and instructional purposes within the school setting.

English language learners communicate information, ideas and concepts necessary for academic success in the content area of Science.

English language learners communicate for social and instructional purposes within the school setting.

General Course Information and Notes

General Notes

Laboratory investigations that include the use of scientific inquiry, research, measurement, problem solving, laboratory apparatus and technologies, experimental procedures, and safety procedures are an integral part of this course. The National Science Teachers Association (NSTA) recommends that at the high school level, all students should be in the science lab or field, collecting data every week. School laboratory investigations (labs) are defined by the National Research Council (NRC) as an experience in the laboratory, classroom, or the field that provides students with opportunities to interact directly with natural phenomena or with data collected by others using tools, materials, data collection techniques, and models (NRC, 2006, p. 3). Laboratory investigations in the high school classroom should help all students develop a growing understanding of the complexity and ambiguity of empirical work, as well as the skills to calibrate and troubleshoot equipment used to make observations. Learners should understand measurement error; and have the skills to aggregate, interpret, and present the resulting data (National Research Council, 2006, p. 77; NSTA, 2007).

Special Notes:

Instructional Practices

Teaching from a range of complex text is optimized when teachers in all subject areas implement the following strategies on a routine basis:

1. Ensuring wide reading from complex text that varies in length.
2. Making close reading and rereading of texts central to lessons.
3. Emphasizing text-specific complex questions, and cognitively complex tasks, reinforce focus on the text and cultivate independence.
4. Emphasizing students supporting answers based upon evidence from the text.
5. Providing extensive research and writing opportunities (claims and evidence).


- Asking questions (for science) and defining problems (for engineering).
- Developing and using models.
- Planning and carrying out investigations.
- Analyzing and interpreting data.
- Using mathematics, information and computer technology, and computational thinking.
- Constructing explanations (for science) and designing solutions (for engineering).
- Engaging in argument from evidence.
- Obtaining, evaluating, and communicating information.

Florida’s Benchmarks for Excellent Student Thinking (B.E.S.T.) Standards

This course includes Florida’s B.E.S.T. ELA Expectations (EE) and Mathematical Thinking and Reasoning Standards (MTRs) for students. Florida educators should intentionally embed these standards within the content and their instruction as applicable. For guidance on the implementation of the EE and MTRs, please visit https://www.cpalms.org/Standards/BEST_Standards.aspx and select the appropriate B.E.S.T. Standards package.

English Language Development ELD Standards Special Notes Section:

Teachers are required to provide listening, speaking, reading and writing instruction that allows English language learners (ELL) to communicate information, ideas and concepts for academic success in the content area of Science. For the given level of English language proficiency and with visual, graphic, or interactive support, students will interact with grade level words, expressions, sentences and discourse to process or produce language necessary for academic success The ELD standard should specify a relevant content area concept or topic of study chosen by curriculum developers and teachers which maximizes an ELL's need for communication and social skills. To access an ELL supporting document which delineates performance definitions and descriptors, please click on the following link:

https://cpalmsmediaprod.blob.core.windows.net/uploads/docs/standards/eld/sc.pdf

General Information

Course Number: 2001350

Number of Credits: One (1) credit

Course Type: Elective Course

Course Status: State Board Approved

Grade Level(s): 9,10,11,12

Course Path: Section: Grades PreK to 12 Education
Courses > Grade Group: Grades 9 to 12 and Adult Education Courses > Subject: Science > SubSubject:
Earth/Space Sciences
Abbreviated Title: ASTRONOMY S/G
Course Length: Year (Y)
Course Level: 2
<table>
<thead>
<tr>
<th>Educator Certifications</th>
</tr>
</thead>
<tbody>
<tr>
<td>Science (Secondary Grades 7-12)</td>
</tr>
<tr>
<td>Physics (Grades 6-12)</td>
</tr>
<tr>
<td>Earth/Space Science (Grades 6-12)</td>
</tr>
<tr>
<td>Middle Grades General Science (Middle Grades 5-9)</td>
</tr>
</tbody>
</table>
General Course Information and Notes

**GENERAL NOTES**

The curriculum description for this IB course is provided at http://www.ibo.org/en/programmes/.

### GENERAL INFORMATION

<table>
<thead>
<tr>
<th>Course Number:</th>
<th>2001370</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of Credits:</td>
<td>One (1) credit</td>
</tr>
<tr>
<td>Course Type:</td>
<td>Core Academic Course</td>
</tr>
<tr>
<td>Course Status:</td>
<td>Course Approved</td>
</tr>
<tr>
<td>Grade Level(s):</td>
<td>9,10,11,12</td>
</tr>
<tr>
<td>Graduation Requirement:</td>
<td>Equally Rigorous Science</td>
</tr>
</tbody>
</table>

**Course Path:** Section: Grades PreK to 12 Education Courses > Grade Group: Grades 9 to 12 and Adult Education Courses > Subject: Science > SubSubject: Environmental Science >

**Abbreviated Title:** IB ENV SYS & SOC 1

**Course Length:** Year (Y)

**Course Attributes:**
- International Baccalaureate (IB)

**Course Level:** 3

### Educator Certifications

<table>
<thead>
<tr>
<th>Certification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Science (Secondary Grades 7-12)</td>
</tr>
<tr>
<td>Biology (Grades 6-12)</td>
</tr>
<tr>
<td>Chemistry (Grades 6-12)</td>
</tr>
<tr>
<td>Earth/Space Science (Grades 6-12)</td>
</tr>
</tbody>
</table>
General Course Information and Notes

GENERAL NOTES

The curriculum description for this IB course is provided at http://www.ibo.org/en/programmes/.

GENERAL INFORMATION

Course Number: 2001375

Number of Credits: One (1) credit

Course Type: Core Academic Course

Course Status: Course Approved

Grade Level(s): 9,10,11,12

Graduation Requirement: Equally Rigorous Science

Course Path: Section: Grades PreK to 12 Education Courses > Grade Group: Grades 9 to 12 and Adult Education Courses > Subject: Science > SubSubject: Environmental Science

Abbreviated Title: IB ENV SYS & SOC 2

Course Length: Year (Y)

Course Attributes:
• International Baccalaureate (IB)

Course Level: 3

Educator Certifications

| Science (Secondary Grades 7-12) |
| Biology (Grades 6-12)          |
| Chemistry (Grades 6-12)        |
| Earth/Space Science (Grades 6-12) |
Advanced Placement Environmental Science (#2001380) 2014 - And Beyond (current)

General Course Information and Notes

GENERAL NOTES

The course description for this Advanced Placement courses is located on the College Board site at http://apcentral.collegeboard.com/apc/public/courses/teachers_corner/index.html.

GENERAL INFORMATION

- **Course Number:** 2001380
- **Course Path:** Section: Grades PreK to 12 Education Courses > Grade Group: Grades 9 to 12 and Adult Education Courses > Subject: Science > SubSubject: Environmental Science
- **Abbreviated Title:** AP ENV SCI
- **Course Length:** Year (Y)
- **Course Attributes:**
  - Advanced Placement (AP)
- **Course Level:** 3
- **Number of Credits:** One (1) credit
- **Course Type:** Core Academic Course
- **Course Status:** Course Approved
- **Grade Level(s):** 9, 10, 11, 12
- **Graduation Requirement:** Equally Rigorous Science

Educator Certifications

- Science (Secondary Grades 7-12)
- Biology (Grades 6-12)
- Chemistry (Grades 6-12)
- Earth/Space Science (Grades 6-12)
Cambridge AICE Environmental Management AS Level (#2001381) 2014 - And Beyond (current)

General Course Information and Notes

GENERAL NOTES

For more information about this Cambridge course, visit http://www.cie.org.uk/programmes-and-qualifications/cambridge-advanced/cambridge-international-as-and-a-levels/curriculum/.

GENERAL INFORMATION

Course Number: 2001381
Course Path: Section: Grades PreK to 12 Education Courses > Grade Group: Grades 9 to 12 and Adult Education Courses > Subject: Science > SubSubject: Environmental Science > Abbreviated Title: AICE ENV MGMNT AS
Course Length: Year (Y)
Course Attributes:
- Advanced International Certificate of Education (AICE)
Course Level: 3
Number of Credits: One (1) credit

Graduation Requirement: Equally Rigorous Science

Educator Certifications

| Science (Secondary Grades 7-12) |
| Biology (Grades 6-12) |
| Earth/Space Science (Grades 6-12) |
| Chemistry (Grades 6-12) |
General Course Information and Notes

GENERAL NOTES


GENERAL INFORMATION

Course Number: 2001390

Course Length: Year (Y)

Course Attributes:
- Advanced International Certificate of Education (AICE)

Course Level: 3

Course Status: Course Approved

Graduation Requirement: Equally Rigorous Science

Number of Credits: One (1) credit

Course Type: Core Academic Course

Grade Level(s): 9,10,11,12

Educator Certifications

<table>
<thead>
<tr>
<th>Subject</th>
<th>Grade Group</th>
</tr>
</thead>
<tbody>
<tr>
<td>Science (Secondary Grades 7-12)</td>
<td>Grades PreK to 12 Education Courses &gt; Grade Group: Grades 9 to 12 and Adult Education Courses &gt; Subject: Science &gt; SubSubject: Integrated Sciences &gt;</td>
</tr>
<tr>
<td>Biology (Grades 6-12)</td>
<td></td>
</tr>
<tr>
<td>Physics (Grades 6-12)</td>
<td></td>
</tr>
<tr>
<td>Chemistry (Grades 6-12)</td>
<td></td>
</tr>
</tbody>
</table>
General Course Information and Notes

GENERAL NOTES


GENERAL INFORMATION

Course Number: 2001400

Course Path: Section: Grades PreK to 12 Education Courses > Grade Group: Grades 9 to 12 and Adult Education Courses > Subject: Science > SubSubject: Integrated Sciences > Abbreviated Title: PRE-AICE COORSCI 2IG

Number of Credits: One (1) credit

Course Length: Year (Y)

Course Attributes:
- Advanced International Certificate of Education (AICE)

Course Type: Core Academic Course

Course Status: Course Approved

Grade Level(s): 9,10,11,12

Graduation Requirement: Equally Rigorous Science

Educator Certifications

<table>
<thead>
<tr>
<th>Science (Secondary Grades 7-12)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Biology (Grades 6-12)</td>
</tr>
<tr>
<td>Physics (Grades 6-12)</td>
</tr>
<tr>
<td>Chemistry (Grades 6-12)</td>
</tr>
</tbody>
</table>
General Course Information and Notes

**GENERAL NOTES**


**GENERAL INFORMATION**

- **Course Number:** 2001405
- **Course Attributes:** Advanced International Certificate of Education (AICE)
- **Course Path:** Section: Grades PreK to 12 Education Courses > Grade Group: Grades 9 to 12 and Adult Education Courses > Subject: Science > SubSubject: Integrated Sciences
- **Abbreviated Title:** PRE-AICE COMB SCI IG
- **Course Length:** Year (Y)
- **Course Type:** Core Academic Course
- **Course Status:** Course Approved
- **Grade Level(s):** 9, 10, 11, 12
- **Graduation Requirement:** Equally Rigorous Science
- **Number of Credits:** One (1) credit
- **Course Level:** 3

**Educator Certifications**

<table>
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<tr>
<td>Physics (Grades 6-12)</td>
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<tr>
<td>Chemistry (Grades 6-12)</td>
</tr>
</tbody>
</table>
General Course Information and Notes

**GENERAL NOTES**

The curriculum description for this IB course is provided at http://www.ibo.org/en/programmes/.

**GENERAL INFORMATION**

- **Course Number:** 2001810
- **Course Path:** Section: Grades PreK to 12 Education Courses > Grade Group: Grades 9 to 12 and Adult Education Courses > Subject: Science > SubSubject: Earth/Space Sciences
- **Abbreviated Title:** IB ASTRONOMY 2
- **Number of Credits:** One (1) credit
- **Course Type:** Core Academic Course
- **Course Status:** Course Approved
- **Grade Level(s):** 9,10,11,12
- **Graduation Requirement:** Equally Rigorous Science
- **Course Length:** Year (Y)
- **Course Attributes:**
  - International Baccalaureate (IB)
- **Course Level:** 3

**Educator Certifications**

- Science (Secondary Grades 7-12)
- Physics (Grades 6-12)
- Earth/Space Science (Grades 6-12)
- Middle Grades General Science (Middle Grades 5-9)
International Baccalaureate Sports Exercise Science
1 (#2001820) 2014 - And Beyond (current)

General Course Information and Notes

GENERAL NOTES

The curriculum description for this IB course is provided at http://www.ibo.org/en/programmes/.

GENERAL INFORMATION

Course Number: 2001820

Course Path: Section: Grades PreK to 12 Education Courses > Grade Group: Grades 9 to 12 and Adult Education Courses > Subject: Science > SubSubject: Integrated Sciences > Abbreviated Title: IB SPORTS EXER SCI 1

Course Length: Year (Y)

Course Attributes:
- International Baccalaureate (IB)

Course Level: 3

Number of Credits: One (1) credit

Course Type: Core Academic Course

Course Status: Course Approved

Grade Level(s): 9,10,11,12

Graduation Requirement: Equally Rigorous Science

Educator Certifications

Physical Education (Grades 6-12)

Physical Education (Elementary and Secondary Grades K-12)
General Course Information and Notes

GENERAL NOTES

The curriculum description for this IB course is provided at http://www.ibo.org/en/programmes/.

GENERAL INFORMATION

Course Number: 2001830

Course Path: Section: Grades PreK to 12 Education Courses > Grade Group: Grades 9 to 12 and Adult Education Courses > Subject: Science > SubSubject: Integrated Sciences >

Abbreviated Title: IB SPORTS EXER SCI 2

Course Length: Year (Y)

Course Attributes:
- International Baccalaureate (IB)

Course Level: 3

Number of Credits: One (1) credit

Grade Level(s): 9,10,11,12

Graduation Requirement: Equally Rigorous Science

Educator Certifications

<table>
<thead>
<tr>
<th>Physical Education (Grades 6-12)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Physical Education (Elementary and Secondary Grades K-12)</td>
</tr>
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</table>
General Course Information and Notes

VERSION DESCRIPTION

The curriculum description for this IB course is provided at http://www.ibo.org/en/programmes/.

GENERAL INFORMATION

Course Number: 2001835
Number of Credits: One (1) credit
Course Type: Core Academic Course
Course Status: Course Approved
Grade Level(s): 9,10,11,12
Graduation Requirement: Equally Rigorous Science

Course Path: Section: Grades PreK to 12 Education Courses > Grade Group: Grades 9 to 12 and Adult Education Courses > Subject: Science > SubSubject: Integrated Sciences >
Abbreviated Title: IB SPORTS EXER SCI 3
Course Length: Year (Y)
Course Attributes:
- International Baccalaureate (IB)
Course Level: 3

Educator Certifications

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<tr>
<th>Physical Education (Grades 6-12)</th>
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<tbody>
<tr>
<td>Physical Education (Elementary and Secondary Grades K-12)</td>
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<tr>
<td>Biology (Grades 6-12)</td>
</tr>
</tbody>
</table>
## Experimental Science 1 Honors (#2002340) 2015 - 2022 (current)

### Course Standards

<table>
<thead>
<tr>
<th>Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>LAFS.910.RST.1.1:</td>
<td>Cite specific textual evidence to support analysis of science and technical texts, attending to the precise details of explanations or descriptions.</td>
</tr>
<tr>
<td>LAFS.910.RST.1.2:</td>
<td>Determine the central ideas or conclusions of a text; trace the text's explanation or depiction of a complex process, phenomenon, or concept; provide an accurate summary of the text.</td>
</tr>
<tr>
<td>LAFS.910.RST.1.3:</td>
<td>Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks, attending to special cases or exceptions defined in the text.</td>
</tr>
<tr>
<td>LAFS.910.RST.1.4:</td>
<td>Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 9-10 texts and topics.</td>
</tr>
<tr>
<td>LAFS.910.RST.2.5:</td>
<td>Analyze the structure of the relationships among concepts in a text, including relationships among key terms (e.g., force, friction, reaction force, energy).</td>
</tr>
<tr>
<td>LAFS.910.RST.2.6:</td>
<td>Analyze the author's purpose in providing an explanation, describing a procedure, or discussing an experiment in a text, defining the question the author seeks to address.</td>
</tr>
<tr>
<td>LAFS.910.RST.3.7:</td>
<td>Translate quantitative or technical information expressed in words in a text into visual form (e.g., a table or chart) and translate information expressed visually or mathematically (e.g., in an equation) into words.</td>
</tr>
<tr>
<td>LAFS.910.RST.3.8:</td>
<td>Assess the extent to which the reasoning and evidence in a text support the author's claim or a recommendation for solving a scientific or technical problem.</td>
</tr>
<tr>
<td>LAFS.910.RST.3.9:</td>
<td>Compare and contrast findings presented in a text to those from other sources (including their own experiments), noting when the findings support or contradict previous explanations or accounts.</td>
</tr>
<tr>
<td>LAFS.910.RST.4.10:</td>
<td>By the end of grade 10, read and comprehend science/technical texts in the grades 9-10 text complexity band independently and proficiently.</td>
</tr>
<tr>
<td>LAFS.910.SL.1.1:</td>
<td>Initiate and participate effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grades 9-10 topics, texts, and issues, building on others' ideas and expressing their own clearly and persuasively.</td>
</tr>
<tr>
<td>LAFS.910.SL.1.2:</td>
<td>Come to discussions prepared, having read and researched material under study; explicitly draw on that preparation by referring to evidence from texts and other research on the topic or issue to stimulate a thoughtful, well-reasoned exchange of ideas.</td>
</tr>
<tr>
<td>LAFS.910.SL.1.3:</td>
<td>Work with peers to set rules for collegial discussions and decision-making (e.g., informal consensus, taking votes on key issues, presentation of alternate views), clear goals and deadlines, and individual roles as needed.</td>
</tr>
<tr>
<td>LAFS.910.SL.1.4:</td>
<td>Propel conversations by posing and responding to questions that relate the current discussion to broader themes or larger ideas; actively incorporate others into the discussion; and clarify, verify, or challenge ideas and conclusions.</td>
</tr>
<tr>
<td>LAFS.910.SL.1.5:</td>
<td>Respond thoughtfully to diverse perspectives, summarize points of agreement and disagreement, and, when warranted, qualify or justify their own views and understanding and make new connections in light of the evidence and reasoning presented.</td>
</tr>
<tr>
<td>LAFS.910.SL.1.6:</td>
<td>Integrate multiple sources of information presented in diverse media or formats (e.g., visually, quantitatively, orally) evaluating the credibility and accuracy of each source.</td>
</tr>
<tr>
<td>LAFS.910.SL.1.7:</td>
<td>Evaluate a speaker's point of view, reasoning, and use of evidence and rhetoric, identifying any fallacious reasoning or exaggerated or distorted evidence.</td>
</tr>
<tr>
<td>LAFS.910.SL.2.4:</td>
<td>Present information, findings, and supporting evidence clearly, concisely, and logically such that listeners can follow the line of reasoning and the organization, development, substance, and style are appropriate to purpose, audience, and task.</td>
</tr>
<tr>
<td>LAFS.910.SL.2.5:</td>
<td>Make strategic use of digital media (e.g., textual, graphical, audio, visual, and interactive elements) in presentations to enhance understanding of findings, reasoning, and evidence and to add interest.</td>
</tr>
<tr>
<td>LAFS.910.WHST.1.1:</td>
<td>Write arguments focused on discipline-specific content.</td>
</tr>
<tr>
<td>LAFS.910.WHST.1.2:</td>
<td>Introduce precise claim(s), distinguish the claim(s) from alternate or opposing claims, and create an organization that establishes clear relationships among the claim(s), counterclaims, reasons, and evidence.</td>
</tr>
<tr>
<td>LAFS.910.WHST.1.3:</td>
<td>Develop claim(s) and counterclaims fairly, supplying data and evidence for each while pointing out the strengths and limitations of both claim(s) and counterclaims in a discipline-appropriate form and in a manner that anticipates the audience's knowledge level and concerns.</td>
</tr>
<tr>
<td>LAFS.910.WHST.1.4:</td>
<td>Use words, phrases, and clauses to link the major sections of the text, create cohesion, and clarify the relationships between claim(s) and reasons, between reasons and evidence, and between claim(s) and counterclaims.</td>
</tr>
<tr>
<td>LAFS.910.WHST.1.5:</td>
<td>Establish and maintain a formal style and objective tone while attending to the norms and conventions of the discipline in which they are writing.</td>
</tr>
<tr>
<td>LAFS.910.WHST.1.6:</td>
<td>Provide a concluding statement or section that follows from or supports the argument presented.</td>
</tr>
<tr>
<td>LAFS.910.WHST.2.4:</td>
<td>Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes.</td>
</tr>
<tr>
<td>LAFS.910.WHST.2.5:</td>
<td>Introduce a topic and organize ideas, concepts, and information to make important connections and distinctions; include formatting (e.g., headings), graphics (e.g., figures, tables), and multimedia when useful to aiding comprehension.</td>
</tr>
<tr>
<td>LAFS.910.WHST.2.6:</td>
<td>Develop the topic with well-chosen, relevant, and sufficient facts, extended definitions, concrete details, quotations, or other information and examples appropriate to the audience's knowledge of the topic.</td>
</tr>
<tr>
<td>LAFS.910.WHST.2.7:</td>
<td>Use varied transitions and sentence structures to link the major sections of the text, create cohesion, and clarify the relationships among ideas and concepts.</td>
</tr>
<tr>
<td>LAFS.910.WHST.2.8:</td>
<td>Use precise language and domain-specific vocabulary to manage the complexity of the topic and convey a style appropriate to the discipline and context as well as to the expertise of likely readers.</td>
</tr>
<tr>
<td>LAFS.910.WHST.2.9:</td>
<td>Establish and maintain a formal style and objective tone while attending to the norms and conventions of the discipline in which they are writing.</td>
</tr>
<tr>
<td>LAFS.910.WHST.2.10:</td>
<td>Provide a concluding statement or section that follows from and supports the information or explanation presented (e.g., articulating implications or the significance of the topic).</td>
</tr>
<tr>
<td>LAFS.910.WHST.3.1:</td>
<td>Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.</td>
</tr>
<tr>
<td>LAFS.910.WHST.3.2:</td>
<td>Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience.</td>
</tr>
</tbody>
</table>
Use technology, including the Internet, to produce, publish, and update individual or shared writing products, taking advantage of technology's capacity to link to other information and to display information flexibly and dynamically.

Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation.

Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the usefulness of each source in answering the research question; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and following a standard format for citation.

Draw evidence from informational texts to support analysis, reflection, and research.

Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose a level of accuracy appropriate to limitations on measurement when reporting quantities.

LAFS.910.WHST.2.6: Use technology, including the Internet, to produce, publish, and update individual or shared writing products, taking advantage of technology's capacity to link to other information and to display information flexibly and dynamically.

MAFS.K12.MP.4.1: Mathematically proficient students can apply the mathematics they know to solve problems arising in everyday life, society, and the workplace. In early grades, this might be as simple as writing an addition equation to describe a situation. In middle grades, a student might apply proportional reasoning to plan a school event or analyze a problem in the community. By high school, a student might use geometry to solve a design problem or use a function to describe how one quantity of interest depends on another. Mathematically proficient students who can apply what they know are comfortable making assumptions and approximations to simplify a complicated situation, realizing that these may need revision later. They are able to identify important quantities in a practical situation and map their relationships using such tools as diagrams, two-way tables, graphs, flowcharts and formulas. They can analyze those relationships mathematically to draw conclusions. They routinely interpret their mathematical results in the context of the situation and reflect on whether the results make sense, possibly improving the model if it has not served its purpose.

LAFS.910.WHST.3.9: Write routinely over extended time frames (time for reflection and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences.

LAFS.910.WHST.4.10: Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases.

MP SK.12.MP.1.1: Mathematics proficient students start by explaining to themselves the meaning of a problem and looking for entry points to its solution. They analyze givens, constraints, relationships, and goals. They make conjectures about the form and meaning of the solution and plan a solution pathway rather than simply jumping into a solution attempt. They consider analogous problems, and try special cases and simpler forms of the original problem in order to gain insight into its solution. They monitor and evaluate their progress and change course if necessary. Older students might, depending on the context of the problem, transform algebraic expressions or change the viewing window on their graphing calculator to get the information they need. Mathematically proficient students can explain correspondences between equations, verbal descriptions, tables, and graphs or draw diagrams of important features and relationships, graph data, and search for regularity or trends. Younger students might rely on using concrete objects or pictures to help conceptualize and solve a problem. Mathematically proficient students check their answers to problems using a different method, and they continually ask themselves, “Does this make sense?” They can understand the approaches of others to solving complex problems and identify correspondences between different approaches.

MAFS.912.F-IF.3.7: \text{a.} \text{Graph linear and quadratic functions and show intercepts, maxima, and minima.} \\
\text{b.} \text{Graph square root, cube root, and piecewise-defined functions, including step functions and absolute value functions.} \\
\text{c.} \text{Graph polynomial functions, identifying zeros when suitable factorizations are available, and showing end behavior.} \\
\text{d.} \text{Graph rational functions, identifying zeros and asymptotes when suitable factorizations are available, and showing end behavior.} \\
\text{e.} \text{Graph exponential and logarithmic functions, showing intercepts and end behavior, and trigonometric functions, showing period, midline, and amplitude, and using phase shift.}

MAFS.912.N-Q.1.1: Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays.

MAFS.912.N-Q.1.3: Choose a level of accuracy appropriate to limitations on measurement when reporting quantities.

MAFS.912.S-IC.2.3: Recognize the purposes of and differences among sample surveys, experiments, and observational studies; explain how randomization relates to each.

MAFS.912.S-IC.2.6: Evaluate reports based on data.

Make sense of problems and persevere in solving them.

Mathematically proficient students start by explaining to themselves the meaning of a problem and looking for entry points to its solution. They analyze givens, constraints, relationships, and goals. They make conjectures about the form and meaning of the solution and plan a solution pathway rather than simply jumping into a solution attempt. They consider analogous problems, and try special cases and simpler forms of the original problem in order to gain insight into its solution. They monitor and evaluate their progress and change course if necessary. Older students might, depending on the context of the problem, transform algebraic expressions or change the viewing window on their graphing calculator to get the information they need. Mathematically proficient students can explain correspondences between equations, verbal descriptions, tables, and graphs or draw diagrams of important features and relationships, graph data, and search for regularity or trends. Younger students might rely on using concrete objects or pictures to help conceptualize and solve a problem. Mathematically proficient students check their answers to problems using a different method, and they continually ask themselves, “Does this make sense?” They can understand the approaches of others to solving complex problems and identify correspondences between different approaches.

Reason abstractly and quantitatively.

Mathematically proficient students make sense of quantities and their relationships in problem situations. They bring two complementary abilities to bear on problems involving quantitative relationships: the ability to decontextualize—to abstract a given situation and represent it symbolically and manipulate the representing symbols as if they have a life of their own, without necessarily attending to their referents—and the ability to contextualize, to pause as needed during the manipulation process in order to probe into the referents for the symbols involved. Quantitative reasoning entails habits of creating a coherent representation of the problem at hand; considering the units involved; attending to the meanings of quantities, not just how to compute them; and knowing and flexing using different properties of operations and objects.

Construct viable arguments and critique the reasoning of others.

Mathematically proficient students understand and use stated assumptions, definitions, and previously established results in constructing arguments. They make conjectures and build a logical progression of statements to explore the truth of their conjectures. They are able to analyze situations by breaking them into cases, and can recognize and use counterexamples. They justify their conclusions, communicate them to others, and respond to the arguments of others. They reason inductively about data, making plausible arguments that take into account the context from which the data arose. Mathematically proficient students are also able to compare the effectiveness of two plausible arguments, distinguish correct logic or reasoning from that which is flawed, and—if there is a flaw in an argument—explain what it is. Elementary students can construct arguments using concrete referents such as objects, drawings, diagrams, and actions. Such arguments can make sense and be correct, even though they are not generalized or made formal until later grades. Later, students learn to determine domains to which an argument applies. Students at all grades can listen or read the arguments of others, decide whether they make sense, and ask useful questions to clarify or improve the arguments.

Model with mathematics.

Mathematically proficient students can apply the mathematics they know to solve problems arising in everyday life, society, and the workplace. In early grades, this might be as simple as writing an addition equation to describe a situation. In middle grades, a student might apply proportional reasoning to plan a school event or analyze a problem in the community. By high school, a student might use geometry to solve a design problem or use a function to describe how one quantity of interest depends on another. Mathematically proficient students who can apply what they know are comfortable making assumptions and approximations to simplify a complicated situation, realizing that these may need revision later. They are able to identify important quantities in a practical situation and map their relationships using such tools as diagrams, two-way tables, graphs, flowcharts and formulas. They can analyze those relationships mathematically to draw conclusions. They routinely interpret their mathematical results in the context of the situation and reflect on whether the results make sense, possibly improving the model if it has not served its purpose.

Use appropriate tools strategically.

Mathematically proficient students consider the available tools when solving a mathematical problem. These tools might include pencil and paper,
Describe and explain what characterizes science and its methods.

Mathematically proficient students try to communicate precisely to others. They try to use clear definitions in discussion with others and in their own reasoning. They state the meaning of the symbols they choose, including using the equal sign consistently and appropriately. They are careful about specifying units of measure, and labeling axes to clarify the correspondence with quantities in a problem. They calculate accurately and efficiently, express numerical answers with a degree of precision appropriate for the problem context. In the elementary grades, students give carefully formulated explanations to each other. By the time they reach high school they have learned to examine claims and make explicit use of definitions.

Mathematically proficient students look closely to discern a pattern or structure. Young students, for example, might notice that three and seven more is the same amount as seven and three more, or they may sort a collection of shapes according to how many sides the shapes have. Later, students will see 7 x 8 equals the well remembered 5 x 7 + 7 x 3, in preparation for learning about the distributive property. In the expression x² + 9x + 14, older students can see the 14 as 2 x 7 and the 9 as 2 + 7. They recognize the significance of an existing line in a geometric figure and can use the strategy of drawing an auxiliary line for solving problems. They also can step back for an overview and shift perspective. They see complicated things, such as some algebraic expressions, as single objects or as being composed of several objects. For example, they can see 5 – 3(x – y²) as 5 minus a positive number times a square and use that to realize that its value cannot be more than 5 for any real numbers x and y.

Look for and express regularity in repeated reasoning.

Mathematically proficient students notice when calculations are repeated, and look both for general methods and for shortcuts. Upper elementary students might notice when dividing 25 by 11 that they are repeating the same calculations over and over again, and conclude they have a repeating decimal. By paying attention to the calculation of slope as they repeatedly check whether points are on the line through (1, 2) with slope 3, middle school students might abstract the equation (y – 2)/(x – 1) = 3. Noticing the regularity in the way terms cancel when expanding (x – 1)(x² + x + 1), (x – 1)(x³ + x² + x + 1), and (x – 1)(x⁴ + x³ + x² + x + 1) might lead them to the general formula for the sum of a geometric series. As they work to solve a problem, mathematically proficient students maintain oversight of the process, while attending to the details. They continually evaluate the reasonableness of their intermediate results.

Define a problem based on a specific body of knowledge, for example: biology, chemistry, physics, and earth/space science, and do the following:

1. Pose questions about the natural world, (Articulate the purpose of the investigation and identify the relevant scientific concepts).
2. Conduct systematic observations, (Write procedures that are clear and replicable. Identify observables and examine relationships between test (independent) variable and outcome (dependent) variable. Employ appropriate methods for accurate and consistent observations; conduct and record measurements at appropriate levels of precision. Follow safety guidelines).
3. Examine books and other sources of information to see what is already known,
4. Review what is known in light of empirical evidence, (Examine whether available empirical evidence can be interpreted in terms of existing knowledge and models, and if not, modify or develop new models).
5. Plan investigations, (Design and evaluate a scientific investigation).
6. Use tools to gather, analyze, and interpret data (this includes the use of measurement in metric and other systems, and also the generation and interpretation of graphical representations of data, including data tables and graphs), (Collect data or evidence in an organized way. Properly use instruments, equipment, and materials (e.g., scales, probeware, meter sticks, microscopes, computers) including set-up, calibration, technique, maintenance, and storage).
7. Pose answers, explanations, or descriptions of events,
8. Generate explanations that explicate or describe natural phenomena (inferences),
9. Use appropriate evidence and reasoning to justify these explanations to others,
10. Communicate results of scientific investigations, and
11. Evaluate the merits of the explanations produced by others.
GENERAL NOTES

In addition to the course related benchmarks, this course requires additional science content that must include benchmarks from at least one other Body of Knowledge. The additional benchmarks must include rigor appropriate for Level 3 courses. Laboratory investigations that include the use of scientific inquiry, research, measurement, problem solving, laboratory apparatus and technologies, experimental procedures, and safety procedures are an integral part of this course. The National Science Teachers Association (NSTA) recommends that at the high school level, all students should be in the science lab or field, collecting data every week. School laboratory investigations (labs) are defined by the National Research Council (NRC) as an experience in the laboratory, classroom, or the field that provides students with opportunities to interact directly with natural phenomena or with data collected by others using tools, materials, data collection techniques, and models (NRC, 2006, p. 3). Laboratory investigations in the high school classroom should help all students develop a growing understanding of the complexity and ambiguity of empirical work, as well as the skills to calibrate and troubleshoot equipment used to make observations. Learners should understand measurement error; and have the skills to aggregate, interpret, and present the resulting data (National Research Council, 2006, p.77; NSTA, 2007).

Special Notes:

Special Notes:

Instructional Practices
Teaching from a range of complex text is optimized when teachers in all subject areas implement the following strategies on a routine basis:

1. Ensuring wide reading from complex text that varies in length.
2. Making close reading and rereading of texts central to lessons.
3. Emphasizing text-specific complex questions, and cognitively complex tasks, reinforce focus on the text and cultivate independence.
4. Emphasizing students supporting answers based upon evidence from the text.
5. Providing extensive research and writing opportunities (claims and evidence).


- Asking questions (for science) and defining problems (for engineering).
- Developing and using models.
- Planning and carrying out investigations.
- Analyzing and interpreting data.
- Using mathematics, information and computer technology, and computational thinking.
- Constructing explanations (for science) and designing solutions (for engineering).
- Engaging in argument from evidence.
- Obtaining, evaluating, and communicating information.

Honors and Advanced Level Course Note: Advanced courses require a greater demand on students through increased academic rigor. Academic rigor is obtained through the application, analysis, evaluation, and creation of complex ideas that are often abstract and multi-faceted. Students are challenged to think and collaborate critically on the content they are learning. Honors level rigor will be achieved by increasing text complexity through text selection, focus on high-level qualitative measures, and complexity of task. Instruction will be structured to give students a deeper understanding of conceptual themes and organization within and across disciplines. Academic rigor is more than simply assigning to students a greater quantity of work.

Literacy Standards in Science

Secondary science courses include reading standards for literacy in science and technical subjects 6-12 and writing standards for literacy in history/social studies, science, and technical subjects 6-12. The courses also include speaking and listening standards. For a complete list of standards required for this course click on the blue tile labeled course standards. You may also download the complete course including all required standards and notes sections using the export function located at the top of this page.

English Language Development ELD Standards Special Notes Section:

Teachers are required to provide listening, speaking, reading and writing instruction that allows English language learners (ELL) to communicate information, ideas and concepts for academic success in the content area of Science. For the given level of English language proficiency and with visual, graphic, or interactive support, students will interact with grade level words, expressions, sentences and discource to process or produce language necessary for academic success. The ELD standard should specify a relevant content area concept or topic of study chosen by curriculum developers and teachers which maximizes an ELL's need for communication and social skills. To access an ELL supporting document which delineates performance definitions and descriptors, please click on the following link:

https://cpalmsmediaprod.blob.core.windows.net/uploads/docs/standards/eld/sc.pdf

GENERAL INFORMATION

Course Number: 2002340
Number of Credits: One (1) credit
Course Type: Elective Course
Course Status: Course Approved
Grade Level(s): 9,10,11,12

Course Path: Section: Grades PreK to 12 Education
Courses > Grade Group: Grades 9 to 12 and Adult Education Courses > Subject: Science > SubSubject: General Sciences
Abbreviated Title: EXP SCI 1 HON
Course Length: Year (Y)
Course Attributes:
- Honors
Course Level: 3
## Educator Certifications

<table>
<thead>
<tr>
<th>Certification</th>
<th>Grade Range</th>
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</thead>
<tbody>
<tr>
<td>Biology</td>
<td>Grades 6-12</td>
</tr>
<tr>
<td>Earth/Space Science</td>
<td>Grades 6-12</td>
</tr>
<tr>
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<tr>
<td>Physics</td>
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</tbody>
</table>
Course Standards

Name | Description
--- | ---
SC.912.N.1.1: | Define a problem based on a specific body of knowledge, for example: biology, chemistry, physics, and earth/space science, and do the following:
1. Pose questions about the natural world, (Articulate the purpose of the investigation and identify the relevant scientific concepts).
2. Conduct systematic observations, (Write procedures that are clear and replicable. Identify observables and examine relationships between test (independent) variable and outcome (dependent) variable. Employ appropriate methods for accurate and consistent observations; conduct and record measurements at appropriate levels of precision. Follow safety guidelines).
3. Examine books and other sources of information to see what is already known,
4. Review what is known in light of empirical evidence, (Examine whether available empirical evidence can be interpreted in terms of existing knowledge and models, and if not, modify or develop new models).
5. Plan investigations, (Design and evaluate a scientific investigation).
6. Use tools to gather, analyze, and interpret data (this includes the use of measurement in metric and other systems, and also the generation and interpretation of graphical representations of data, including data tables and graphs), (Collect data or evidence in an organized way. Properly use instruments, equipment, and materials (e.g., scales, probeware, meter sticks, microscopes, computers) including set-up, calibration, technique, maintenance, and storage).
7. Pose answers, explanations, or descriptions of events,
8. Generate explanations that explicate or describe natural phenomena (inferences),
9. Use appropriate evidence and reasoning to justify these explanations to others,
10. Communicate results of scientific investigations, and
11. Evaluate the merits of the explanations produced by others.

SC.912.N.2.4: | Explain that scientific knowledge is both durable and robust and open to change. Scientific knowledge can change because it is often examined and re-examined by new investigations and scientific argumentation. Because of these frequent examinations, scientific knowledge becomes stronger, leading to its durability.

SC.912.N.2.5: | Describe instances in which scientists' varied backgrounds, talents, interests, and goals influence the inferences and thus the explanations that they make about observations of natural phenomena and describe that competing interpretations (explanations) of scientists are a strength of science as they are a source of new, testable ideas that have the potential to add new evidence to support one or another of the explanations.

SC.912.N.3.1: | Explain that a scientific theory is the culmination of many scientific investigations drawing together all the current evidence concerning a substantial range of phenomena; thus, a scientific theory represents the most powerful explanation scientists have to offer.

SC.912.N.3.2: | Describe the role consensus plays in the historical development of a theory in any one of the disciplines of science.

SC.912.N.3.5: | Describe the function of models in science, and identify the wide range of models used in science.

SC.912.N.4.1: | Explain how scientific knowledge and reasoning provide an empirically-based perspective to inform society's decision making.

Mathematicians who participate in effortful learning both individually and with others:
- Analyze the problem in a way that makes sense given the task.
- Ask questions that will help with solving the task.
- Build perseverance by modifying methods as needed while solving a challenging task.
- Stay engaged and maintain a positive mindset when working to solve tasks.
- Help and support each other when attempting a new method or approach.

MA.K12.MTR.1.1: | Clarifications:
Teachers who encourage students to participate actively in effortful learning both individually and with others:
- Cultivate a community of growth mindset learners.
- Foster perseverance in students by choosing tasks that are challenging.
- Develop students' ability to analyze and problem solve.
- Recognize students' effort when solving challenging problems.

Demonstrate understanding by representing problems in multiple ways. Mathematicians who demonstrate understanding by representing problems in multiple ways:
- Build understanding through modeling and using manipulatives.
- Represent solutions to problems in multiple ways using objects, drawings, tables, graphs and equations.
- Progress from modeling problems with objects and drawings to using algorithms and equations.
- Express connections between concepts and representations.
- Choose a representation based on the given context or purpose.

MA.K12.MTR.2.1: | Clarifications:
Teachers who encourage students to demonstrate understanding by representing problems in multiple ways:
- Help students make connections between concepts and representations.
- Provide opportunities for students to use manipulatives when investigating concepts.
- Guide students from concrete to pictorial to abstract representations as understanding progresses.
- Show students that various representations can have different purposes and can be useful in different situations.

Complete tasks with mathematical fluency.
MA.K12.MTR.3.1: Mathematicians who complete tasks with mathematical fluency:
- Select efficient and appropriate methods for solving problems within the given context.
- Maintain flexibility and accuracy while performing procedures and mental calculations.
- Complete tasks accurately and with confidence.
- Adapt procedures to apply them to a new context.
- Use feedback to improve efficiency when performing calculations.

Clarifications:
Teachers who encourage students to complete tasks with mathematical fluency:
- Provide students with the flexibility to solve problems by selecting a procedure that allows them to solve efficiently and accurately.
- Offer multiple opportunities for students to practice efficient and generalizable methods.
- Provide opportunities for students to reflect on the method they used and determine if a more efficient method could have been used.

MA.K12.MTR.4.1: Engage in discussions that reflect on the mathematical thinking of self and others. Mathematicians who engage in discussions that reflect on the mathematical thinking of self and others:
- Communicate mathematical ideas, vocabulary and methods effectively.
- Analyze the mathematical thinking of others.
- Compare the efficiency of a method to those expressed by others.
- Recognize errors and suggest how to correctly solve the task.
- Justify results by explaining methods and processes.
- Construct possible arguments based on evidence.

Clarifications:
Teachers who encourage students to engage in discussions that reflect on the mathematical thinking of self and others:
- Establish a culture in which students ask questions of the teacher and their peers, and error is an opportunity for learning.
- Create opportunities for students to discuss their thinking with peers.
- Select, sequence and present student work to advance and deepen understanding of correct and increasingly efficient methods.
- Develop students' ability to justify methods and compare their responses to the responses of their peers.

MA.K12.MTR.5.1: Use patterns and structure to help understand and connect mathematical concepts. Mathematicians who use patterns and structure to help understand and connect mathematical concepts:
- Focus on relevant details within a problem.
- Create plans and procedures to logically order events, steps or ideas to solve problems.
- Decompose a complex problem into manageable parts.
- Relate previously learned concepts to new concepts.
- Look for similarities among problems.
- Connect solutions of problems to more complicated large-scale situations.

Clarifications:
Teachers who encourage students to use patterns and structure to help understand and connect mathematical concepts:
- Help students recognize the patterns in the world around them and connect these patterns to mathematical concepts.
- Support students to develop generalizations based on the similarities found among problems.
- Provide opportunities for students to create plans and procedures to solve problems.
- Develop students' ability to construct relationships between their current understanding and more sophisticated ways of thinking.

MA.K12.MTR.6.1: Assess the reasonableness of solutions. Mathematicians who assess the reasonableness of solutions:
- Estimate to discover possible solutions.
- Use benchmark quantities to determine if a solution makes sense.
- Check calculations when solving problems.
- Verify possible solutions by explaining the methods used.
- Evaluate results based on the given context.

Clarifications:
Teachers who encourage students to assess the reasonableness of solutions:
- Have students estimate or predict solutions prior to solving.
- Prompt students to continually ask, "Does this solution make sense? How do you know?"
- Reinforce that students check their work as they progress within and after a task.
- Strengthen students' ability to verify solutions through justifications.

MA.K12.MTR.7.1: Apply mathematics to real-world contexts. Mathematicians who apply mathematics to real-world contexts:
- Connect mathematical concepts to everyday experiences.
- Use models and methods to understand, represent and solve problems.
- Perform investigations to gather data or determine if a method is appropriate. • Redesign models and methods to improve accuracy or efficiency.

Clarifications:
Teachers who encourage students to apply mathematics to real-world contexts:
- Provide opportunities for students to create models, both concrete and abstract, and perform investigations.
- Challenge students to question the accuracy of their models and methods.
- Support students as they validate conclusions by comparing them to the given situation.
- Indicate how various concepts can be applied to other disciplines.

Cite evidence to explain and justify reasoning.
General Course Information and Notes

GENERAL NOTES

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4. Emphasizing students supporting answers based upon evidence from the text.
5. Providing extensive research and writing opportunities (claims and evidence).


- Asking questions (for science) and defining problems (for engineering).
- Developing and using models.
• Planning and carrying out investigations.
• Analyzing and interpreting data.
• Using mathematics, information and computer technology, and computational thinking.
• Constructing explanations (for science) and designing solutions (for engineering).
• Engaging in argument from evidence.
• Obtaining, evaluating, and communicating information.

Honors and Advanced Level Course Note: Advanced courses require a greater demand on students through increased academic rigor. Academic rigor is obtained through the application, analysis, evaluation, and creation of complex ideas that are often abstract and multi-faceted. Students are challenged to think and collaborate critically on the content they are learning. Honors level rigor will be achieved by increasing text complexity through text selection, focus on high-level qualitative measures, and complexity of task. Instruction will be structured to give students a deeper understanding of conceptual themes and organization within and across disciplines. Academic rigor is more than simply assigning to students a greater quantity of work.

Florida’s Benchmarks for Excellent Student Thinking (B.E.S.T.) Standards

This course includes Florida’s B.E.S.T. ELA Expectations (EE) and Mathematical Thinking and Reasoning Standards (MTRs) for students. Florida educators should intentionally embed these standards within the content and their instruction as applicable. For guidance on the implementation of the EEs and MTRs, please visit https://www.cpalms.org/Standards/BEST_Standards.aspx and select the appropriate B.E.S.T. Standards package.

English Language Development ELD Standards Special Notes Section:

Teachers are required to provide listening, speaking, reading and writing instruction that allows English language learners (ELL) to communicate information, ideas and concepts for academic success in the content area of Science. For the given level of English language proficiency and with visual, graphic, or interactive support, students will interact with grade level words, expressions, sentences and discourse to process or produce language necessary for academic success. The ELD standard should specify a relevant content area concept or topic of study chosen by curriculum developers and teachers which maximizes an ELL’s need for communication and social skills.

To access an ELL supporting document which delineates performance definitions and descriptors, please click on the following link:
https://cpalmsmediaprod.blob.core.windows.net/uploads/docs/standards/eld/sc.pdf

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**GENERAL INFORMATION**

**Course Number:** 2002340

**Course Path:** Section: Grades PreK to 12 Education
   Courses > Grade Group: Grades 9 to 12 and Adult Education
   Courses > Subject: Science > SubSubject: General Sciences

**Number of Credits:** One (1) credit

**Abbreviated Title:** EXP SCI 1 HON

**Course Length:** Year (Y)

**Course Attributes:**
• Honors

**Course Level:** 3

**Grade Level(s):** 9, 10, 11, 12

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**Educator Certifications**

<table>
<thead>
<tr>
<th>Biology (Grades 6-12)</th>
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</thead>
<tbody>
<tr>
<td>Earth/Space Science (Grades 6-12)</td>
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<tr>
<td>Chemistry (Grades 6-12)</td>
</tr>
<tr>
<td>Physics (Grades 6-12)</td>
</tr>
</tbody>
</table>
Experimental Science 2 Honors (#2002350) 2015 - 2022 (current)

### Course Standards

<table>
<thead>
<tr>
<th>Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>LAFS.910.RST.1.1:</td>
<td>Cite specific textual evidence to support analysis of science and technical texts, attending to the precise details of explanations or descriptions.</td>
</tr>
<tr>
<td>LAFS.910.RST.1.2:</td>
<td>Determine the central ideas or conclusions of a text; trace the text's explanation or depiction of a complex process, phenomenon, or concept; provide an accurate summary of the text.</td>
</tr>
<tr>
<td>LAFS.910.RST.1.3:</td>
<td>Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks, attending to special cases or exceptions defined in the text.</td>
</tr>
<tr>
<td>LAFS.910.RST.1.4:</td>
<td>Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 9-10 texts and topics.</td>
</tr>
<tr>
<td>LAFS.910.RST.1.5:</td>
<td>Analyze the structure of the relationships among concepts in a text, including relationships among key terms (e.g., force, friction, reaction force, energy).</td>
</tr>
<tr>
<td>LAFS.910.RST.2.6:</td>
<td>Analyze the author's purpose in providing an explanation, describing a procedure, or discussing an experiment in a text, defining the question the author seeks to address.</td>
</tr>
<tr>
<td>LAFS.910.RST.3.7:</td>
<td>Translate quantitative or technical information expressed in words in a text into visual form (e.g., a table or chart) and translate information expressed visually or mathematically (e.g., in an equation) into words.</td>
</tr>
<tr>
<td>LAFS.910.RST.3.8:</td>
<td>Assess the extent to which the reasoning and evidence in a text support the author's claim or a recommendation for solving a scientific or technical problem.</td>
</tr>
<tr>
<td>LAFS.910.RST.3.9:</td>
<td>Compare and contrast findings presented in a text to those from other sources (including their own experiments), noting when the findings support or contradict previous explanations or accounts.</td>
</tr>
<tr>
<td>LAFS.910.RST.4.10:</td>
<td>By the end of grade 10, read and comprehend science/technical texts in the grades 9-10 text complexity band independently and proficiently.</td>
</tr>
</tbody>
</table>

Initiate and participate effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grades 9-10 topics, texts, and issues, building on others' ideas and expressing their own clearly and persuasively.

- a. Come to conversations prepared, having read and researched material under study; explicitly draw on that preparation by referring to evidence from texts and other research on the topic or issue to stimulate a thoughtful, well-reasoned exchange of ideas.
- b. Work with peers to set rules for collegial discussions and decision-making (e.g., informal consensus, taking votes on key issues, presentation of alternate views), clear goals and deadlines, and individual roles as needed.
- c. Propel conversations by posing and responding to questions that relate the current discussion to broader themes or larger ideas; actively incorporate others into the discussion; and clarify, verify, or challenge ideas and conclusions.
- d. Respond thoughtfully to diverse perspectives, summarize points of agreement and disagreement, and, when warranted, qualify or justify their own views and understanding and make new connections in light of the evidence and reasoning presented.

Integrate multiple sources of information presented in diverse media or formats (e.g., visually, quantitatively, orally) evaluating the credibility and accuracy of each source.

Evaluate a speaker's point of view, reasoning, and use of evidence and rhetoric, identifying any fallacious reasoning or exaggerated or distorted evidence.

Present information, findings, and supporting evidence clearly, concisely, and logically such that listeners can follow the line of reasoning and the organization, development, substance, and style are appropriate to purpose, audience, and task.

Make strategic use of digital media (e.g., textual, graphical, audio, visual, and interactive elements) in presentations to enhance understanding of findings, reasoning, and evidence and to add interest.

Write arguments focused on discipline-specific content.

- a. Introduce precise claim(s), distinguish the claim(s) from alternate or opposing claims, and create an organization that establishes clear relationships among the claim(s), counterclaims, reasons, and evidence.
- b. Develop claim(s) and counterclaims fairly, supplying data and evidence for each while pointing out the strengths and limitations of both claim(s) and counterclaims in a discipline-appropriate form and in a manner that anticipates the audience's knowledge level and concerns.
- c. Use words, phrases, and clauses to link the major sections of the text, create cohesion, and clarify the relationships between claim(s) and reasons, between reasons and evidence, and between claim(s) and counterclaims.
- d. Establish and maintain a formal style and objective tone while attending to the norms and conventions of the discipline in which they are writing.
- e. Provide a concluding statement or section that follows from or supports the argument presented.

Write informative/explanatory texts, including the narration of historical events, scientific procedures/experiments, or technical processes.

- a. Introduce a topic and organize ideas, concepts, and information to make important connections and distinctions; include formatting (e.g., headings), graphics (e.g., figures, tables), and multimedia when useful to aiding comprehension.
- b. Develop the topic with well-chosen, relevant, and sufficient facts, extended definitions, concrete details, quotations, or other information and examples appropriate to the audience's knowledge of the topic.
- c. Use varied transitions and sentence structures to link the major sections of the text, create cohesion, and clarify the relationships among ideas and concepts.
- d. Use precise language and domain-specific vocabulary to manage the complexity of the topic and convey a style appropriate to the discipline and context as well as to the expertise of likely readers.
- e. Establish and maintain a formal style and objective tone while attending to the norms and conventions of the discipline in which they are writing.
- f. Provide a concluding statement or section that follows from and supports the information or explanation presented (e.g., articulating implications or the significance of the topic).

Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.

Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience.
Use technology, including the Internet, to produce, publish, and update individual or shared writing products, taking advantage of technology's capacity to link to other information and to display information flexibly and dynamically.

Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose a level of accuracy appropriate to limitations on measurement when reporting quantities.

Draw evidence from informational texts to support analysis, reflection, and research.

Recognize the purposes of and differences among sample surveys, experiments, and observational studies; explain how randomization relates to the arguments.

Write routinely over extended time frames (time for reflection and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences.

Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases. ★

- Graph linear and quadratic functions and show intercepts, maxima, and minima.
- Graph square root, cube root, and piecewise-defined functions, including step functions and absolute value functions.
- Graph polynomial functions, identifying zeros when suitable factorizations are available, and showing end behavior.
- Graph rational functions, identifying zeros and asymptotes when suitable factorizations are available, and showing end behavior.
- Graph exponential and logarithmic functions, showing intercepts and end behavior, and trigonometric functions, showing period, midline, and amplitude, and using phase shift.

Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays. ★

Choose a level of accuracy appropriate to limitations on measurement when reporting quantities. ★

Recognize the purposes of and differences among sample surveys, experiments, and observational studies; explain how randomization relates to each. ★

Evaluate reports based on data. ★

Mathematically proficient students start by explaining to themselves the meaning of a problem and looking for entry points to its solution. They analyze givens, constraints, relationships, and goals. They make conjectures about the form and meaning of the solution and plan a solution pathway rather than simply jumping into a solution attempt. They consider analogous problems, and try special cases and simpler forms of the original problem in order to gain insight into its solution. They monitor and evaluate their progress and change course if necessary. Older students might, depending on the context of the problem, transform algebraic expressions or change the viewing window on their graphing calculator to get the information they need. Mathematically proficient students can explain correspondences between equations, verbal descriptions, tables, and graphs or draw diagrams of important features and relationships, graph data, and search for regularity or trends. Younger students might rely on using concrete objects or pictures to help conceptualize and solve a problem. Mathematically proficient students check their answers to problems using a different method, and they continually ask themselves, "Does this make sense?" They can understand the approaches of others to solving complex problems and identify correspondences between different approaches.

Mathematically proficient students make sense of quantities and their relationships in problem situations. They bring two complementary abilities to bear on problems involving quantitative relationships: the ability to decontextualize—to abstract a given situation and represent it symbolically and manipulate the representing symbols as if they have a life of their own, without necessarily attending to their referents—and the ability to contextualize, to pause as needed during the manipulation process in order to probe into the referents for the symbols involved. Quantitative reasoning entails habits of creating a coherent representation of the problem at hand; considering the units involved; attending to the meaning of quantities, not just how to compute them; and knowing and flexibly using different properties of operations and objects.

Mathematically proficient students understand and use stated givens, constraints, relationships, and goals. They make conjectures about the form and meaning of the solution and plan a solution pathway rather than simply jumping into a solution attempt. They consider analogous problems, and try special cases and simpler forms of the original problem in order to gain insight into its solution. They monitor and evaluate their progress and change course if necessary. Older students might, depending on the context of the problem, transform algebraic expressions or change the viewing window on their graphing calculator to get the information they need. Mathematically proficient students can explain correspondences between equations, verbal descriptions, tables, and graphs or draw diagrams of important features and relationships, graph data, and search for regularity or trends. Younger students might rely on using concrete objects or pictures to help conceptualize and solve a problem. Mathematically proficient students check their answers to problems using a different method, and they continually ask themselves, "Does this make sense?" They can understand the approaches of others to solving complex problems and identify correspondences between different approaches.

Mathematically proficient students understand use stated assumptions, definitions, and previously established results in constructing arguments. They make conjectures and build a logical progression of statements to explore the truth of their conjectures. They are able to analyze situations by breaking them into cases, and can recognize and use counterexamples. They justify their conclusions, communicate them to others, and respond to the arguments of others. They reason inductively about data, making plausible arguments that take into account the context from which the data arose. Mathematically proficient students are also able to compare the effectiveness of two plausible arguments, distinguish correct logic or reasoning from that which is flawed, and—if there is a flaw in an argument—explain what it is. Elementary students can construct arguments using concrete referents such as objects, drawings, diagrams, and actions. Such arguments can make sense and be correct, even though they are not generalized or made formal until later grades. Later, students learn to determine domains to which an argument applies. Students at all grades can listen or read the arguments of others, decide whether they make sense, and ask useful questions to clarify or improve the arguments.

Mathematically proficient students apply the mathematics they know to solve problems arising in everyday life, society, and the workplace. In early grades, this might be as simple as writing an addition equation to describe a situation. In middle grades, a student might apply proportional reasoning to plan a school event or analyze a problem in the community. By high school, a student might use geometry to solve a design problem or use a function to describe how one quantity of interest depends on another. Mathematically proficient students who can apply what they know are comfortable making assumptions and approximations to simplify a complicated situation, realizing that these may need revision later. They are able to identify important quantities in a practical situation and map their relationships using such tools as diagrams, two-way tables, graphs, flowcharts and formulas. They can analyze those relationships mathematically to draw conclusions. They routinely interpret their mathematical results in the context of the situation and reflect on whether the results make sense, possibly improving the model if it has not served its purpose.

Mathematically proficient students consider the available tools when solving a mathematical problem. These tools might include pencil and paper,
concrete models, a ruler, a protractor, a calculator, a spreadsheet, a computer algebra system, a statistical package, or dynamic geometry software.

Proficient students are sufficiently familiar with tools appropriate for their grade or course to make sound decisions about when each of these tools might be helpful, recognizing both the insight to be gained and their limitations. For example, mathematically proficient high school students analyze graphs of functions and solutions generated using a graphing calculator. They detect possible errors by strategically using estimation and other mathematical knowledge. When making mathematical models, they know that technology can enable them to visualize the results of varying assumptions, explore consequences, and compare predictions with data. Mathematically proficient students at various grade levels are able to identify relevant external mathematical resources, such as digital content located on a website, and use them to pose or solve problems. They are able to use technological tools to explore and deepen their understanding of concepts.

**Standard Relation to Course: Supporting**

MAFS.K12.MP.5.1:

**Attend to precision.**

Mathematically proficient students try to communicate precisely to others. They try to use clear definitions in discussion with others and in their own reasoning. They state the meaning of the symbols they choose, including using the equal sign consistently and appropriately. They are careful about specifying units of measure, and labeling axes to clarify the correspondence with quantities in a problem. They calculate accurately and efficiently, express numerical answers with a degree of precision appropriate for the problem context. In the elementary grades, students give carefully formulated explanations to each other. By the time they reach high school they have learned to examine claims and make explicit use of definitions.

**Standard Relation to Course: Supporting**

MAFS.K12.MP.6.1:

**Look for and make use of structure.**

Mathematically proficient students look closely to discern a pattern or structure. Young students, for example, might notice that three and seven more is the same amount as seven and three more, or they may sort a collection of shapes according to how many sides the shapes have. Later, students will see 7 × 8 equals the well remembered 5 × 7 + 5 × 3, in preparation for learning about the distributive property. In the expression 2 × 9 × 1 + 1, older students can see the 14 as 2 × 7 and the 9 as 2 × 7. They recognize the significance of an existing line in a geometric figure and can use the strategy of drawing an auxiliary line for solving problems. They also can step back for an overview and shift perspective. They can see complicated things, such as some algebraic expressions, as single objects or as being composed of several objects. For example, they can see 5 – (3 × (y – 1)) as 5 minus a positive number times a square and use that to realize that its value cannot be more than 5 for any real numbers x and y.

**Standard Relation to Course: Supporting**

MAFS.K12.MP.7.1:

**Look for and express regularity in repeated reasoning.**

Mathematically proficient students notice if calculations are repeated, and look both for general methods and for shortcuts. Upper elementary students might notice when dividing 25 by 11 that they are repeating the same calculations over and over again, and conclude they have a repeating decimal. By paying attention to the calculation of slope as they repeatedly check whether points are on the line through (1, 2) with slope 3, middle school students might abstract the equation (y – 2)/(x – 1) = 3. Noticing the regularity in the way terms cancel when expanding (x – 1)(x + 1), (x – 1)(x^2 + x + 1), and (x – 1)(x^3 + x^2 + x + 1) might lead them to the general formula for the sum of a geometric series. As they work to solve a problem, mathematically proficient students maintain oversight of the process, while attending to the details. They continually evaluate the reasonableness of their intermediate results.

**Standard Relation to Course: Supporting**

SC.912.N.1.1.1:

**Define a problem based on a specific body of knowledge, for example:** biology, chemistry, physics, and earth/space science, and do the following:

1. Pose questions about the natural world, (Articulate the purpose of the investigation and identify the relevant scientific concepts).
2. Conduct systematic observations, (Write procedures that are clear and replicable. Identify observables and examine relationships between test (independent) variable and outcome (dependent) variable. Employ appropriate methods for accurate and consistent observations; conduct and record measurements at appropriate levels of precision. Follow safety guidelines).
3. Examine books and other sources of information to see what is already known,
4. Review what is known in light of empirical evidence, (Examine whether available empirical evidence can be interpreted in terms of existing knowledge and models, and if not, modify or develop new models).
5. Plan investigations, (Design and evaluate a scientific investigation).
6. Use tools to gather, analyze, and interpret data (this includes the use of measurement in metric and other systems, and also the generation and interpretation of graphical representations of data, including data tables and graphs), (Collect data or evidence in an organized way. Properly use instruments, equipment, and materials (e.g., scales, probeware, meter sticks, microscopes, computers) including setup, calibration, technique, maintenance, and storage).
7. Pose answers, explanations, or descriptions of events,
8. Generate explanations that explicate or describe natural phenomena (inferences),
9. Use appropriate evidence and reasoning to justify these explanations to others,
10. Communicate results of scientific investigations, and
11. Evaluate the merits of the explanations produced by others.

SC.912.N.1.2.2:

**Describe and explain what characterizes science and its methods.**

SC.912.N.1.3.3:

**Recognize that the strength or usefulness of a scientific claim is evaluated through scientific argumentation, which depends on critical and logical thinking, and the active construction of alternative explanations to explain the data presented.**

SC.912.N.1.6.4:

**Describe how scientific inferences are drawn from scientific observations and provide examples from the content being studied.**

SC.912.N.2.4.5:

**Explain that scientific knowledge is both durable and robust and open to change. Scientific knowledge can change because it is often examined and re-examined by new investigations and scientific argumentation. Because of these frequent examinations, scientific knowledge becomes stronger, leading to its durability.**

SC.912.N.2.5.6:

**Describe instances in which scientists’ varied backgrounds, talents, interests, and goals influence the inferences and thus the explanations that they make about observations of natural phenomena and describe that competing interpretations (explanations) of scientists are a strength of science as they are a source of new, testable ideas that have the potential to add new evidence to support one or another of the explanations.**

SC.912.N.3.1.7:

**Explain that a scientific theory is the culmination of many scientific investigations drawing together all the current evidence concerning a substantial range of phenomena; thus, a scientific theory represents the most powerful explanation scientists have to offer.**

SC.912.N.3.2.8:

**Describe the role consensus plays in the historical development of a theory in any one of the disciplines of science.**

SC.912.N.3.5.9:

**Describe the function of models in science, and identify the wide range of models used in science.**

SC.912.N.4.1.10:

**Explain how scientific knowledge and reasoning provide an empirically-based perspective to inform society’s decision making.**

ELD.K12.ELL.SC.1.11:

**English language learners communicate information, ideas and concepts necessary for academic success in the content area of Science.**

ELD.K12.ELL.SL.1.12:

**English language learners communicate for social and instructional purposes within the school setting.**
General Course Information and Notes

GENERAL NOTES

In addition to the course related benchmarks, this course requires additional science content that must include benchmarks from at least one other Body of Knowledge. The additional benchmarks must include rigor appropriate for Level 3 courses and should not duplicate additional content addressed in Experimental Science 1. Laboratory investigations that include the use of scientific inquiry, research, measurement, problem solving, laboratory apparatus and technologies, experimental procedures, and safety procedures are an integral part of this course. The National Science Teachers Association (NSTA) recommends that at the high school level, all students should be in the science lab or field, collecting data every week. School laboratory investigations (labs) are defined by the National Research Council (NRC) as an experience in the laboratory, classroom, or the field that provides students with opportunities to interact directly with natural phenomena or with data collected by others using tools, materials, data collection techniques, and models (NRC, 2006, p. 3). Laboratory investigations in the high school classroom should help all students develop a growing understanding of the complexity and ambiguity of empirical work, as well as the skills to calibrate and troubleshoot equipment used to make observations. Learners should understand measurement error; and have the skills to aggregate, interpret, and present the resulting data (National Research Council, 2006, p.77, NSTA, 2007).

Special Notes:

Instructional Practices

Teaching from a range of complex text is optimized when teachers in all subject areas implement the following strategies on a routine basis:

1. Ensuring wide reading from complex text that varies in length.
2. Making close reading and rereading of texts central to lessons.
3. Emphasizing text-specific complex questions, and cognitively complex tasks, reinforce focus on the text and cultivate independence.
4. Emphasizing students supporting answers based upon evidence from the text.
5. Providing extensive research and writing opportunities (claims and evidence).


- Asking questions (for science) and defining problems (for engineering).
- Developing and using models.
- Planning and carrying out investigations.
- Analyzing and interpreting data.
- Using mathematics, information and computer technology, and computational thinking.
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- Engaging in argument from evidence.
- Obtaining, evaluating, and communicating information.

Honors and Advanced Level Course Note: Advanced courses require a greater demand on students through increased academic rigor. Academic rigor is obtained through the application, analysis, evaluation, and creation of complex ideas that are often abstract and multi-faceted. Students are challenged to think and collaborate critically on the content they are learning. Honors level rigor will be achieved by increasing text complexity through text selection, focus on high-level qualitative measures, and complexity of task. Instruction will be structured to give students a deeper understanding of conceptual themes and organization within and across disciplines. Academic rigor is more than simply assigning to students a greater quantity of work.

Literacy Standards in Science

Secondary science courses include reading standards for literacy in science and technical subjects 6-12 and writing standards for literacy in history/social studies, science, and technical subjects 6-12. The courses also include speaking and listening standards. For a complete list of standards required for this course click on the blue tile labeled course standards. You may also download the complete course including all required standards and notes sections using the export function located at the top of this page.

English Language Development ELD Standards Special Notes Section:

Teachers are required to provide listening, speaking, reading and writing instruction that allows English language learners (ELL) to communicate information, ideas and concepts for academic success in the content area of Science. For the given level of English language proficiency and with visual, graphic, or interactive support, students will interact with grade level words, expressions, sentences and discourse to process or produce language necessary for academic success. The ELD standard should specify a relevant content area concept or topic of study chosen by curriculum developers and teachers which maximizes ELL’s need for communication and social skills.

To access an ELL supporting document which delineates performance definitions and descriptors, please click on the following link:
https://cpalmsmediaprod.blob.core.windows.net/uploads/docs/standards/eld/sc.pdf

GENERAL INFORMATION

Course Number: 2002350
Course Type: Elective Course
Number of Credits: One (1) credit
Course Level: 3
Course Attributes: Honors
Grade Levels: 9,10,11,12
<table>
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### Course Standards

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<thead>
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<th>Name</th>
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</tr>
</thead>
</table>
| SC.912.N.1.1:         | Define a problem based on a specific body of knowledge, for example: biology, chemistry, physics, and earth/space science, and do the following:  
  1. Pose questions about the natural world, (Articulate the purpose of the investigation and identify the relevant scientific concepts).  
  2. Conduct systematic observations, (Write procedures that are clear and replicable. Identify observables and examine relationships between test (independent) variable and outcome (dependent) variable. Employ appropriate methods for accurate and consistent observations; conduct and record measurements at appropriate levels of precision. Follow safety guidelines).  
  3. Examine books and other sources of information to see what is already known,  
  4. Review what is known in light of empirical evidence, (Examine whether available empirical evidence can beinterpreted in terms of existing knowledge and models, and if not, modify or develop new models).  
  5. Plan investigations, (Design and evaluate a scientific investigation).  
  6. Use tools to gather, analyze, and interpret data (this includes the use of measurement in metric and other systems, and also the generation and interpretation of graphical representations of data, including data tables and graphs), (Collect data or evidence in an organized way. Properly use instruments, equipment, and materials (e.g., scales, probeware, meter sticks, microscopes, computers) including set-up, calibration, technique, maintenance, and storage).  
  7. Pose answers, explanations, or descriptions of events,  
  8. Generate explanations that explicate or describe natural phenomena (inferences),  
  9. Use appropriate evidence and reasoning to justify these explanations to others,  
  10. Communicate results of scientific investigations, and  
  11. Evaluate the merits of the explanations produced by others.                                                                                                                                                                                                                                                                                                     |
| SC.912.N.1.2:         | Describe and explain what characterizes science and its methods.                                                                                                                                                                                                                                                                                                     |
| SC.912.N.1.3:         | Recognize that the strength or usefulness of a scientific claim is evaluated through scientific argumentation, which depends on critical and logical thinking, and the active consideration of alternative scientific explanations to explain the data presented.                                                                                                                                                                           |
| SC.912.N.1.6:         | Describe how scientific inferences are drawn from scientific observations and provide examples from the content being studied.                                                                                                                                                                                                                                    |
| SC.912.N.2.2:         | Explain that scientific knowledge is both durable and robust and open to change. Scientific knowledge can change because it is often examined and re-examined by new investigations and scientific argumentation. Because of these frequent examinations, scientific knowledge becomes stronger, leading to its durability.                                                                                                                                                      |
| SC.912.N.2.4:         | Describe instances in which scientists' varied backgrounds, talents, interests, and goals influence the inferences and thus the explanations that they make about observations of natural phenomena and describe that competing interpretations (explanations) of scientists are a strength as they are a source of new, testable ideas that have the potential to add new evidence to support one or another of the explanations.                                                                                                                                                               |
| SC.912.N.2.5:         | Explain that a scientific theory is the culmination of many scientific investigations drawing together all the current evidence concerning a substantial range of phenomena; thus, a scientific theory represents the most powerful explanation scientists have to offer.                                                                                                                                                        |
| SC.912.N.3.1:         | Describe the role consensus plays in the historical development of a theory in any one of the disciplines of science.                                                                                                                                                                                                                                          |
| SC.912.N.3.2:         | Describe the function of models in science, and identify the wide range of models used in science.                                                                                                                                                                                                                                                                |
| SC.912.N.4.1:         | Explain how scientific knowledge and reasoning provide an empirically-based perspective to inform society's decision making. Mathematicians who participate in collaborative learning both individually and with others:  
  - Analyze the problem in a way that makes sense given the task.  
  - Ask questions that will help with solving the task.  
  - Build perseverance by modifying methods as needed while solving a challenging task.  
  - Stay engaged and maintain a positive mindset when working to solve tasks.  
  - Help and support each other when attempting a new method or approach.                                                                                                                                                                                                                          |
| MA.K12.MTR.1.1:       | Demonstrate understanding by representing problems in multiple ways. Mathematicians who demonstrate understanding by representing problems in multiple ways:  
  - Build understanding through modeling and using manipulatives.  
  - Represent solutions to problems in multiple ways using objects, drawings, tables, graphs and equations.  
  - Progress from modeling problems with objects and drawings to using algorithms and equations.  
  - Express connections between concepts and representations.  
  - Choose a representation based on the given context or purpose.                                                                                                                                                                                                                                      |
| MA.K12.MTR.2.1:       | Complete tasks with mathematical fluency. Teachers who encourage students to demonstrate understanding by representing problems in multiple ways:  
  - Help students make connections between concepts and representations.  
  - Provide opportunities for students to use manipulatives when investigating concepts.  
  - Guide students from concrete to pictorial to abstract representations as understanding progresses.  
  - Show students that various representations can have different purposes and can be useful in different situations.                                                                                                                                                                                                 |
MA.K12.MTR.3.1:
Mathematicians who complete tasks with mathematical fluency:
- Select efficient and appropriate methods for solving problems within the given context.
- Maintain flexibility and accuracy while performing procedures and mental calculations.
- Complete tasks accurately and with confidence.
- Adapt procedures to apply them to a new context.
- Use feedback to improve efficiency when performing calculations.

Clarifications:
Teachers who encourage students to complete tasks with mathematical fluency:
- Provide students with the flexibility to solve problems by selecting a procedure that allows them to solve efficiently and accurately.
- Offer multiple opportunities for students to practice efficient and generalizable methods.
- Provide opportunities for students to reflect on the methods they used and determine if a more efficient method could have been used.

MA.K12.MTR.4.1:
Engage in discussions that reflect on the mathematical thinking of self and others.
Mathematicians who engage in discussions that reflect on the mathematical thinking of self and others:
- Communicate mathematical ideas, vocabulary and methods effectively.
- Analyze the mathematical thinking of others.
- Compare the efficiency of a method to those expressed by others.
- Recognize errors and suggest how to correctly solve the task.
- Justify results by explaining methods and processes.
- Construct possible arguments based on evidence.

Clarifications:
Teachers who encourage students to engage in discussions that reflect on the mathematical thinking of self and others:
- Establish a culture in which students ask questions of the teacher and their peers, and error is an opportunity for learning.
- Create opportunities for students to discuss their thinking with peers.
- Select, sequence and present student work to advance and deepen understanding of correct and increasingly efficient methods.
- Develop students' ability to justify methods and compare their responses to the responses of their peers.

MA.K12.MTR.5.1:
Use patterns and structure to help understand and connect mathematical concepts.
Mathematicians who use patterns and structure to help understand and connect mathematical concepts:
- Focus on relevant details within a problem.
- Create plans and procedures to logically order events, steps or ideas to solve problems.
- Decompose a complex problem into manageable parts.
- Relate previously learned concepts to new concepts.
- Look for similarities among problems.
- Connect solutions of problems to more complicated large-scale situations.

Clarifications:
Teachers who encourage students to use patterns and structure to help understand and connect mathematical concepts:
- Help students recognize the patterns in the world around them and connect these patterns to mathematical concepts.
- Support students to develop generalizations based on the similarities found among problems.
- Provide opportunities for students to create plans and procedures to solve problems.
- Develop students' ability to construct relationships between their current understanding and more sophisticated ways of thinking.

MA.K12.MTR.6.1:
Assess the reasonableness of solutions.
Mathematicians who assess the reasonableness of solutions:
- Estimate to discover possible solutions.
- Use benchmark quantities to determine if a solution makes sense.
- Check calculations when solving problems.
- Verify possible solutions by explaining the methods used.
- Evaluate results based on the given context.

Clarifications:
Teachers who encourage students to assess the reasonableness of solutions:
- Have students estimate or predict solutions prior to solving.
- Prompt students to continually ask, "Does this solution make sense? How do you know?"
- Reinforce that students check their work as they progress within and after a task.
- Strengthen students' ability to verify solutions through justifications.

MA.K12.MTR.7.1:
Apply mathematics to real-world contexts.
Mathematicians who apply mathematics to real-world contexts:
- Connect mathematical concepts to everyday experiences.
- Use models and methods to understand, represent and solve problems.
- Perform investigations to gather data or determine if a method is appropriate. • Redesign models and methods to improve accuracy or efficiency.

Clarifications:
Teachers who encourage students to apply mathematics to real-world contexts:
- Provide opportunities for students to create models, both concrete and abstract, and perform investigations.
- Challenge students to question the accuracy of their models and methods.
- Support students as they validate conclusions by comparing them to the given situation.
- Indicate how various concepts can be applied to other disciplines.

Cite evidence to explain and justify reasoning.
English language learners communicate in their oral communication with guidance and support from adults. The evidence can consist of details from the text without naming the text. During 1st grade, students learn how to incorporate the evidence in their writing. 2-3 Students include relevant textual evidence in their written and oral communication. Students should name the text when they refer to it. In 3rd grade, students should use a combination of direct and indirect citations. 4-5 Students continue with previous skills and reference comments made by speakers and peers. Students cite texts that they’ve directly quoted, paraphrased, or used for information. When writing, students will use the form of citation dictated by the instructor or the style guide referenced by the instructor. 6-8 Students continue with previous skills and use a style guide to create a proper citation. 9-12 Students continue with previous skills and should be aware of existing style guides and the ways in which they differ.

**Clarifications:**

**ELA.K12.EE.1.1:**

K-1 Students include textual evidence in their oral communication with guidance and support from adults. The evidence can consist of details from the text without naming the text. During 1st grade, students learn how to incorporate the evidence in their writing. 2-3 Students include relevant textual evidence in their written and oral communication. Students should name the text when they refer to it. In 3rd grade, students should use a combination of direct and indirect citations. 4-5 Students continue with previous skills and reference comments made by speakers and peers. Students cite texts that they’ve directly quoted, paraphrased, or used for information. When writing, students will use the form of citation dictated by the instructor or the style guide referenced by the instructor. 6-8 Students continue with previous skills and use a style guide to create a proper citation. 9-12 Students continue with previous skills and should be aware of existing style guides and the ways in which they differ.

**General Course Information and Notes**

**GENERAL NOTES**

In addition to the course related benchmarks, this course requires additional science content that must include benchmarks from at least one other Body of Knowledge. The additional benchmarks must include rigor appropriate for Level 3 courses and should not duplicate additional content addressed in Experimental Science 1. Laboratory investigations that include the use of scientific inquiry, research, measurement, problem solving, laboratory apparatus and technologies, experimental procedures, and safety procedures are an integral part of this course. The National Science Teachers Association (NSTA) recommends that at the high school level, all students should be in the science lab or field, collecting data every week. School laboratory investigations (labs) are defined by the National Research Council (NRC) as an experience in the laboratory, classroom, or the field that provides students with opportunities to interact directly with natural phenomena or with data collected by others using tools, materials, data collection techniques, and models (NRC, 2006, p. 3). Laboratory investigations in the high school classroom should help all students develop a growing understanding of the connectedness of science and society as well as the skills to calibrate and troubleshoot equipment used to make observations. Learners should understand measurement error; and have the skills to aggregate, interpret, and present the resulting data (National Research Council, 2006, p. 77; NSTA, 2007).

**Special Notes:**

**Instructional Practices**

Teaching from a range of complex text is optimized when teachers in all subject areas implement the following strategies on a routine basis:

1. Ensuring wide reading from complex text that varies in length.
2. Making close reading and rereading of texts central to lessons.
3. Emphasizing text-specific complex questions, and cognitively complex tasks, reinforce focus on the text and cultivate independence.
4. Emphasizing students supporting answers based upon evidence from the text.
5. Providing extensive research and writing opportunities (claims and evidence).

**Science and Engineering Practices** (NRC Framework for K-12 Science Education, 2010)

- Asking questions (for science) and defining problems (for engineering).
- Developing and using models.
- Planning and carrying out investigations.
- Analyzing and interpreting data.
- Using mathematics, information and computer technology, and computational thinking.
- Constructing explanations (for science) and designing solutions (for engineering).
- Engaging in argument from evidence.
- Obtaining, evaluating, and communicating information.

**Honors and Advanced Level Course Note:** Advanced courses require a greater demand on students through increased academic rigor. Academic rigor is obtained through the application, analysis, evaluation, and creation of complex ideas that are often abstract and multi-faceted. Students are challenged to think and collaborate critically on the content they are learning. Honors level rigor will be achieved by increasing text complexity through text selection, focus on high-level qualitative measures, and complexity of task. Instruction will be structured to give students a deeper understanding of conceptual themes and organization within and across disciplines.

**Florida's Benchmarks for Excellent Student Thinking (B.E.S.T.) Standards**

This course includes Florida's B.E.S.T. ELA Expectations (EE) and Mathematical Thinking and Reasoning Standards (MTRs) for students. Florida educators should intentionally embed these standards within the content and their instruction as applicable. For guidance on the implementation of the EE and MTRs, please visit https://www.cpalms.org/Standards/BEST_Standards.aspx and select the appropriate B.E.S.T. Standards package.

**English Language Development ELD Standards Special Notes Section:**

Teachers are required to provide listening, speaking, reading and writing instruction that allows English language learners (ELL) to communicate information, ideas and concepts for academic success in the content area of Science. For the given level of English language proficiency and with visual, graphic, or interactive support, students will interact with grade level words, expressions, sentences and discourse to process or produce language necessary for academic success. The ELD standard should specify a relevant content area concept or topic of study chosen by curriculum developers and teachers which maximizes an ELL's need for communication and social skills. To access an ELL supporting document which delineates performance definitions and descriptors, please click on the following link: https://cpalmsmediaprod.blob.core.windows.net/uploads/docs/standards/eld/sc.pdf

**GENERAL INFORMATION**

**Course Number:** 2002350

**Course Path:** Section: Grades PreK to 12 Education Courses > Grade Group: Grades 9 to 12 and Adult Education Courses > Subject: Science > SubSubject: General Sciences >

**Abbreviated Title:** EXP SCI 2 HON

**Number of Credits:** One (1) credit

**Course Type:** Elective Course

**Course Status:** State Board Approved

**Grade Level(s):** 9,10,11,12

**Course Length:** Year (Y)

**Course Attributes:**
- Honors

**Course Level:** 3

**Educator Certifications**

- Biology (Grades 6-12)
- Earth/Space Science (Grades 6-12)
- Chemistry (Grades 6-12)
- Physics (Grades 6-12)
### Course Standards

<table>
<thead>
<tr>
<th>Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>LAFLS.1112.RST.1.1:</td>
<td>Cite specific textual evidence to support analysis of science and technical texts, attending to important distinctions the author makes and to any gaps or inconsistencies in the account.</td>
</tr>
<tr>
<td>LAFLS.1112.RST.1.2:</td>
<td>Determine the central ideas or conclusions of a text; summarize complex concepts, processes, or information presented in a text by paraphrasing them in simpler but still accurate terms.</td>
</tr>
<tr>
<td>LAFLS.1112.RST.1.3:</td>
<td>Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks; analyze the specific results based on explanations in the text.</td>
</tr>
<tr>
<td>LAFLS.1112.RST.2.4:</td>
<td>Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 11-12 texts and topics.</td>
</tr>
<tr>
<td>LAFLS.1112.RST.2.5:</td>
<td>Analyze how the text structures information or ideas into categories or hierarchies, demonstrating understanding of the information or ideas.</td>
</tr>
<tr>
<td>LAFLS.1112.RST.2.6:</td>
<td>Analyze the author's purpose in providing an explanation, describing a procedure, or discussing an experiment in a text, identifying important issues that remain unresolved.</td>
</tr>
<tr>
<td>LAFLS.1112.RST.3.7:</td>
<td>Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g., quantitative data, video, multimedia) in order to address a question or solve a problem.</td>
</tr>
<tr>
<td>LAFLS.1112.RST.3.8:</td>
<td>Evaluate the hypotheses, data, analysis, and conclusions in a science or technical text, verifying the data when possible and corroborating or challenging conclusions with other sources of information.</td>
</tr>
<tr>
<td>LAFLS.1112.RST.3.9:</td>
<td>Synthesize information from a range of sources (e.g., texts, experiments, simulations) into a coherent understanding of a process, phenomenon, or concept, resolving conflicting information when possible.</td>
</tr>
<tr>
<td>LAFLS.1112.RST.4.10:</td>
<td>By the end of grade 12, read and comprehend science/technical texts in the grades 11-12 text complexity band independently and proficiently.</td>
</tr>
<tr>
<td>LAFLS.1112.SL.1.1:</td>
<td>Initiate and participate effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grades 11-12 topics, texts, and issues, building on others’ ideas and expressing their own clearly and persuasively.</td>
</tr>
<tr>
<td>LAFLS.1112.SL.1.2:</td>
<td>Integrate multiple sources of information presented in diverse formats and media (e.g., visually, quantitatively, orally) in order to make informed decisions and solve problems, evaluating the credibility and accuracy of each source and noting any discrepancies among the data.</td>
</tr>
<tr>
<td>LAFLS.1112.SL.1.3:</td>
<td>Evaluate a speaker’s point of view, reasoning, and use of evidence and rhetoric, assessing the stance, premises, links among ideas, word choice, points of emphasis, and tone used.</td>
</tr>
<tr>
<td>LAFLS.1112.SL.2.4:</td>
<td>Present information, findings, and supporting evidence, conveying a clear and distinct perspective, such that listeners can follow the line of reasoning, alternative or opposing perspectives are addressed, and the organization, development, substance, and style are appropriate to purpose, audience, and a range of formal and informal tasks.</td>
</tr>
<tr>
<td>LAFLS.1112.SL.2.5:</td>
<td>Make strategic use of digital media (e.g., textual, graphical, audio, visual, and interactive elements) in presentations to enhance understanding of findings, reasoning, and evidence and to add interest.</td>
</tr>
<tr>
<td>LAFLS.1112.WHST.1.1:</td>
<td>Write arguments focused on discipline-specific content.</td>
</tr>
<tr>
<td>LAFLS.1112.WHST.1.2:</td>
<td>Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes.</td>
</tr>
<tr>
<td>LAFLS.1112.WHST.2.4:</td>
<td>Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.</td>
</tr>
</tbody>
</table>
LAFS.1112.WHST.2.5: Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience.

LAFS.1112.WHST.2.6: Use technology, including the Internet, to produce, publish, and update individual or shared writing products in response to ongoing feedback, including new arguments or information.

LAFS.1112.WHST.3.7: Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation.

LAFS.1112.WHST.3.8: Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the strengths and limitations of each source in terms of the specific task, purpose, and audience; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and overreliance on any one source and following a standard format for citation.

LAFS.1112.WHST.3.9: Draw evidence from informational texts to support analysis, reflection, and research.

LAFS.1112.WHST.4.10: Write routinely over extended time frames (time for reflection and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences.

MAFS.912.F-IF.3.7: Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases. ★
   a. Graph linear and quadratic functions and show intercepts, maxima, and minima.
   b. Graph square root, cube root, and piecewise-defined functions, including step functions and absolute value functions.
   c. Graph polynomial functions, identifying zeros when suitable factorizations are available, and showing end behavior.
   d. Graph rational functions, identifying zeros and asymptotes when suitable factorizations are available, and showing end behavior.
   e. Graph exponential and logarithmic functions, showing intercepts and end behavior, and trigonometric functions, showing period, midline, and amplitude, and using phase shift.

MAFS.912.N-Q.1.1: Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays. ★

MAFS.912.N-Q.1.3: Choose a level of accuracy appropriate to limitations on measurement when reporting quantities. ★

MAFS.912.S-IC.2.3: Recognize the purposes of and differences among sample surveys, experiments, and observational studies; explain how randomization relates to each. ★

MAFS.912.S-IC.2.6: Evaluate reports based on data. ★

Make sense of problems and persevere in solving them.

Mathematically proficient students start by explaining to themselves the meaning of a problem and looking for entry points to its solution. They analyze givens, constraints, relationships, and goals. They make conjectures about the form and meaning of the solution and plan a solution pathway rather than simply jumping into a solution attempt. They consider analogous problems, and try special cases and simpler forms of the original problem in order to gain insight into its solution. They monitor and evaluate their progress and change course if necessary. Older students might, depending on the context of the problem, transform the problem, or the context of the problem, transform the information they need. Mathematically proficient students can explain correspondences between equations, verbal descriptions, tables, and graphs or draw diagrams of important features and relationships, graph data, and search for regularity or trends. Younger students might rely on using concrete objects or pictures to help conceptualize and solve a problem. Mathematically proficient students check their answers to problems using a different method, and they continually ask themselves, “Does this make sense?” They can understand the approaches of others to solving complex problems and identify correspondences between different approaches.

Standard Relation to Course: Supporting

Reason abstractly and quantitatively.

Mathematically proficient students make sense of quantities and their relationships in problem situations. They bring two complementary abilities to bear on problems involving quantitative relationships: the ability to decontextualize—to abstract a given situation and represent it symbolically and manipulate the representing symbols as if they have a life of their own, without necessarily attending to their referents—and the ability to contextualize, to pause as needed during the manipulation process in order to probe into the referents for the symbols involved. Quantitative reasoning entails habits of creating a coherent representation of the problem at hand; considering the units involved; attending to the meaning of quantities, not just how to compute them; and knowing and flexibly using different properties of operations and objects.

Standard Relation to Course: Supporting

Construct viable arguments and critique the reasoning of others.

Mathematically proficient students understand and use stated assumptions, definitions, and previously established results in constructing arguments. They make conjectures and build a logical progression of statements to explore the truth of their conjectures. They are able to analyze situations by breaking them into cases, and can recognize and use counterexamples. They justify their conclusions, communicate them to others, and respond to the arguments of others. They reason inductively about data, making plausible arguments that take into account the context from which the data arose. Mathematically proficient students are also able to compare the effectiveness of two plausible arguments, distinguish correct logic or reasoning from that which is flawed, and—if there is a flaw in an argument—explain what it is. Elementary students can construct arguments using concrete referents such as objects, drawings, diagrams, and actions. Such arguments can make sense and be correct, even though they are not generalized or made formal until later grades. Later, students learn to determine domains to which an argument applies. Students at all grades can listen or read arguments of others, decide whether they make sense, and ask useful questions to clarify or improve the arguments.

Standard Relation to Course: Supporting

Model with mathematics.

Mathematically proficient students can apply the mathematics they know to solve problems arising in everyday life, society, and the workplace. In early grades, this might be as simple as writing an addition equation to describe a situation. In middle grades, a student might apply proportional reasoning to plan a school event or analyze a problem in the community. By high school, a student might use geometry to solve a design problem or use a function to describe how one quantity of interest depends on another. Mathematically proficient students who can apply what they know are comfortable making assumptions and approximations to simplify a complicated situation, realizing that these may need revision later. They are able to identify important quantities in a practical situation and map their relationships using such tools as diagrams, two-way tables, graphs, flowcharts, and formulas. They can analyze those relationships mathematically to draw conclusions. They routinely interpret their mathematical results in the context of the situation and reflect on whether the results make sense, possibly improving the model if it has not served its purpose.

Standard Relation to Course: Supporting

Use appropriate tools strategically.
Mathematically proficient students consider the available tools when solving a mathematical problem. These tools might include pencil and paper, concrete models, a ruler, a protractor, a calculator, a spreadsheet, a computer algebra system, a statistical package, or dynamic geometry software. Proficient students are sufficiently familiar with tools appropriate for their grade or course to make sound decisions about when each of these tools might be helpful, recognizing both the insight to be gained and their limitations. For example, mathematically proficient high school students analyze graphs of functions and solutions generated using a graphing calculator. They detect possible errors by strategizing using estimation and other mathematical knowledge. When making mathematical models, they know that technology can enable them to visualize the results of varying assumptions, explore consequences, and compare predictions with data. Mathematically proficient students at various grade levels are able to identify relevant external mathematical resources, such as digital content located on a website, and use them to pose or solve problems. They are able to use technological tools to explore and deepen their understanding of concepts.

**Standard Relation to Course: Supporting**

Attend to precision.

Mathematically proficient students try to communicate precisely to others. They try to use clear definitions in discussion with others and in their own reasoning. They state the meaning of the symbols they choose, including using the equal sign consistently and appropriately. They are careful about specifying units of measure, and labeling axes to clarify the correspondence with quantities in a problem. They calculate accurately and efficiently, express numerical answers with a degree of precision appropriate for the problem context. In the elementary grades, students give carefully formulated explanations to each other. By the time they reach high school they have learned to examine claims and make explicit use of definitions.

**Standard Relation to Course: Supporting**

Look for and make use of structure.

Mathematically proficient students look closely to discern a pattern or structure. Young students, for example, might notice that three and seven more is the same amount as seven and three more, or they may sort a collection of shapes according to how many sides the shapes have. Later, students will see 7 x 8 equals the well remembered 7 x 5 + 7 x 3, in preparation for learning about the distributive property. In the expression x² + 9x + 14, older students can see the 14 as 2 x 7 and the 9 as 2 + 7. They recognize the significance of an existing line in a geometric figure and can see the 3(x – y)² as 5 minus a positive number times a square and use that to realize that its value cannot be more than 5 for any real numbers x and y.

**Standard Relation to Course: Supporting**

Look for and express regularity in repeated reasoning.

Mathematically proficient students notice if calculations are repeated, and look both for general methods and for shortcuts. Upper elementary students might notice when dividing 25 by 11 that they are repeating the same calculations over and over again, and conclude they have a repeating decimal. By paying attention to the calculation of slope as they repeatedly check whether points are on the line through (1, 2) with slope 3, middle school students might abstract the equation (y – 2) = 3(x – 1). Notice the regularity in the way terms cancel when expanding (x – 1)(x + 1), (x – 1)(x² + x + 1), and (x – 1)(x³ + x² + x + 1) might lead them to the general formula for the sum of a geometric series. As they work to solve a problem, mathematically proficient students maintain oversight of the process, while attending to the details. They continually evaluate the reasonableness of their intermediate results.

**Standard Relation to Course: Supporting**

Define a problem based on a specific body of knowledge, for example: biology, chemistry, physics, and earth/space science, and do the following:

1. Pose questions about the natural world, (Articulate the purpose of the investigation and identify the relevant scientific concepts).
2. Conduct systematic observations, (Write procedures that are clear and replicable. Identify observables and examine relationships between test (independent) variable and outcome (dependent) variable. Employ appropriate methods for accurate and consistent observations; conduct and record measurements at appropriate levels of precision. Follow safety guidelines).
3. Examine books and other sources of information to see what is already known.
4. Review what is known in light of empirical evidence, (Examine whether available empirical evidence can be interpreted in terms of existing knowledge and models, and if not, modify or develop new models).
5. Plan investigations, (Design and evaluate a scientific investigation).
6. Use tools to gather, analyze, and interpret data (this includes the use of measurement in metric and other systems, and also the generation and interpretation of graphical representations of data, including data tables and graphs), (Collect data or evidence in an organized way. Properly use instruments, equipment, and materials (e.g., scales, probeware, meter sticks, microscopes, computers) including setup, calibration, technique, maintenance, and storage).
7. Pose answers, explanations, or descriptions of events,
8. Generate explanations that explicate or describe natural phenomena (inferences),
9. Use appropriate evidence and reasoning to justify these explanations to others,
10. Communicate results of scientific investigations, and
11. Evaluate the merits of the explanations produced by others.

**Standard Relation to Course: Supporting**

Describe and explain what characterizes science and its methods.

Recognize that the strength or usefulness of a scientific claim is evaluated through scientific argumentation, which depends on critical and logical thinking, and the active consideration of alternative scientific explanations to explain the data presented.

Describe how scientific inferences are drawn from scientific observations and provide examples from the content being studied.

Explain that scientific knowledge is both durable and robust and open to change. Scientific knowledge can change because it is often examined and re-examined by new investigations and scientific argumentation. Because of these frequent examinations, scientific knowledge becomes stronger, leading to its durability.

Describe instances in which scientists’ varied backgrounds, talents, interests, and goals influence the inferences and thus the explanations that they make about observations of natural phenomena and describe that competing interpretations (explanations) of scientists are a strength of science as they are a source of new, testable ideas that have the potential to add new evidence to support one or another of the explanations.

Explain that a scientific theory is the culmination of many scientific investigations drawing together all the current evidence concerning a substantial range of phenomena; thus, a scientific theory represents the most powerful explanation scientists have to offer.

Describe the role consensus plays in the historical development of a theory in any one of the disciplines of science.

Describe the function of models in science, and identify the wide range of models used in science.

Explain how scientific knowledge and reasoning provide an empirically-based perspective to inform society’s decision making.
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GENERAL NOTES

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- Analyzing and interpreting data.
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- Constructing explanations (for science) and designing solutions (for engineering).
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- Obtaining, evaluating, and communicating information.

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Literacy Standards in Science
Secondary science courses include reading standards for literacy in science and technical subjects 6-12 and writing standards for literacy in history/social studies, science, and technical subjects 6-12. The courses also include speaking and listening standards. For a complete list of standards required for this course click on the blue tile labeled course standards. You may also download the complete course including all required standards and notes sections using the export function located at the top of this page.

English Language Development ELD Standards Special Notes Section:
Teachers are required to provide listening, speaking, reading and writing instruction that allows English language learners (ELL) to communicate information, ideas and concepts for academic success in the content area of Science. For the given level of English language proficiency and with visual, graphic, or interactive support, students will interact with grade level words, expressions, sentences and discourse to process or produce language necessary for academic success. The ELD standard should specify a relevant content area concept or topic of study chosen by curriculum developers and teachers which maximizes an ELL's need for communication and social skills. To access an ELL supporting document which delineates performance definitions and descriptors, please click on the following link:
https://cpalmsmediaprod.blob.core.windows.net/uploads/docs/standards/eld/sc.pdf

GENERAL INFORMATION

Course Number: 2002360
Number of Credits: One (1) credit
Course Type: Elective Course
Course Attributes: 
- Honors
Course Level: 3
Grade Level(s): 9,10,11,12
<table>
<thead>
<tr>
<th>Educator Certifications</th>
</tr>
</thead>
<tbody>
<tr>
<td>Biology (Grades 6-12)</td>
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<tr>
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### Course Standards

<table>
<thead>
<tr>
<th>Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>SC.912.N.1.1:</td>
<td>Define a problem based on a specific body of knowledge, for example: biology, chemistry, physics, and earth/space science, and do the following: 1. Pose questions about the natural world, (Articulate the purpose of the investigation and identify the relevant scientific concepts), 2. Conduct systematic observations, (Write procedures that are clear and replicable. Identify observables and examine relationships between test (independent) variable and outcome (dependent) variable. Employ appropriate methods for accurate and consistent observations; conduct and record measurements at appropriate levels of precision. Follow safety guidelines), 3. Examine books and other sources of information to see what is already known, 4. Review what is known in light of empirical evidence, (Examine whether available empirical evidence can be interpreted in terms of existing knowledge and models, and if not, modify or develop new models). 5. Plan investigations, (Design and evaluate a scientific investigation), 6. Use tools to gather, analyze, and interpret data (this includes the use of measurement in metric and other systems, and also the generation and interpretation of graphical representations of data, including data tables and graphs), (Collect data or evidence in an organized way. Properly use instruments, equipment, and materials (e.g., scales, probeware, meter sticks, microscopes, computers) including set-up, calibration, technique, maintenance, and storage), 7. Pose answers, explanations, or descriptions of events, 8. Generate explanations that explicate or describe natural phenomena (inferences), 9. Use appropriate evidence and reasoning to justify these explanations to others, 10. Communicate results of scientific investigations, and 11. Evaluate the merits of the explanations produced by others.</td>
</tr>
<tr>
<td>SC.912.N.1.2:</td>
<td>Describe and explain what characterizes science and its methods.</td>
</tr>
<tr>
<td>SC.912.N.1.3:</td>
<td>Recognize that the strength or usefulness of a scientific claim is evaluated through scientific argumentation, which depends on critical and logical thinking, and the active consideration of alternative scientific explanations to explain the data presented.</td>
</tr>
<tr>
<td>SC.912.N.1.6:</td>
<td>Describe how scientific inferences are drawn from scientific observations and provide examples from the content being studied.</td>
</tr>
<tr>
<td>SC.912.N.2.4:</td>
<td>Explain that scientific knowledge is both durable and robust and open to change. Scientific knowledge can change because it is often examined and re-examined by new investigations and scientific argumentation. Because of these frequent examinations, scientific knowledge becomes stronger, leading to its durability.</td>
</tr>
<tr>
<td>SC.912.N.2.5:</td>
<td>Describe instances in which scientists’ varied backgrounds, talents, interests, and goals influence the inferences and thus the explanations that they make about observations of natural phenomena and describe that competing interpretations (explanations) of scientists are a strength of science as they are a source of new, testable ideas that have the potential to add new evidence to support one or another of the explanations.</td>
</tr>
<tr>
<td>SC.912.N.3.1:</td>
<td>Explain that a scientific theory is the culmination of many scientific investigations drawing together all the current evidence concerning a substantial range of phenomena; thus, a scientific theory represents the most powerful explanation scientists have to offer.</td>
</tr>
<tr>
<td>SC.912.N.3.2:</td>
<td>Describe the role consensus plays in the historical development of a theory in any one of the disciplines of science.</td>
</tr>
<tr>
<td>SC.912.N.3.5:</td>
<td>Describe the function of models in science, and identify the wide range of models used in science.</td>
</tr>
<tr>
<td>SC.912.N.4.1:</td>
<td>Explain how scientific knowledge and reasoning provide an empirically-based perspective to inform society's decision making.</td>
</tr>
<tr>
<td>MA.K12.MTR.1.1:</td>
<td>Mathematics who participate in effortful learning both individually and with others: 1. Analyze the problem in a way that makes sense given the task. 2. Ask questions that will help with solving the task. 3. Build perseverance by modifying methods as needed while solving a challenging task. 4. Stay engaged and maintain a positive mindset when working to solve tasks. 5. Help and support each other when attempting a new method or approach.</td>
</tr>
<tr>
<td>MA.K12.MTR.2.1:</td>
<td>Demonstrate understanding by representing problems in multiple ways. Mathematics who demonstrate understanding by representing problems in multiple ways: 1. Build understanding through modeling and using manipulatives. 2. Represent solutions to problems in multiple ways using objects, drawings, tables, graphs and equations. 3. Progress from modeling problems with objects and drawings to using algorithms and equations. 4. Express connections between concepts and representations. 5. Choose a representation based on the given context or purpose.</td>
</tr>
</tbody>
</table>

### Clarifications:

| Teachers who encourage students to participate actively in effortful learning: 1. Cultivate a community of growth mindset learners. 2. Foster perseverance in students by choosing tasks that are challenging. 3. Develop students’ ability to analyze and problem solve. 4. Recognize students' effort when solving challenging problems. Complete tasks with mathematical fluency. |
| Clarifications: Teachers who encourage students to demonstrate understanding by representing problems in multiple ways: 1. Help students make connections between concepts and representations. 2. Provide opportunities for students to use manipulatives when investigating concepts. 3. Guide students from concrete to pictorial to abstract representations as understanding progresses. 4. Show students that various representations can have different purposes and can be useful in different situations. |
Mathematicians who complete tasks with mathematical fluency:

- Select efficient and appropriate methods for solving problems within the given context.
- Maintain flexibility and accuracy while performing procedures and mental calculations.
- Complete tasks accurately and with confidence.
- Adapt procedures to apply them to a new context.
- Use feedback to improve efficiency when performing calculations.

**Clarifications:**

Teachers who encourage students to complete tasks with mathematical fluency:

- Provide students with the flexibility to solve problems by selecting a procedure that allows them to solve efficiently and accurately.
- Offer multiple opportunities for students to practice efficient and generalizable methods.
- Provide opportunities for students to reflect on the method they used and determine if a more efficient method could have been used.

Engage in discussions that reflect on the mathematical thinking of self and others.

Mathematicians who engage in discussions that reflect on the mathematical thinking of self and others:

- Communicate mathematical ideas, vocabulary and methods effectively.
- Analyze the mathematical thinking of others.
- Compare the efficiency of a method to those expressed by others.
- Recognize errors and suggest how to correctly solve the task.
- Justify results by explaining methods and processes.
- Construct possible arguments based on evidence.

**Clarifications:**

Teachers who encourage students to engage in discussions that reflect on the mathematical thinking of self and others:

- Establish a culture in which students ask questions of the teacher and their peers, and error is an opportunity for learning.
- Create opportunities for students to discuss their thinking with peers.
- Select, sequence and present student work to advance and deepen understanding of correct and increasingly efficient methods.
- Develop students' ability to justify methods and compare their responses to the responses of their peers.

Use patterns and structure to help understand and connect mathematical concepts.

Mathematicians who use patterns and structure to help understand and connect mathematical concepts:

- Focus on relevant details within a problem.
- Create plans and procedures to logically order events, steps or ideas to solve problems.
- Decompose a complex problem into manageable parts.
- Relate previously learned concepts to new concepts.
- Look for similarities among problems.
- Connect solutions of problems to more complicated large-scale situations.

**Clarifications:**

Teachers who encourage students to use patterns and structure to help understand and connect mathematical concepts:

- Help students recognize the patterns in the world around them and connect these patterns to mathematical concepts.
- Support students to develop generalizations based on the similarities found among problems.
- Provide opportunities for students to create plans and procedures to solve problems.
- Develop students' ability to construct relationships between their current understanding and more sophisticated ways of thinking.

Assess the reasonableness of solutions.

Mathematicians who assess the reasonableness of solutions:

- Estimate to discover possible solutions.
- Use benchmark quantities to determine if a solution makes sense.
- Check calculations when solving problems.
- Verify possible solutions by explaining the methods used.
- Evaluate results based on the given context.

**Clarifications:**

Teachers who encourage students to assess the reasonableness of solutions:

- Have students estimate or predict solutions prior to solving.
- Prompt students to continually ask, "Does this solution make sense? How do you know?"
- Reinforce that students check their work as they progress within and after a task.
- Strengthen students' ability to verify solutions through justifications.

Apply mathematics to real-world contexts.

Mathematicians who apply mathematics to real-world contexts:

- Connect mathematical concepts to everyday experiences.
- Use models and methods to understand, represent and solve problems.
- Perform investigations to gather data or determine if a method is appropriate. • Redesign models and methods to improve accuracy or efficiency.

**Clarifications:**

Teachers who encourage students to apply mathematics to real-world contexts:

- Provide opportunities for students to create models, both concrete and abstract, and perform investigations.
- Challenge students to question the accuracy of their models and methods.
- Support students as they validate conclusions by comparing them to the given situation.
- Indicate how various concepts can be applied to other disciplines.

Cite evidence to explain and justify reasoning.
English language learners communicate information, ideas and concepts English language learners communicate for social and instructional purposes within the school setting.

Asking questions (for science) and defining problems (for engineering).
Developing and using models.

GENERAL NOTES

In addition to the course related benchmarks, this course requires additional science content that must include benchmarks from at least one other Body of Knowledge. The additional benchmarks must include rigor appropriate for Level 3 courses and should not duplicate additional content addressed in Experimental Science 1 and 2. Laboratory investigations that include the use of scientific inquiry, research, measurement, problem solving, laboratory apparatus and technologies, experimental procedures, and safety procedures are an integral part of this course. The National Science Teachers Association (NSTA) recommends that at the high school level, all students should be in the science lab or field, collecting data every week. School laboratory investigations (labs) are defined by the National Research Council (NRC) as an experience in the laboratory, classroom, or the field that provides students with opportunities to interact directly with natural phenomena or with data collected by others using tools, materials, data collection techniques, and models (NRC, 2006, p. 3). Laboratory investigations in the high school classroom should help all students develop a growing understanding of the complexity and ambiguity of empirical work, as well as the skills to calibrate and troubleshoot equipment used to make observations. Learners should understand measurement error; and have the skills to aggregate, interpret, and present the resulting data (National Research Council, 2006, p. 77; NSTA, 2007).

Special Notes:

Instructional Practices
Teaching from a range of complex text is optimized when teachers in all subject areas implement the following strategies on a routine basis:

1. Ensuring wide reading from complex text that varies in length.
2. Making close reading and rereading of texts central to lessons.
3. Emphasizing text-specific complex questions, and cognitively complex tasks, reinforce focus on the text and cultivate independence.
4. Emphasizing students supporting answers based upon evidence from the text.
5. Providing extensive research and writing opportunities (claims and evidence).


- Asking questions (for science) and defining problems (for engineering).
- Developing and using models.
- Planning and carrying out investigations.
- Analyzing and interpreting data.
- Using mathematics, information and computer technology, and computational thinking.
- Constructing explanations (for science) and designing solutions (for engineering).
- Engaging in argument from evidence.
- Obtaining, evaluating, and communicating information.

**Honors and Advanced Level Course Note:** Advanced courses require a greater demand on students through increased academic rigor. Academic rigor is obtained through the application, analysis, evaluation, and creation of complex ideas that are often abstract and multi-faceted. Students are challenged to think and collaborate critically on the content they are learning. Honors level rigor will be achieved by increasing text complexity through text selection, focus on high-level qualitative measures, and complexity of task. Instruction will be structured to give students a deeper understanding of conceptual themes and organization within and across disciplines. Academic rigor is more than simply assigning to students a greater quantity of work.

**Florida’s Benchmarks for Excellent Student Thinking (B.E.S.T.) Standards**
This course includes Florida’s B.E.S.T. ELA Expectations (EE) and Mathematical Thinking and Reasoning Standards (MTRs) for students. Florida educators should intentionally embed these standards within the content and their instruction as applicable. For guidance on the implementation of the EEs and MTRs, please visit https://www.cpalms.org/Standards/BEST_Standards.aspx and select the appropriate B.E.S.T. Standards package.

**English Language Development ELD Standards Special Notes Section:**
Teachers are required to provide listening, speaking, reading and writing instruction that allows English language learners (ELL) to communicate information, ideas and concepts for academic success in the content area of Science. For the given level of English language proficiency and with visual, graphic, or interactive support, students will interact with grade level words, expressions, sentences and discourse to process or produce language necessary for academic success. The ELD standard should specify a relevant content area concept or topic of study chosen by curriculum developers and teachers which maximizes an ELL's need for communication and social skills.

To access an ELL supporting document which delineates performance definitions and descriptors, please click on the following link: https://cpalmsmediaprod.blob.core.windows.net/uploads/docs/standards/eld/sc.pdf

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<table>
<thead>
<tr>
<th>Course Number:</th>
<th>2002360</th>
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<tr>
<td>Course Path:</td>
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<td></td>
<td>Courses &gt; Grade Group: Grades 9 to 12 and Adult</td>
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<tr>
<td></td>
<td>Education Courses &gt; Subject: Science &gt; SubSubject: General Sciences</td>
</tr>
<tr>
<td>Abbreviated Title:</td>
<td>EXP SCI 3 HON</td>
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<tr>
<td>Number of Credits:</td>
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<td>Course Length:</td>
<td>Year (Y)</td>
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<td>Honors</td>
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<td>9,10,11,12</td>
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<tr>
<td>Course Type:</td>
<td>Elective Course</td>
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<td>Course Status:</td>
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**Educator Certifications**

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## Course Standards

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<tbody>
<tr>
<td>LAFS.1112.RST.1.1:</td>
<td>Cite specific textual evidence to support analysis of science and technical texts, attending to important distinctions the author makes and to any gaps or inconsistencies in the account.</td>
</tr>
<tr>
<td>LAFS.1112.RST.1.2:</td>
<td>Determine the central ideas or conclusions of a text; summarize complex concepts, processes, or information presented in a text by paraphrasing them in simpler but still accurate terms.</td>
</tr>
<tr>
<td>LAFS.1112.RST.1.3:</td>
<td>Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks; analyze the specific results based on explanations in the text.</td>
</tr>
<tr>
<td>LAFS.1112.RST.2.4:</td>
<td>Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 11–12 texts and topics.</td>
</tr>
<tr>
<td>LAFS.1112.RST.2.5:</td>
<td>Analyze how the text structures information or ideas into categories or hierarchies, demonstrating understanding of the information or ideas.</td>
</tr>
<tr>
<td>LAFS.1112.RST.2.6:</td>
<td>Analyze the author's purpose in providing an explanation, describing a procedure, or discussing an experiment in a text, identifying important issues that remain unresolved.</td>
</tr>
<tr>
<td>LAFS.1112.RST.3.7:</td>
<td>Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g., quantitative data, video, multimedia) in order to address a question or solve a problem.</td>
</tr>
<tr>
<td>LAFS.1112.RST.3.8:</td>
<td>Evaluate the hypotheses, data, analysis, and conclusions in a science or technical text, verifying the data when possible and corroborating or challenging conclusions with other sources of information.</td>
</tr>
<tr>
<td>LAFS.1112.RST.3.9:</td>
<td>Synthesize information from a range of sources (e.g., texts, experiments, simulations) into a coherent understanding of a process, phenomenon, or concept, resolving conflicting information when possible.</td>
</tr>
<tr>
<td>LAFS.1112.RST.4.10:</td>
<td>By the end of grade 12, read and comprehend science/technical texts in the grades 11–12 text complexity band independently and proficiently.</td>
</tr>
<tr>
<td>LAFS.1112.SL.1.1:</td>
<td>Initiate and participate effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grades 11–12 topics, texts, and issues, building on others' ideas and expressing their own clearly and persuasively.</td>
</tr>
<tr>
<td>LAFS.1112.SL.1.2:</td>
<td>Integrate multiple sources of information presented in diverse formats and media (e.g., visually, quantitatively, orally) in order to make informed decisions and solve problems, evaluating the credibility and accuracy of each source and noting any discrepancies among the data.</td>
</tr>
<tr>
<td>LAFS.1112.SL.1.3:</td>
<td>Evaluate a speaker's point of view, reasoning, and use of evidence and rhetoric, assessing the stance, premises, links among ideas, word choice, points of emphasis, and tone used.</td>
</tr>
<tr>
<td>LAFS.1112.SL.2.5:</td>
<td>Make strategic use of digital media (e.g., textual, graphical, audio, visual, and interactive elements) in presentations to enhance understanding of findings, reasoning, and evidence and to add interest.</td>
</tr>
<tr>
<td>LAFS.1112.WHST.1.1:</td>
<td>Write arguments focused on discipline-specific content.</td>
</tr>
<tr>
<td>LAFS.1112.WHST.1.2:</td>
<td>Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes.</td>
</tr>
<tr>
<td>LAFS.1112.WHST.2.4:</td>
<td>Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.</td>
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Experimental Science 4 Honors (#2002370) 2015 - 2022 (current)
Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience.

Use technology, including the internet, to produce, publish, and update individual or shared writing products in response to ongoing feedback, including new arguments or information.

Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation.

Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the strengths and limitations of each source in terms of the specific task, purpose, and audience; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and overreliance on any one source and following a standard format for citation.

Draw evidence from informational texts to support analysis, reflection, and research.

Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays.

Use appropriate tools strategically.

Mathematically proficient students can apply the mathematics they know to solve problems arising in everyday life, society, and the workplace. In early grades, this might be as simple as writing an addition equation to describe a situation. In middle grades, a student might apply proportional reasoning to plan a school event or analyze a problem in the community. By high school, a student might use geometry to solve a design problem or use a function to describe how one quantity of interest depends on another. Mathematically proficient students who can apply what they know are comfortable making assumptions and approximations to simplify a complicated situation, realizing that these may need revision later. They are able to identify important quantities in a practical situation and map their relationships using such tools as diagrams, two-way tables, graphs, flowcharts and formulas. They can analyze those relationships mathematically to draw conclusions. They routinely interpret their mathematical results in the context of the situation and reflect on whether the results make sense, possibly improving the model if it has not served its purpose.

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Mathematically proficient students consider the available tools when solving a mathematical problem. These tools might include pencil and paper, concrete models, a ruler, a protractor, a calculator, a spreadsheet, a computer algebra system, a statistical package, or dynamic geometry software. Proficient students are sufficiently familiar with tools appropriate for their grade or course to make sound decisions about when each of these tools might be helpful, recognizing both the insight to be gained and their limitations. For example, mathematically proficient high school students analyze graphs of functions and solutions generated using a graphing calculator. They detect possible errors by strategically using estimation and other mathematical knowledge. When making mathematical models, they know that technology can enable them to visualize the results of varying assumptions, explore consequences, and compare predictions with data. Mathematically proficient students at various grade levels are able to identify relevant external mathematical resources, such as digital content located on a website, and use them to pose or solve problems. They are able to use technological tools to explore and deepen their understanding of concepts.

**Standard Relation to Course: Supporting**

**Attention to precision.**

Mathematically proficient students try to communicate precisely to others. They try to use clear definitions in discussion with others and in their own reasoning. They state the meaning of the symbols they choose, including using the equal sign consistently and appropriately. They are careful about specifying units of measure, and labeling axes to clarify the correspondence with quantities in a problem. They calculate accurately and efficiently, express numerical answers with a degree of precision appropriate for the problem context. In the elementary grades, students give carefully formulated explanations to each other. By the time they reach high school they have learned to examine claims and make explicit use of definitions.

**Standard Relation to Course: Supporting**

**Look for and make use of structure.**

Mathematically proficient students look closely to discern a pattern or structure. Young students, for example, might notice that three and seven more is the same amount as seven and three more, or they may sort a collection of shapes according to how many sides the shapes have. Later, students will see 7 × 8 equals the well remembered 7 × 5 + 7 × 3, in preparation for learning about the distributive property. In the expression x² + 9x + 14, older students can see the 14 as 2 × 7 and the 9 as 2 + 7. They recognize the significance of an existing line in a geometric figure and can use the strategy of drawing an auxiliary line for solving problems. They also can step back for an overview and shift perspective. They can see complicated things, such as some algebraic expressions, as single objects or as being composed of several objects. For example, they can see 5 – (x – 1)² as 5 minus a positive number times a square and use that to realize that its value cannot be more than 5 for any real numbers x and y.

**Standard Relation to Course: Supporting**

**Look for and express regularity in repeated reasoning.**

Mathematically proficient students notice if calculations are repeated, and look both for general methods and for shortcuts. Upper elementary students might notice when dividing 25 by 11 that they are repeating the same calculations over and over again, and conclude they have a repeating decimal. By paying attention to the calculation of slope as they repeatedly check whether points are on the line through (1, 2) with slope 3, middle school students might abstract the equation (y – 2)/(x – 1) = 3. Notice the regularity in the way terms cancel when expanding (x – 1)(x + 1), (x – 1)², or (x + 1)², which lead them to the general formula for the sum of a geometric series. As they work to solve a problem, mathematically proficient students maintain oversight of the process, while attending to the details. They continually evaluate the reasonableness of their intermediate results.

**Standard Relation to Course: Supporting**

**Define a problem based on a specific body of knowledge, for example: biology, chemistry, physics, and earth/space science, and do the following:**

1. Pose questions about the natural world, (Articulate the purpose of the investigation and identify the relevant scientific concepts).
2. Conduct systematic observations, (Write procedures that are clear and replicable. Identify observables and examine relationships between test (independent) variable and outcome (dependent) variable. Employ appropriate methods for accurate and consistent observations; conduct and record measurements at appropriate levels of precision. Follow safety guidelines).
3. Examine books and other sources of information to see what is already known, (Review what is known in light of empirical evidence. Examine in light of available empirical evidence can be interpreted in terms of existing knowledge and models, and if not, modify or develop new models).
4. Plan investigations, (Design and evaluate a scientific investigation).
5. Use tools to gather, analyze, and interpret data (this includes the use of measurement in metric and other systems, and also the generation and interpretation of graphical representations of data, including data tables and graphs), (Collect data or evidence in an organized way. Properly use instruments, equipment, and materials (e.g., scales, probeware, meter sticks, microscopes, computers) including set-up, calibration, technique, maintenance, and storage).
6. Pose answers, explanations, or descriptions of events, (Examine in light of available empirical evidence can be interpreted in terms of existing knowledge and models, and if not, modify or develop new models).
7. Generate explanations that explicate or describe natural phenomena (inferences), (Explain in light of available empirical evidence can be interpreted in terms of existing knowledge and models, and if not, modify or develop new models).
8. Use appropriate evidence and reasoning to justify these explanations to others, (Explain in light of available empirical evidence can be interpreted in terms of existing knowledge and models, and if not, modify or develop new models).
9. Communicate results of scientific investigations, and (Explain in light of available empirical evidence can be interpreted in terms of existing knowledge and models, and if not, modify or develop new models).
10. Evaluate the merits of the explanations produced by others. (Explain in light of available empirical evidence can be interpreted in terms of existing knowledge and models, and if not, modify or develop new models).

**Standard Relation to Course: Supporting**

**Describe and explain what characterizes science and its methods.**

**Recognize that the strength or usefulness of a scientific claim is evaluated through scientific argumentation, which depends on critical and logical thinking, and the active consideration of alternative scientific explanations to explain the data presented.**

**Describe how scientific inferences are drawn from scientific observations and provide examples from the content being studied.**

**Explain that scientific knowledge is both durable and robust and open to change. Scientific knowledge can change because it is often examined and re-examined by new investigations and scientific argumentation. Because of these frequent examinations, scientific knowledge becomes stronger, leading to its durability.**

**Describe instances in which scientists’ varied backgrounds, talents, interests, and goals influence the inferences and thus the explanations that they make about observations of natural phenomena and describe that competing interpretations (explanations) of scientists are a strength of science as they are a source of new, testable ideas that have the potential to add new evidence to support one or another of the explanations.**

**Explain that a scientific theory is the culmination of many scientific investigations drawing together all the current evidence concerning a substantial range of phenomena; thus, a scientific theory represents the most powerful explanation scientists have to offer.**

**Describe the role consensus plays in the historical development of a theory in any one of the disciplines of science.**

**Describe the function of models in science, and identify the wide range of models used in science.**

**Explain how scientific knowledge and reasoning provide an empirically-based perspective to inform society's decision making.**
General Course Information and Notes

GENERAL NOTES

In addition to the course related benchmarks, this course requires additional science content that must include benchmarks from at least one other Body of Knowledge. The additional benchmarks must include rigor appropriate for Level 3 courses and should not duplicate additional content addressed in Experimental Science 1, 2 and 3. Laboratory investigations that include the use of scientific inquiry, research, measurement, problem solving, laboratory apparatus and technologies, experimental procedures, and safety procedures are an integral part of this course. The National Science Teachers Association (NSTA) recommends that at the high school level, all students should be in the science lab or field, collecting data every week. School laboratory investigations (labs) are defined by the National Research Council (NRC) as an experience in the laboratory, classroom, or the field that provides students with opportunities to interact directly with natural phenomena or with data collected by others using tools, materials, data collection techniques, and models (NRC, 2006, p. 3). Laboratory investigations in the high school classroom should help all students develop a growing understanding of the complexity and ambiguity of empirical work, as well as the skills to calibrate and troubleshoot equipment used to make observations. Learners should understand measurement error; and have the skills to aggregate, interpret, and present the resulting data (National Research Council, 2006, p. 77; NSTA, 2007).

Special Notes:

Instructional Practices
Teaching from a range of complex text is optimized when teachers in all subject areas implement the following strategies on a routine basis:

1. Ensuring wide reading from complex text that varies in length.
2. Making close reading and rereading of texts central to lessons.
3. Emphasizing text-specific complex questions, and cognitively complex tasks, reinforce focus on the text and cultivate independence.
4. Emphasizing students supporting answers based upon evidence from the text.
5. Providing extensive research and writing opportunities (claims and evidence).


- Asking questions (for science) and defining problems (for engineering).
- Developing and using models.
- Planning and carrying out investigations.
- Analyzing and interpreting data.
- Using mathematics, information and computer technology, and computational thinking.
- Constructing explanations (for science) and designing solutions (for engineering).
- Engaging in argument from evidence.
- Obtaining, evaluating, and communicating information.

Honors and Advanced Level Course Note: Advanced courses require a greater demand on students through increased academic rigor. Academic rigor is obtained through the application, analysis, evaluation, and creation of complex ideas that are often abstract and multi-faceted. Students are challenged to think and collaborate critically on the content they are learning. Honors level rigor will be achieved by increasing text complexity through text selection, focus on high-level qualitative measures, and complexity of task. Instruction will be structured to give students a deeper understanding of conceptual themes and organization within and across disciplines. Academic rigor is more than simply assigning to students a greater quantity of work.

Literacy Standards in Science
Secondary science courses include reading standards for literacy in science and technical subjects 6-12 and writing standards for literacy in history/social studies, science, and technical subjects 6-12. The courses also include speaking and listening standards. For a complete list of standards required for this course click on the blue tile labeled course standards. You may also download the complete course including all required standards and notes sections using the export function located at the top of this page.

English Language Development ELD Standards Special Notes Section:
Teachers are required to provide listening, speaking, reading and writing instruction that allows English language learners (ELL) to communicate information, ideas and concepts for academic success in the content area of Science. For the given level of English language proficiency and with visual, graphic, or interactive support, students will interact with grade level words, expressions, sentences and discourse to process or produce language necessary for academic success. The ELD standard should specify a relevant content area concept or topic of study chosen by curriculum developers and teachers which maximizes an ELL’s need for communication and social skills. To access an ELL supporting document which delineates performance definitions and descriptors, please click on the following link:
https://cpalmsmediaprod.blob.core.windows.net/uploads/docs/standards/eld/sc.pdf

GENERAL INFORMATION

| Course Number | 2002370 |
| Course Type | Elective Course |
| Course Status | Course Approved |
| Course Level | 3 |
| Grade Level(s) | 9,10,11,12 |
| Number of Credits | One (1) credit |
| Course Path: Section | Grades PreK to 12 Education |
| Courses: Grade Group | Grades 9 to 12 and Adult |
| Education Courses | Subject: Science |
| SubSubject: General Sciences |
| Abbreviated Title | EXP SCI 4 HON |
| Course Length: Year (Y) |
| Course Attributes: Honors |
| Year (Y) | Honors |
## Educator Certifications

<table>
<thead>
<tr>
<th>Subject</th>
<th>Grade Levels</th>
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<tbody>
<tr>
<td>Biology</td>
<td>6-12</td>
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<tr>
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<td>6-12</td>
</tr>
<tr>
<td>Chemistry</td>
<td>6-12</td>
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<tr>
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<td>6-12</td>
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</table>
### Course Standards

<table>
<thead>
<tr>
<th>Name</th>
<th>Description</th>
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<tbody>
<tr>
<td>SC.912.N.1.1:</td>
<td>Define a problem based on a specific body of knowledge, for example: biology, chemistry, physics, and earth/space science, and do the following:</td>
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<td>1. Pose questions about the natural world, (Articulate the purpose of the investigation and identify the relevant scientific concepts).</td>
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<td>2. Conduct systematic observations, (Write procedures that are clear and replicable. Identify observables and examine relationships between test (independent) variable and outcome (dependent) variable. Employ appropriate methods for accurate and consistent observations; conduct and record measurements at appropriate levels of precision. Follow safety guidelines).</td>
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<td>3. Examine books and other sources of information to see what is already known,</td>
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<td>SC.912.N.1.3:</td>
<td>Recognize that the strength or usefulness of a scientific claim is evaluated through scientific argumentation, which depends on critical and logical thinking, and the active consideration of alternative scientific explanations to explain the data presented.</td>
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<td>SC.912.N.1.6:</td>
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<td>SC.912.N.2.4:</td>
<td>Explain that scientific knowledge is both durable and robust and open to change. Scientific knowledge can change because it is often examined and re-examined by new investigations and scientific argumentation. Because of these frequent examinations, scientific knowledge becomes stronger, leading to its durability.</td>
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<td>SC.912.N.2.5:</td>
<td>Describe instances in which scientists' varied backgrounds, talents, interests, and goals influence the inferences and thus the explanations that they make about observations of natural phenomena and describe that competing interpretations (explanations) of scientists are a strength of science as they are a source of new, testable ideas that have the potential to add new evidence to support one or another of the explanations.</td>
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<td>SC.912.N.3.1:</td>
<td>Explain that a scientific theory is the culmination of many scientific investigations drawing together all the current evidence concerning a substantial range of phenomena; thus, a scientific theory represents the most powerful explanation scientists have to offer.</td>
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<td>SC.912.N.3.2:</td>
<td>Describe the role consensus plays in the historical development of a theory in any one of the disciplines of science.</td>
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<td>SC.912.N.3.5:</td>
<td>Describe the function of models in science, and identify the wide range of models used in science.</td>
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<td>SC.912.N.4.1:</td>
<td>Explain how scientific knowledge and reasoning provide an empirically-based perspective to inform society's decision making.</td>
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<tr>
<td>MA.K12.MTR.1.1:</td>
<td>Mathematics who participate in effortful learning both individually and with others:</td>
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<tr>
<td></td>
<td>• Analyze the problem in a way that makes sense given the task.</td>
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<td></td>
<td>• Ask questions that will help with solving the task.</td>
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<td></td>
<td>• Build perseverance by modifying methods as needed while solving a challenging task.</td>
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<td></td>
<td>• Stay engaged and maintain a positive mindset when working to solve tasks.</td>
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<td></td>
<td>• Help and support each other when attempting a new method or approach.</td>
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<tr>
<td>MA.K12.MTR.2.1:</td>
<td>Demonstrate understanding by representing problems in multiple ways.</td>
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<td></td>
<td>Mathematics who demonstrate understanding by representing problems in multiple ways:</td>
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<tr>
<td></td>
<td>• Build understanding through modeling and using manipulatives.</td>
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<tr>
<td></td>
<td>• Represent solutions to problems in multiple ways using objects, drawings, tables, graphs and equations.</td>
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<tr>
<td></td>
<td>• Progress from modeling problems with objects and drawings to using algorithms and equations.</td>
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<td></td>
<td>• Express connections between concepts and representations.</td>
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<tr>
<td></td>
<td>• Choose a representation based on the given context or purpose.</td>
</tr>
<tr>
<td>Clarifications:</td>
<td>Teachers who encourage students to demonstrate understanding by representing problems in multiple ways:</td>
</tr>
<tr>
<td></td>
<td>• Help students make connections between concepts and representations.</td>
</tr>
<tr>
<td></td>
<td>• Provide opportunities for students to use manipulatives when investigating concepts.</td>
</tr>
<tr>
<td></td>
<td>• Guide students from concrete to pictorial to abstract representations as understanding progresses.</td>
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<tr>
<td></td>
<td>• Show students that various representations can have different purposes and can be useful in different situations.</td>
</tr>
</tbody>
</table>

Complete tasks with mathematical fluency.
Mathematicians who complete tasks with mathematical fluency:

- Select efficient and appropriate methods for solving problems within the given context.
- Maintain flexibility and accuracy while performing procedures and mental calculations.
- Complete tasks accurately and with confidence.
- Adapt procedures to apply them to a new context.
- Use feedback to improve efficiency when performing calculations.

**Clarifications:**

Teachers who encourage students to complete tasks with mathematical fluency:

- Provide students with the flexibility to solve problems by selecting a procedure that allows them to solve efficiently and accurately.
- Offer multiple opportunities for students to practice efficient and generalizable methods.
- Provide opportunities for students to reflect on the method they used and determine if a more efficient method could have been used.

Engage in discussions that reflect on the mathematical thinking of self and others.

Mathematicians who engage in discussions that reflect on the mathematical thinking of self and others:

- Communicate mathematical ideas, vocabulary and methods effectively.
- Analyze the mathematical thinking of others.
- Compare the efficiency of a method to those expressed by others.
- Recognize errors and suggest how to correctly solve the task.
- Justify results by explaining methods and processes.
- Construct possible arguments based on evidence.

**Clarifications:**

Teachers who encourage students to engage in discussions that reflect on the mathematical thinking of self and others:

- Establish a culture in which students ask questions of the teacher and their peers, and error is an opportunity for learning.
- Create opportunities for students to discuss their thinking with peers.
- Select, sequence and present student work to advance and deepen understanding of correct and increasingly efficient methods.
- Develop students’ ability to justify methods and compare their responses to the responses of their peers.

Use patterns and structure to help understand and connect mathematical concepts.

Mathematicians who use patterns and structure to help understand and connect mathematical concepts:

- Focus on relevant details within a problem.
- Create plans and procedures to logically order events, steps or ideas to solve problems.
- Decompose a complex problem into manageable parts.
- Relate previously learned concepts to new concepts.
- Look for similarities among problems.
- Connect solutions of problems to more complicated large-scale situations.

**Clarifications:**

Teachers who encourage students to use patterns and structure to help understand and connect mathematical concepts:

- Help students recognize the patterns in the world around them and connect these patterns to mathematical concepts.
- Support students to develop generalizations based on the similarities found among problems.
- Provide opportunities for students to create plans and procedures to solve problems.
- Develop students' ability to construct relationships between their current understanding and more sophisticated ways of thinking.

Assess the reasonableness of solutions.

Mathematicians who assess the reasonableness of solutions:

- Estimate to discover possible solutions.
- Use benchmark quantities to determine if a solution makes sense.
- Check calculations when solving problems.
- Verify possible solutions by explaining the methods used.
- Evaluate results based on the given context.

**Clarifications:**

Teachers who encourage students to assess the reasonableness of solutions:

- Have students estimate or predict solutions prior to solving.
- Prompt students to continually ask, "Does this solution make sense? How do you know?"
- Reinforce that students check their work as they progress within and after a task.
- Strengthen students’ ability to verify solutions through justifications.

Apply mathematics to real-world contexts.

Mathematicians who apply mathematics to real-world contexts:

- Connect mathematical concepts to everyday experiences.
- Use models and methods to understand, represent and solve problems.
- Perform investigations to gather data or determine if a method is appropriate. • Redesign models and methods to improve accuracy or efficiency.

**Clarifications:**

Teachers who encourage students to apply mathematics to real-world contexts:

- Provide opportunities for students to create models, both concrete and abstract, and perform investigations.
- Challenge students to question the accuracy of their models and methods.
- Support students as they validate conclusions by comparing them to the given situation.
- Indicate how various concepts can be applied to other disciplines.

Cite evidence to explain and justify reasoning.
General Course Information and Notes

GENERAL NOTES

In addition to the course related benchmarks, this course requires additional science content that must include benchmarks from at least one other Body of Knowledge. The additional benchmarks must include rigor appropriate for Level 3 courses and should not duplicate additional content addressed in Experimental Science 1, 2 and 3. Laboratory investigations that include the use of scientific inquiry, research, measurement, problem solving, laboratory apparatus and technologies, experimental procedures, and safety procedures are an integral part of this course. The National Science Teachers Association (NSTA) recommends that at the high school level, all students should be in the science lab or field, collecting data every week. School laboratory investigations (labs) are defined by the National Research Council (NRC) as an experience in the laboratory, classroom, or the field that provides students with opportunities to interact directly with natural phenomena or with data collected by others using tools, materials, data collection techniques, and models (NRC, 2006, p. 3). Laboratory investigations in the high school classroom should help all students develop a growing understanding of the complexity and ambiguity of empirical work, as well as the skills to calibrate and troubleshoot equipment used to make observations. Learners should understand measurement error; and have the skills to aggregate, interpret, and present the resulting data (National Research Council, 2006, p. 77; NSTA, 2007).

Special Notes:

Instructional Practices

Teaching from a range of complex text is optimized when teachers in all subject areas implement the following strategies on a routine basis:

1. Ensuring wide reading from complex text that varies in length.
2. Making close reading and rereading of texts central to lessons.
3. Emphasizing text-specific complex questions, and cognitively complex tasks, reinforce focus on the text and cultivate independence.
4. Emphasizing students supporting answers based upon evidence from the text.
5. Providing extensive research and writing opportunities (claims and evidence).


- Asking questions (for science) and defining problems (for engineering).
- Developing and using models.

ELA.K12.EE.1.1: Read and comprehend grade-level complex texts proficiently.

Clarifications:

Asking questions (for science) and defining problems (for engineering).
Developing and using models.
Providing extensive research and writing opportunities (claims and evidence).
Emphasizing making close reading and rereading of texts central to lessons.
Ensuring wide reading from complex text that varies in length.

ELA.K12.EE.2.1: Make inferences to support comprehension.

Clarifications:

In kindergarten, students learn to listen to one another respectfully.
In grades 1-2, students build upon these skills by justifying what they are thinking. For example: “I think _______ because _______.” The collaborative conversations are becoming academic conversations.
In grades 3-12, students engage in academic conversations discussing claims and justifying their reasoning, refining and applying skills. Students build on ideas, propel the conversation, and support claims and counterclaims with evidence.

ELA.K12.EE.3.1: Use appropriate collaborative techniques and active listening skills when engaging in discussions in a variety of situations.

Clarifications:

In kindergarten, students learn to listen to one another respectfully.

ELA.K12.EE.4.1: Use the accepted rules governing a specific format to create quality work.

Clarifications:

General Course Information and Notes

Page 582 of 926
• Planning and carrying out investigations.
• Analyzing and interpreting data.
• Using mathematics, information and computer technology, and computational thinking.
• Constructing explanations (for science) and designing solutions (for engineering).
• Engaging in argument from evidence.
• Obtaining, evaluating, and communicating information.

**Honors and Advanced Level Course Note:** Advanced courses require a greater demand on students through increased academic rigor. Academic rigor is obtained through the application, analysis, evaluation, and creation of complex ideas that are often abstract and multi-faceted. Students are challenged to think and collaborate critically on the content they are learning. Honors level rigor will be achieved by increasing text complexity through text selection, focus on high-level qualitative measures, and complexity of task. Instruction will be structured to give students a deeper understanding of conceptual themes and organization within and across disciplines. Academic rigor is more than simply assigning to students a greater quantity of work. Florida's Benchmarks for Excellent Student Thinking (B.E.S.T.) Standards

This course includes Florida's B.E.S.T. ELA Expectations (EE) and Mathematical Thinking and Reasoning Standards (MTRs) for students. Florida educators should intentionally embed these standards within the content and their instruction as applicable. For guidance on the implementation of the EEs and MTRs, please visit https://www.cpalms.org/Standards/BEST_Standards.aspx and select the appropriate B.E.S.T. Standards package.

**English Language Development ELD Standards Special Notes Section:**

Teachers are required to provide listening, speaking, reading and writing instruction that allows English language learners (ELL) to communicate information, ideas and concepts for academic success in the content area of Science. For the given level of English language proficiency and with visual, graphic, or interactive support, students will interact with grade level words, expressions, sentences and discourse to process or produce language necessary for academic success. The ELD standard should specify a relevant content area concept or topic of study chosen by curriculum developers and teachers which maximizes an ELL's need for communication and social skills. To access an ELL supporting document which delineates performance definitions and descriptors, please click on the following link: https://cpalmsmediaprod.blob.core.windows.net/uploads/docs/standards/eld/sc.pdf

**GENERAL INFORMATION**

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<th>Course Number: 2002370</th>
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<tr>
<td>Course Path: Section: Grades PreK to 12 Education Courses &gt; Grade Group: Grades 9 to 12 and Adult Education Courses &gt; Subject: Science &gt; SubSubject: General Sciences &gt;</td>
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<tr>
<td>Abbreviated Title: EXP SCI 4 HON</td>
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<tr>
<td>Number of Credits: One (1) credit</td>
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<tr>
<td>Course Type: Elective Course</td>
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<td>Course Status: State Board Approved</td>
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<td>Grade Level(s): 9,10,11,12</td>
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**Educator Certifications**

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<td>Chemistry (Grades 6-12)</td>
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<td>Physics (Grades 6-12)</td>
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</table>
Explain the interrelated nature of photosynthesis and cellular respiration.

Explain the reasons for changes in how organisms are classified.

Explain how the scientific theory of evolution is supported by the fossil record, comparative anatomy, comparative embryology, biogeography, molecular biology, and observed evolutionary change.

Discuss distinguishing characteristics of the domains and kingdoms of living organisms.

Explain the physical properties of the Sun and its dynamic nature and connect them to conditions and events on Earth.

Compare and contrast structure and function of various types of microscopes.

Describe the process of meiosis, including independent assortment and crossing over. Explain how reduction division results in the formation of haploid gametes or spores.

Compare and contrast mitosis and meiosis and relate to the processes of sexual and asexual reproduction and their consequences for genetic variation.

Compare and contrast structure and function of various types of microscopes.

Compare and contrast the general structures of plant and animal cells. Compare and contrast the general structures of prokaryotic and eukaryotic cells.

Compare and contrast structure and function of various types of microscopes.

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Define a problem based on a specific body of knowledge, for example: biology, chemistry, physics, and earth/space science, and do the following:

1. Pose questions about the natural world. (Articulate the purpose of the investigation and identify the relevant scientific concepts).
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11. Evaluate the merits of the explanations produced by others.
SC.912.N.1.2: Describe and explain what characterizes science and its methods.

SC.912.N.1.3: Recognize that the strength or usefulness of a scientific claim is evaluated through critical and logical thinking, and the active consideration of alternative scientific explanations and evidence presented.

SC.912.N.1.4: Identify sources of information and assess their reliability according to the strict standards of scientific investigation.

SC.912.N.1.6: Describe how scientific inferences are drawn from scientific observations and provide examples from the content being studied.

SC.912.N.1.7: Recognize the role of creativity in constructing scientific questions, methods, and explanations.

SC.912.N.3.1: Explain that a scientific theory is the culmination of many scientific investigations drawing together all the current evidence concerning a substantial range of phenomena; thus, a scientific theory represents the most powerful explanation scientists have to offer.

SC.912.N.3.3: Explain that scientific laws are descriptions of specific relationships under given conditions in nature, but do not offer explanations for those relationships.

SC.912.N.3.4: Recognize that theories do not become laws, nor do laws become theories; theories are well supported explanations and laws are well supported descriptions.

SC.912.N.3.5: Describe the function of models in science, and identify the wide range of models used in science.

SC.912.P.8.1: Differentiate among the four states of matter.

SC.912.P.8.2: Differentiate between physical and chemical properties and physical and chemical changes of matter.

SC.912.P.8.3: Explore the scientific theory of atoms (also known as atomic theory) by describing changes in the atomic model over time and why those changes were necessitated by experimental evidence.

SC.912.P.8.4: Explore the scientific theory of atoms (also known as atomic theory) by describing the structure of atoms in terms of protons, neutrons and electrons, and differentiate among these particles in terms of their mass, electrical charges and locations within the atom.

SC.912.P.8.5: Relate properties of atoms and their position in the periodic table to the arrangement of their electrons.

SC.912.P.8.7: Interpret formula representations of molecules and compounds in terms of composition and structure.

SC.912.P.10.1: Differentiate among the various forms of energy and recognize that they can be transformed from one form to others.

SC.912.P.10.4: Describe heat as the energy transferred by convection, conduction, and radiation, and explain the connection of heat to change in temperature or states of matter.

SC.912.P.10.7: Distinguish between endothermic and exothermic chemical processes.

SC.912.P.10.20: Describe the measurable properties of waves and explain the relationships among them and how these properties change when the wave moves from one medium to another.

SC.912.P.12.3: Interpret and apply Newton's three laws of motion.

LAFS.910.RST.1.3: Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks, attending to special cases or exceptions defined in the text.

LAFS.910.RST.2.4: Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 9–10 texts and topics.

LAFS.910.RST.2.5: Analyze the structure of the relationships among concepts in a text, including relationships among key terms (e.g., force, friction, reaction force, energy).

LAFS.910.RST.2.6: Analyze the author's purpose in providing an explanation, describing a procedure, or discussing an experiment in a text, defining the question the author seeks to address.

LAFS.910.RST.3.7: Translate quantitative or technical information expressed in words into a table or chart and translate information expressed visually or mathematically (e.g., in an equation) into words.

LAFS.910.RST.3.8: Assess the extent to which the reasoning and evidence in a text support the author's claim or a recommendation for solving a scientific or technical problem.

LAFS.910.RST.3.9: Compare and contrast findings presented in a text to those from other sources (including their own experiments), noting when the findings support or contradict previous explanations or accounts.

LAFS.910.RST.4.10: By the end of grade 10, read and comprehend science/technical texts in the grades 9–10 text complexity band independently and proficiently.

LAFS.910.SL.1.1: Initiate and participate effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grades 9–10 topics, texts, and issues, building on others' ideas and expressing their own clearly and persuasively.
   a. Come to discussions prepared, having read and researched material under study; explicitly draw on that preparation by referring to evidence from texts and other research on the topic or issue to stimulate a thoughtful, well-reasoned exchange of ideas.
   b. Work with peers to set rules for collegial discussions and decision-making (e.g., informal consensus, taking votes on key issues, presentation of alternate views), clear goals and deadlines, and individual roles as needed.
   c. Propose conversations by posing and responding to questions that relate the current discussion to broader themes or larger ideas; actively incorporate others into the discussion; and clarify, verify, or challenge ideas and conclusions.
   d. Respond thoughtfully to diverse perspectives, summarize points of agreement and disagreement, and, when warranted, qualify or justify their own views and understanding and make new connections in light of the evidence and reasoning presented.

LAFS.910.SL.1.2: Integrate multiple sources of information presented in diverse media or formats (e.g., visually, quantitatively, orally) evaluating the credibility and accuracy of each source.

LAFS.910.SL.1.3: Evaluate a speaker's point of view, reasoning, and use of evidence and rhetoric, identifying any fallacious reasoning or exaggerated or distorted evidence.

LAFS.910.SL.2.4: Present information, findings, and supporting evidence clearly, concisely, and logically such that listeners can follow the line of reasoning and the organization, development, substance, and style are appropriate to purpose, audience, and task.

LAFS.910.SL.2.5: Make strategic use of digital media (e.g., textual, graphical, audio, visual, and interactive elements) in presentations to enhance understanding of findings, reasoning, and evidence and to add interest.

Write arguments focused on discipline-specific content.
   a. Introduce precise claim(s), distinguish the claim(s) from alternate or opposing claims, and create an organization that establishes clear relationships among the claim(s), counterclaims, reasons, and evidence.
   b. Develop claim(s) and counterclaims fairly, supplying data and evidence for each while pointing out the strengths and limitations of both claim(s)
and counterclaims in a discipline-appropriate form and in a manner that anticipates the audience's knowledge level and concerns.

- Use words, phrases, and clauses to link the major sections of the text, create cohesion, and clarify the relationships between claim(s) and reasons, between reasons and evidence, and between claim(s) and counterclaims.

- Establish and maintain a formal style and objective tone while adhering to the norms and conventions of the discipline in which they are writing.

- Provide a concluding statement or section that follows from or supports the argument presented.

Write informative/explanatory texts, including the narration of historical events, scientific procedures, experiments, or technical processes.

- Introduce a topic and organize ideas, concepts, and information to make important connections and distinctions; include formatting (e.g., headings), graphics (e.g., figures, tables), and multimedia when useful to aiding comprehension.

- Develop the topic with well-chosen, relevant, and sufficient facts, extended definitions, concrete details, quotations, or other information and examples appropriate to the audience's knowledge of the topic.

- Use varied transitions and sentence structures to link the major sections of the text, create cohesion, and clarify the relationships among ideas and concepts.

- Use precise language and domain-specific vocabulary to manage the complexity of the topic and convey a style appropriate to the discipline and context as well as the expertise of likely readers.

- Establish and maintain a formal style and objective tone while attending to the norms and conventions of the discipline in which they are writing.

- Provide a concluding statement or section that follows from and supports the information or explanation presented (e.g., articulating implications or the significance of the topic).

Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.

Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience.

Use technology, including the Internet, to produce, publish, and update individual or shared writing products, taking advantage of technology's capacity to link to other information and to display information flexibly and dynamically.

Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation.

Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the usefulness of each source in answering the research question; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and following a standard format for citation.

Draw evidence from informational texts to support analysis, reflection, and research.

Write routinely over extended time frames (time for reflection and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences.

Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays.

Choose a level of accuracy appropriate to limitations on measurement when reporting quantities.

Make sense of problems and persevere in solving them.

Mathematically proficient students start by explaining to themselves the meaning of a problem and looking for entry points to its solution. They analyze givens, constraints, relationships, and goals. They make conjectures about the form and meaning of the solution and plan a solution pathway rather than simply jumping into a solution attempt. They consider analogous problems, and try special cases and simpler forms of the original problem in order to gain insight into its solution. They monitor and evaluate their progress and change course if necessary. Older students might, depending on the context of the problem, transform algebraic expressions or change the viewing window on their graphing calculator to get information they need. Mathematically proficient students can explain correspondences between equations, verbal descriptions, tables, and graphs or draw diagrams of important features and relationships, graph data, and search for regularity or trends. Younger students might rely on using concrete objects or pictures to help conceptualize and solve a problem. Mathematically proficient students check their answers to problems using a different method, and they continually ask themselves, “Does this make sense?” They can understand the approaches of others to solving complex problems and identify correspondences between different approaches.

Reason abstractly and quantitatively.

Mathematically proficient students make sense of quantities and their relationships in problem situations. They bring two complementary abilities to bear on problems involving quantitative relationships: the ability to contextualize—to abstract a given situation and represent it symbolically and manipulate the representations as if they have a life of their own, without necessarily attending to their referents—and the ability to decontextualize, to pause as needed during the manipulation process in order to probe into the referents for the symbols involved. Quantitative reasoning entails habits of creating a coherent representation of the problem at hand; considering the units involved; attending to the meaning of quantities, not just how to compute them; and knowing and flexibly using different properties of operations and objects.

Construct viable arguments and critique the reasoning of others.

Mathematically proficient students understand and use stated assumptions, definitions, and previously established results in constructing arguments. They make conjectures and build a logical progression of statements to explore the truth of their conjectures. They are able to analyze situations by breaking them into cases, and can recognize and use counterexamples. They justify their conclusions, communicate them to others, and respond to the arguments of others. They reason inductively about data, making plausible arguments that take into account the context from which the data arose. Mathematically proficient students are also able to compare the effectiveness of two plausible arguments, distinguish correct logic or reasoning from that which is flawed, and—if there is a flaw in an argument—explain what is it. Elementary students can construct arguments using concrete referents such as objects, drawings, diagrams, and actions. Such arguments can make sense and be correct, even though they are not generalized or made formal until later grades. Later, students learn to determine domains to which an argument applies. Students at all grades can listen or read the arguments of others, decide whether they make sense, and ask useful questions to clarify or improve the arguments.

Model with mathematics.

Mathematically proficient students can apply the mathematics they know to solve problems arising in everyday life, society, and the workplace. In early grades, this might be as simple as writing an addition equation to describe a situation. In middle grades, a student might apply proportional reasoning to plan a school event or analyze a problem in the community. By high school, a student might use geometry to solve a design problem.
MAFS.K12.MP.4.1: or use a function to describe how one quantity of interest depends on another. Mathematically proficient students who can apply what they know are comfortable making assumptions and approximations to simplify a complicated situation, realizing that these may need revision later. They are able to identify important quantities in a practical situation and map their relationships using such tools as diagrams, two-way tables, graphs, flowcharts and formulas. They can analyze those relationships mathematically to draw conclusions. They routinely interpret their mathematical results in the context of the situation and reflect on whether the results make sense, possibly improving the model if it has not served its purpose.

Standard Relation to Course: Supporting

Use appropriate tools strategically.

Mathematically proficient students consider the available tools when solving a mathematical problem. These tools might include pencil and paper, concrete models, a ruler, a protractor, a calculator, a spreadsheet, a computer algebra system, a statistical package, or dynamic geometry software. Proficient students are sufficiently familiar with tools appropriate for their grade or course to make sound decisions about when each of these tools might be helpful, recognizing both the insight to be gained and their limitations. For example, mathematically proficient high school students analyze graphs of functions and solutions generated using a graphing calculator. They detect possible errors by strategically using estimation and other mathematical knowledge. When making mathematical models, they know that technology can enable them to visualize the results of varying assumptions, explore consequences, and compare predictions with data. Mathematically proficient students at various grade levels are able to identify relevant external mathematical resources, such as digital content located on a website, and use them to pose or solve problems. They are able to use technological tools to explore and deepen their understanding of concepts.

Standard Relation to Course: Supporting

MAFS.K12.MP.5.1: Attend to precision.

Mathematically proficient students try to communicate precisely to others. They try to use clear definitions in discussion with others and in their own reasoning. They state the meaning of the symbols they choose, including using the equal sign consistently and appropriately. They are careful about specifying units of measure, and labeling axes to clarify the correspondence with quantities in a problem. They calculate accurately and efficiently, express numerical answers with a degree of precision appropriate for the problem context. In the elementary grades, students give closely formulated explanations to each other. By the time they reach high school they have learned to examine claims and make explicit use of definitions.

Standard Relation to Course: Supporting

MAFS.K12.MP.6.1: Look for and make use of structure.

Mathematically proficient students look closely to discern a pattern or structure. Young students, for example, might notice that three and seven more is the same amount as seven and three more, or they may sort a collection of shapes according to how many sides the shapes have. Later, students will see 7 

\[ 8 = \text{the well remembered } 7 \times 5 + 7 \times 3, \text{ in preparation for learning about the distributive property. In the expression } x^2 + 9x + 14, \text{ older students can see the 14 as } 2 \times 7 \text{ and the 9 as } 2 + 7. \text{ They recognize the significance of an existing line in a geometric figure and can use the strategy of drawing an auxiliary line for solving problems. They also can step back for an overview and shift perspective. They can see complicated things, such as some algebraic expressions, as single objects or as being composed of several objects. For example, they can see } 5 - 3(x - y) \text{ as } 5 \text{ minus a positive number times a square and use that to realize that its value cannot be more than } 5 \text{ for any real numbers } x \text{ and } y.

Standard Relation to Course: Supporting

MAFS.K12.MP.7.1: Look for and express regularity in repeated reasoning.

Mathematically proficient students notice when calculations are repeated, and look both for general methods and for shortcuts. Upper elementary students might notice when dividing 25 by 11 that they are repeating the same calculations over and over again, and conclude they have a repeating decimal. By paying attention to the calculation of slope as they repeatedly check whether points are on the line through (1, 2) with slope 3, middle school students might abstract the equation \( y - 2 = 3(x - 1) \). Noticing the regularity in the way terms cancel when expanding \( (x - 1)(x + 1), \) \((x - 1)(x^2 + x + 1),\) and \((x - 1)x^2 + x^2 + x + 1)\) might lead them to the general formula for the sum of a geometric series. As they work to solve a problem, mathematically proficient students maintain oversight of the process, while attending to the details. They continually evaluate the reasonableness of their intermediate results.

Standard Relation to Course: Supporting

MAFS.K12.MP.8.1: English language learners communicate information, ideas and concepts necessary for academic success in the content area of Science.

General Course Information and Notes

GENERAL NOTES

Laboratory investigations that include the use of scientific inquiry, research, measurement, problem solving, laboratory apparatus and technologies, experimental procedures, and safety procedures are an integral part of this course. The National Science Teachers Association (NSTA) recommends that at the high school level, all students should be in the science lab or field, collecting data every week. School laboratory investigations (labs) are defined by the National Research Council (NRC) as an experience in the laboratory, classroom, or the field that provides students with opportunities to interact directly with natural phenomena or with data collected by others using tools, materials, data collection techniques, and models (NRC, 2006, p. 3). Laboratory investigations in the high school classroom should help all students develop a growing understanding of the complexity and ambiguity of empirical work, as well as the skills to calibrate and troubleshoot equipment used to make observations. Learners should understand measurement error; and have the skills to aggregate, interpret, and present the resulting data (National Research Council, 2006, p. 77; NSTA, 2007).

Special Notes:

Instructional Practices
Teaching from a range of complex text is optimized when teachers in all subject areas implement the following strategies on a routine basis:
1. Ensuring wide reading from complex text that varies in length.
2. Making close reading and re-reading of texts central to lessons.
3. Emphasizing text-specific complex questions, and cognitively complex tasks, reinforce focus on the text and cultivate independence.
4. Emphasizing students supporting answers based upon evidence from the text.
5. Providing extensive research and writing opportunities (claims and evidence).

- Asking questions (for science) and defining problems (for engineering).
- Developing and using models.
- Planning and carrying out investigations.
- Analyzing and interpreting data.
- Using mathematics, information and computer technology, and computational thinking.
- Constructing explanations (for science) and designing solutions (for engineering).
- Engaging in argument from evidence.
- Obtaining, evaluating, and communicating information.

Educator Certifications

- Earth/Space Science (Grades 6-12)
- Physics (Grades 6-12)
- Science (Secondary Grades 7-12)
- Biology (Grades 6-12)
- Middle Grades General Science (Middle Grades 5-9)
- Chemistry (Grades 6-12)

Literacy Standards in Science

Secondary science courses include reading standards for literacy in science and technical subjects 6-12 and writing standards for literacy in history/social studies, science, and technical subjects 6-12. The courses also include speaking and listening standards. For a complete list of standards required for this course click on the blue tile labeled course standards. You may also download the complete course including all required standards and notes sections using the export function located at the top of this page.

English Language Development ELD Standards Special Notes Section:

Teachers are required to provide listening, speaking, reading and writing instruction that allows English language learners (ELL) to communicate information, ideas and concepts for academic success in the content area of Science. For the given level of English language proficiency and with visual, graphic, or interactive support, students will interact with grade level words, expressions, sentences and discourse to process or produce language necessary for academic success. The ELD standard should specify a relevant content area concept or topic of study chosen by curriculum developers and teachers which maximizes an ELL’s need for communication and social skills. To access an ELL supporting document which delineates performance definitions and descriptors, please click on the following link:

https://cpalmsmediaprod.blob.core.windows.net/uploads/docs/standards/eld/sc.pdf

GENERAL INFORMATION

Course Number: 2002400
Course Path: Education Courses > Subject: Science > SubSubject: Integrated Sciences
Course Type: Core Academic Course
Course Level: 2
Course Status: Course Approved
Number of Credits: One (1) credit
Course Length: Year (Y)
Grade Level(s): 9,10,11,12
Graduation Requirement: Equally Rigorous Science

Abbreviated Title: INTEG SCI 1
Course Attributes:
- Class Size Core Required

Educator Certifications

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<tr>
<th>Subject</th>
<th>Grade Level</th>
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<tbody>
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<td>Earth/Space Science</td>
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<td>Chemistry</td>
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Course Standards

<table>
<thead>
<tr>
<th>Name</th>
<th>Description</th>
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<tbody>
<tr>
<td>SC.912.E.5.1:</td>
<td>Cite evidence used to develop and verify the scientific theory of the Big Bang (also known as the Big Bang Theory) of the origin of the universe.</td>
</tr>
<tr>
<td>SC.912.E.5.2:</td>
<td>Identify patterns in the organization and distribution of matter in the universe and the forces that determine them.</td>
</tr>
<tr>
<td>SC.912.E.5.4:</td>
<td>Explain the physical properties of the Sun and its dynamic nature and connect them to conditions and events on Earth.</td>
</tr>
<tr>
<td>SC.912.E.5.7:</td>
<td>Relate the history of and explain the justification for future space exploration and continuing technology development.</td>
</tr>
<tr>
<td>SC.912.E.5.8:</td>
<td>Connect the concepts of radiation and the electromagnetic spectrum to the use of historical and newly-developed observational tools.</td>
</tr>
<tr>
<td>SC.912.E.6.1:</td>
<td>Describe and differentiate the layers of Earth and the interactions among them.</td>
</tr>
<tr>
<td>SC.912.E.6.2:</td>
<td>Connect surface features to surface processes that are responsible for their formation.</td>
</tr>
<tr>
<td>SC.912.E.6.3:</td>
<td>Analyze the scientific theory of plate tectonics and identify related major processes and features as a result of moving plates.</td>
</tr>
<tr>
<td>SC.912.E.7.1:</td>
<td>Analyze the movement of matter and energy through the different biogeochemical cycles, including water and carbon.</td>
</tr>
<tr>
<td>SC.912.E.7.3:</td>
<td>Differentiate and describe the various interactions among Earth systems, including atmosphere, hydrosphere, cryosphere, geosphere, and biosphere.</td>
</tr>
<tr>
<td>SC.912.L.14.1:</td>
<td>Describe the scientific theory of cells (cell theory) and relate the history of its discovery to the process of science.</td>
</tr>
<tr>
<td>SC.912.L.14.2:</td>
<td>Relate structure to function for the components of plant and animal cells. Explain the role of cell membranes as a highly selective barrier (passive and active transport).</td>
</tr>
<tr>
<td>SC.912.L.14.3:</td>
<td>Compare and contrast the general structures of plant and animal cells. Compare and contrast the general structures of prokaryotic and eukaryotic cells.</td>
</tr>
<tr>
<td>SC.912.L.14.4:</td>
<td>Compare and contrast structure and function of various types of microscopes.</td>
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<tr>
<td>SC.912.L.14.7:</td>
<td>Relate the structure of each of the major plant organs and tissues to physiological processes.</td>
</tr>
<tr>
<td>SC.912.L.15.1:</td>
<td>Explain how the scientific theory of evolution is supported by the fossil record, comparative anatomy, comparative embryology, biogeography, molecular biology, and observed evolutionary change.</td>
</tr>
<tr>
<td>SC.912.L.15.4:</td>
<td>Describe how and why organisms are hierarchically classified and based on evolutionary relationships.</td>
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<tr>
<td>SC.912.L.15.5:</td>
<td>Explain the reasons for changes in how organisms are classified.</td>
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<tr>
<td>SC.912.L.15.6:</td>
<td>Discuss distinguishing characteristics of the domains and kingdoms of living organisms.</td>
</tr>
<tr>
<td>SC.912.L.15.8:</td>
<td>Describe the scientific explanations of the origin of life on Earth.</td>
</tr>
<tr>
<td>SC.912.L.16.14:</td>
<td>Describe the cell cycle, including the process of mitosis. Explain the role of mitosis in the formation of new cells and its importance in maintaining chromosome number during asexual reproduction.</td>
</tr>
<tr>
<td>SC.912.L.16.16:</td>
<td>Describe the process of meiosis, including independent assortment and crossing over. Explain how reduction division results in the formation of haploid gametes or spores.</td>
</tr>
<tr>
<td>SC.912.L.16.17:</td>
<td>Compare and contrast mitosis and meiosis and relate to the processes of sexual and asexual reproduction and their consequences for genetic variation.</td>
</tr>
<tr>
<td>SC.912.L.17.2:</td>
<td>Explain the general distribution of life in aquatic systems as a function of chemistry, geography, light, depth, salinity, and temperature.</td>
</tr>
<tr>
<td>SC.912.L.17.3:</td>
<td>Discuss how various oceanic and freshwater processes, such as currents, tides, and waves, affect the abundance of aquatic organisms.</td>
</tr>
<tr>
<td>SC.912.L.17.4:</td>
<td>Describe changes in ecosystems resulting from seasonal variations, climate change and succession.</td>
</tr>
<tr>
<td>SC.912.L.17.9:</td>
<td>Use a food web to identify and distinguish producers, consumers, and decomposers. Explain the pathway of energy transfer through trophic levels and the reduction of available energy at successive trophic levels.</td>
</tr>
<tr>
<td>SC.912.L.17.11:</td>
<td>Evaluate the costs and benefits of renewable and nonrenewable resources, such as water, energy, fossil fuels, wildlife, and forests.</td>
</tr>
<tr>
<td>SC.912.L.18.1:</td>
<td>Describe the basic molecular structures and primary functions of the four major categories of biological macromolecules.</td>
</tr>
<tr>
<td>SC.912.L.18.7:</td>
<td>Identify the reactants, products, and basic functions of photosynthesis.</td>
</tr>
<tr>
<td>SC.912.L.18.8:</td>
<td>Identify the reactants, products, and basic functions of aerobic and anaerobic cellular respiration.</td>
</tr>
<tr>
<td>SC.912.L.18.9:</td>
<td>Explain the interrelated nature of photosynthesis and cellular respiration.</td>
</tr>
<tr>
<td>SC.912.L.18.12:</td>
<td>Discuss the special properties of water that contribute to Earth’s suitability as an environment for life: cohesive behavior, ability to moderate temperature, expansion upon freezing, and versatility as a solvent.</td>
</tr>
</tbody>
</table>

Define a problem based on a specific body of knowledge, for example: biology, chemistry, physics, and earth/space science, and do the following:

1. Pose questions about the natural world, (Articulate the purpose of the investigation and identify the relevant scientific concepts).
2. Conduct systematic observations, (Write procedures that are clear and replicable. Identify observables and examine relationships between test (independent) variable and outcome (dependent) variable. Employ appropriate methods for accurate and consistent observations; conduct and record measurements at appropriate levels of precision. Follow safety guidelines).
3. Examine books and other sources of information to see what is already known, (Review what is known in light of empirical evidence, (Examine whether available empirical evidence can be interpreted in terms of existing knowledge and models, and if not, modify or develop new models).)
4. Plan investigations, (Design and evaluate a scientific investigation).
5. Use tools to gather, analyze, and interpret data (this includes the use of measurement in metric and other systems, and also the generation and interpretation of graphical representations of data, including data tables and graphs), (Collect data or evidence in an organized way. Properly use instruments, equipment, and materials (e.g., scales, probeware, meter sticks, microscopes, computers) including set-up, calibration, technique, maintenance, and storage).
6. Pose answers, explanations, or descriptions of events,
7. Generate explanations that explicate or describe natural phenomena (inferences),
8. Use appropriate evidence and reasoning to justify these explanations to others,
9. Communicate results of scientific investigations, and
10. Evaluate the merits of the explanations produced by others.
Describe and explain what characterizes science and its methods.

Differentiate between physical and chemical properties and physical and chemical changes of matter.

Recognize the role of creativity in constructing scientific questions, methods and explanations.

Interpret formula representations of molecules and compounds in terms of composition and structure.

Identify sources of information and assess their reliability according to the strict standards of scientific investigation.

Describe how scientific inferences are drawn from scientific observations and provide examples from the content being studied.

Recognize that the strength or usefulness of a scientific claim is

Distinguish between endothermic and exothermic chemical processes.

Describe heat as the energy transferred by convection, conduction, and

Explain that scientific laws are descriptions of specific relationships under given conditions in nature, but do not offer explanations for those relationships.

Recognize that theories do not become laws, nor do laws become theories; theories are well supported explanations and laws are well supported descriptions.

Describe the function of models in science, and identify the wide range of models used in science.

Interpret and apply Newton's three laws of motion.

Explore the scientific theory of atoms (also known as atomic theory) by describing changes in the atomic model over time and why those changes were necessitated by experimental evidence.

Explore the scientific theory of atoms (also known as atomic theory) by describing the structure of atoms in terms of protons, neutrons and electrons, and differentiate among these particles in terms of their mass, electrical charges and locations within the atom.

Determine properties of atoms and their position in the periodic table to the arrangement of their electrons.

Interpret formula representations of molecules and compounds in terms of composition and structure.

Distinguish between physical and chemical properties and physical and chemical changes of matter.

Explore the scientific theory of atoms (also known as atomic theory) by describing changes in the atomic model over time and why those changes were necessitated by experimental evidence.

Relate properties of atoms and their position in the periodic table to the arrangement of their electrons.

Interpret formula representations of molecules and compounds in terms of composition and structure.

Distinguish between endothermic and exothermic chemical processes.

Describe the measurable properties of waves and explain the relationships among them and how these properties change when the wave moves from one medium to another.

Interpret and apply Newton's three laws of motion.

Mathematicians who participate in effortful learning both individually and with others:
- Analyze the problem in a way that makes sense given the task.
- Ask questions that will help with solving the task.
- Build perseverance by modifying methods as needed while solving a challenging task.
- Stay engaged and maintain a positive mindset when working to solve tasks.
- Help and support each other when attempting a new method or approach.

Mathematicians who demonstrate understanding by representing problems in multiple ways:
- Build understanding through modeling and using manipulatives.
- Represent solutions to problems in multiple ways using objects, drawings, tables, graphs and equations.
- Progress from modeling problems with objects and drawings to using algorithms and equations.
- Express connections between concepts and representations.
- Choose a representation based on the given context or purpose.

Mathematicians who complete tasks with mathematical fluency:
- Complete tasks accurately and with confidence.
- Adapt procedures to apply them to a new context.
- Use feedback to improve efficiency when performing calculations.

Mathematicians who engage in discussions that reflect on the mathematical thinking of self and others:
- Offer multiple opportunities for students to practice efficient and generalizable methods.
- Provide opportunities for students to reflect on the method they used and determine if a more efficient method could have been used.

Mathematicians who engage in discussions that reflect on the mathematical thinking of self and others:
- Recognize students' effort when solving challenging problems.
- Develop students' ability to analyze and problem solve.
- Recognize students' effort when solving challenging problems.
- Provide opportunities for students to use manipulatives when investigating concepts.
- Help and support each other when attempting a new method or approach.
- Help students make connections between concepts and representations.
- Demonstrate understanding by representing problems in multiple ways.
- Choose a representation based on the given context or purpose.
- Complete tasks with mathematical fluency.
- Engage in discussions that reflect on the mathematical thinking of self and others.

Clarifications:
Teachers who encourage students to engage in discussions that reflect on the mathematical thinking of self and others:
- Recognize students' effort when solving challenging problems.
- Provide opportunities for students to reflect on the method they used and determine if a more efficient method could have been used.

Clarifications:
Teachers who encourage students to participate actively in effortful learning both individually and with others:
- Cultivate a community of growth mindset learners.
- Foster perseverance in students by choosing tasks that are challenging.
- Develop students' ability to analyze and problem solve.
- Recognize students' effort when solving challenging problems.

Clarifications:
Mathematicians who complete tasks with mathematical fluency:
- Select efficient and appropriate methods for solving problems within the given context.
- Maintain flexibility and accuracy while performing procedures and mental calculations.
- Complete tasks accurately and with confidence.
- Adapt procedures to apply them to a new context.
- Use feedback to improve efficiency when performing calculations.

Clarifications:
Mathematicians who participate in effortful learning both individually and with others:
- Analyze the problem in a way that makes sense given the task.
- Ask questions that will help with solving the task.
- Build perseverance by modifying methods as needed while solving a challenging task.
- Stay engaged and maintain a positive mindset when working to solve tasks.
- Help and support each other when attempting a new method or approach.

Clarifications:
Teachers who encourage students to participate actively in effortful learning both individually and with others:
- Cultivate a community of growth mindset learners.
- Foster perseverance in students by choosing tasks that are challenging.
- Develop students' ability to analyze and problem solve.
- Recognize students' effort when solving challenging problems.
**MA.K12.MTR.4.1:**
- Communicate mathematical ideas, vocabulary and methods effectively.
- Analyze the mathematical thinking of others.
- Compare the efficiency of a method to those expressed by others.
- Recognize errors and suggest how to correctly solve the task.
- Justify results by explaining methods and processes.
- Construct possible arguments based on evidence.

**Clarifications:**
Teachers who encourage students to engage in discussions that reflect on the mathematical thinking of self and others:
- Establish a culture in which students ask questions of the teacher and their peers, and error is an opportunity for learning.
- Create opportunities for students to discuss their thinking with peers.
- Select, sequence and present student work to advance and deepen understanding of correct and increasingly efficient methods.
- Develop students' ability to justify methods and compare their responses to the responses of their peers.

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**MA.K12.MTR.5.1:**
- Use patterns and structure to help understand and connect mathematical concepts.
- Mathematicians who use patterns and structure to help understand and connect mathematical concepts:
  - Focus on relevant details within a problem.
  - Create plans and procedures to logically order events, steps or ideas to solve problems.
  - Decompose a complex problem into manageable parts.
  - Relate previously learned concepts to new concepts.
  - Look for similarities among problems.
  - Connect solutions of problems to more complicated large-scale situations.

**Clarifications:**
Teachers who encourage students to use patterns and structure to help understand and connect mathematical concepts:
- Help students recognize the patterns in the world around them and connect these patterns to mathematical concepts.
- Support students to develop generalizations based on the similarities found among problems.
- Provide opportunities for students to create plans and procedures to solve problems.
- Develop students' ability to construct relationships between their current understanding and more sophisticated ways of thinking.

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**MA.K12.MTR.6.1:**
- Assess the reasonableness of solutions.
- Mathematicians who assess the reasonableness of solutions:
  - Estimate to discover possible solutions.
  - Use benchmark quantities to determine if a solution makes sense.
  - Check calculations when solving problems.
  - Verify possible solutions by explaining the methods used.
  - Evaluate results based on the given context.

**Clarifications:**
Teachers who encourage students to assess the reasonableness of solutions:
- Have students estimate or predict solutions prior to solving.
- Prompt students to continually ask, "Does this solution make sense? How do you know?"
- Reinforce that students check their work as they progress within and after a task.
- Strengthen students' ability to verify solutions through justifications.

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**MA.K12.MTR.7.1:**
- Apply mathematics to real-world contexts.
- Mathematicians who apply mathematics to real-world contexts:
  - Connect mathematical concepts to everyday experiences.
  - Use models and methods to understand, represent and solve problems.
  - Perform investigations to gather data or determine if a method is appropriate.
  - Redesign models and methods to improve accuracy or efficiency.

**Clarifications:**
Teachers who encourage students to apply mathematics to real-world contexts:
- Provide opportunities for students to create models, both concrete and abstract, and perform investigations.
- Challenge students to question the accuracy of their models and methods.
- Support students as they validate conclusions by comparing them to the given situation.
- Indicate how various concepts can be applied to other disciplines.

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**ELA.K12.EE.1.1:**
- Cite evidence to explain and justify reasoning.

**Clarifications:**
K-1 Students include textual evidence in their oral communication with guidance and support from adults. The evidence can consist of details from the text without naming the text. During 1st grade, students learn how to incorporate the evidence in their writing.
2-3 Students include relevant textual evidence in their written and oral communication. Students should name the text when they refer to it. In 3rd grade, students should use a combination of direct and indirect citations.
4-5 Students continue with previous skills and reference comments made by speakers and peers. Students cite texts that they've directly quoted, paraphrased, or used for information. When writing, students will use the form of citation dictated by the instructor or the style guide referenced by the instructor.
6-8 Students continue with previous skills and use a style guide to create a proper citation.
9-12 Students continue with previous skills and should be aware of existing style guides and the ways in which they differ.

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**ELA.K12.EE.2.1:**
- Read and comprehend grade-level complex texts proficiently.

**Clarifications:**
<table>
<thead>
<tr>
<th>ELA.K12.EE.3.1:</th>
<th>Use appropriate collaborative techniques and active listening skills when engaging in discussions in a variety of situations.</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Clarifications:</strong></td>
<td>In kindergarten, students learn to listen to one another respectfully. In grades 1-2, students build upon these skills by justifying what they are thinking. For example: “I think _______ because _______” The collaborative conversations are becoming academic conversations. In grades 3-12, students engage in academic conversations discussing claims and justifying their reasoning, refining and applying skills. Students build on ideas, propel the conversation, and support claims and counterclaims with evidence.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>ELA.K12.EE.5.1:</th>
<th>Use the accepted rules governing a specific format to create quality work.</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Clarifications:</strong></td>
<td>Students will incorporate skills learned into work products to produce quality work. For students to incorporate these skills appropriately, they must receive instruction. A 3rd grade student creating a poster board display must have instruction in how to effectively present information to do quality work.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>ELA.K12.EE.6.1:</th>
<th>Use appropriate voice and tone when speaking or writing.</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Clarifications:</strong></td>
<td>In kindergarten and 1st grade, students learn the difference between formal and informal language. For example, the way we talk to our friends differs from the way we speak to adults. In 2nd grade and beyond, students practice appropriate social and academic language to discuss texts.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>ELD.K12.ELL.SC.1:</th>
<th>English language learners communicate information, ideas and concepts necessary for academic success in the content area of Science.</th>
</tr>
</thead>
<tbody>
<tr>
<td>ELD.K12.ELL.SI.1:</td>
<td>English language learners communicate for social and instructional purposes within the school setting.</td>
</tr>
</tbody>
</table>

**General Course Information and Notes**

**GENERAL NOTES**

Laboratory investigations that include the use of scientific inquiry, research, measurement, problem solving, laboratory apparatus and technologies, experimental procedures, and safety procedures are an integral part of this course. The National Science Teachers Association (NSTA) recommends that at the high school level, all students should be in the science lab or field, collecting data every week. School laboratory investigations (labs) are defined by the National Research Council (NRC) as an experience in the laboratory, classroom, or the field that provides students with opportunities to interact directly with natural phenomena or with data collected by others using tools, materials, data collection techniques, and models (NRC, 2006, p. 3). Laboratory investigations in the high school classroom should help all students develop a growing understanding of the complexity and ambiguity of empirical work, as well as the skills to calibrate and troubleshoot equipment used to make observations. Learners should understand measurement error; and have the skills to aggregate, interpret, and present the resulting data (National Research Council, 2006, p. 77; NSTA, 2007).

**Special Notes:**

**Instructional Practices**

Teaching from a range of complex text is optimized when teachers in all subject areas implement the following strategies on a routine basis:

1. Ensuring wide reading from complex text that varies in length.
2. Making close reading and rereading of texts central to lessons.
3. Emphasizing text-specific complex questions, and cognitively complex tasks, reinforce focus on the text and cultivate independence.
4. Emphasizing students supporting answers based upon evidence from the text.
5. Providing extensive research and writing opportunities (claims and evidence).

**Science and Engineering Practices** (NRC Framework for K-12 Science Education, 2010)

- Asking questions (for science) and defining problems (for engineering).
- Developing and using models.
- Planning and carrying out investigations.
- Analyzing and interpreting data.
- Using mathematics, information and computer technology, and computational thinking.
- Constructing explanations (for science) and designing solutions (for engineering).
- Engaging in argument from evidence.
- Obtaining, evaluating, and communicating information.

**Florida's Benchmarks for Excellent Student Thinking (B.E.S.T.) Standards**

This course includes Florida's B.E.S.T. ELA Expectations (EE) and Mathematical Thinking and Reasoning Standards (MTRS) for students. Florida educators should intentionally embed these standards within the content and their instruction as applicable. For guidance on the implementation of the EEs and MTRS, please visit https://www.cpalms.org/Standards/BEST_Standards.aspx and select the appropriate B.E.S.T. Standards package.

**English Language Development ELD Standards Special Notes Section:**

Teachers are required to provide listening, speaking, reading and writing instruction that allows English language learners (ELL) to communicate information, ideas and concepts for academic success in the content area of Science. For the given level of English language proficiency and with visual, graphic, or interactive support, students will interact with grade level words, expressions, sentences and discourse to process or produce language necessary for academic success. The ELD standard should specify a relevant content area concept or topic of study chosen by curriculum developers and teachers which maximizes an ELL's need for communication and social skills.
To access an ELL supporting document which delineates performance definitions and descriptors, please click on the following link:
https://cpalmsmediaprod.blob.core.windows.net/uploads/docs/standards/eld/sc.pdf

GENERAL INFORMATION

Course Number: 2002400

Number of Credits: One (1) credit

Course Path: Section: Grades PreK to 12 Education Courses > Grade Group: Grades 9 to 12 and Adult Education Courses > Subject: Science > SubSubject: Integrated Sciences

Abbreviated Title: INTEG SCI 1

Course Length: Year (Y)

Course Attributes:
- Class Size Core Required

Course Level: 2

Graduation Requirement: Equally Rigorous Science

Educator Certifications

<table>
<thead>
<tr>
<th>Subject</th>
<th>Grade Level</th>
</tr>
</thead>
<tbody>
<tr>
<td>Earth/Space Science (Grades 6-12)</td>
<td></td>
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<tr>
<td>Physics (Grades 6-12)</td>
<td></td>
</tr>
<tr>
<td>Science (Secondary Grades 7-12)</td>
<td></td>
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<tr>
<td>Biology (Grades 6-12)</td>
<td></td>
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<tr>
<td>Middle Grades General Science (Middle Grades 5-9)</td>
<td></td>
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<tr>
<td>Chemistry (Grades 6-12)</td>
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</tr>
</tbody>
</table>
### Course Standards

<table>
<thead>
<tr>
<th>Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>SC.912.E.5.1:</td>
<td>Cite evidence used to develop and verify the scientific theory of the Big Bang (also known as the Big Bang Theory) of the origin of the universe.</td>
</tr>
<tr>
<td>SC.912.E.5.2:</td>
<td>Identify patterns in the organization and distribution of matter in the universe and the forces that determine them.</td>
</tr>
<tr>
<td>SC.912.E.5.4:</td>
<td>Explain the physical properties of the Sun and its dynamic nature and connect them to conditions and events on Earth.</td>
</tr>
<tr>
<td>SC.912.E.5.7:</td>
<td>Relate the history of and explain the justification for future space exploration and continuing technology development.</td>
</tr>
<tr>
<td>SC.912.E.5.8:</td>
<td>Connect the concepts of radiation and the electromagnetic spectrum to the use of historical and newly-developed observational tools.</td>
</tr>
<tr>
<td>SC.912.E.6.1:</td>
<td>Describe and differentiate the layers of Earth and the interactions among them.</td>
</tr>
<tr>
<td>SC.912.E.6.2:</td>
<td>Connect surface features to surface processes that are responsible for their formation.</td>
</tr>
<tr>
<td>SC.912.E.6.3:</td>
<td>Analyze the scientific theory of plate tectonics and identify related major processes and features as a result of moving plates.</td>
</tr>
<tr>
<td>SC.912.E.6.6:</td>
<td>Analyze past, present, and potential future consequences to the environment resulting from various energy production technologies.</td>
</tr>
<tr>
<td>SC.912.E.7.1:</td>
<td>Analyze the movement of matter and energy through the different biogeochemical cycles, including water and carbon.</td>
</tr>
<tr>
<td>SC.912.E.7.3:</td>
<td>Differentiate and describe the various interactions among Earth systems, including: atmosphere, hydrosphere, cryosphere, geosphere, and biosphere.</td>
</tr>
<tr>
<td>SC.912.L.14.1:</td>
<td>Describe the scientific theory of cells (cell theory) and relate the history of its discovery to the process of science.</td>
</tr>
<tr>
<td>SC.912.L.14.2:</td>
<td>Relate structure to function for the components of plant and animal cells. Explain the role of cell membranes as a highly selective barrier (passive and active transport).</td>
</tr>
<tr>
<td>SC.912.L.14.3:</td>
<td>Compare and contrast structure and function of various types of microscopes.</td>
</tr>
<tr>
<td>SC.912.L.15.1:</td>
<td>Explain how the scientific theory of evolution is supported by the fossil record, comparative anatomy, comparative embryology, biogeography, molecular biology, and observed evolutionary change.</td>
</tr>
<tr>
<td>SC.912.L.15.4:</td>
<td>Describe how and why organisms are hierarchically classified and based on evolutionary relationships.</td>
</tr>
<tr>
<td>SC.912.L.15.5:</td>
<td>Explain the reasons for changes in how organisms are classified.</td>
</tr>
<tr>
<td>SC.912.L.15.6:</td>
<td>Discuss distinguishing characteristics of the domains and kingdoms of living organisms.</td>
</tr>
<tr>
<td>SC.912.L.15.8:</td>
<td>Describe the scientific explanations of the origin of life on Earth.</td>
</tr>
<tr>
<td>SC.912.L.16.14:</td>
<td>Describe the cell cycle, including the process of mitosis. Explain the role of mitosis in the formation of new cells and its importance in maintaining chromosome number during asexual reproduction.</td>
</tr>
<tr>
<td>SC.912.L.16.16:</td>
<td>Describe the process of meiosis, including independent assortment and crossing over. Explain how reduction division results in the formation of haploid gametes or spores.</td>
</tr>
<tr>
<td>SC.912.L.16.17:</td>
<td>Compare and contrast mitosis and meiosis and relate to the processes of sexual and asexual reproduction and their consequences for genetic variation.</td>
</tr>
<tr>
<td>SC.912.L.17.2:</td>
<td>Explain the general distribution of life in aquatic systems as a function of chemistry, geography, light, depth, salinity, and temperature.</td>
</tr>
<tr>
<td>SC.912.L.17.3:</td>
<td>Discuss how various oceanic and freshwater processes, such as currents, tides, and waves, affect the abundance of aquatic organisms.</td>
</tr>
<tr>
<td>SC.912.L.17.4:</td>
<td>Describe changes in ecosystems resulting from seasonal variations, climate change and succession.</td>
</tr>
<tr>
<td>SC.912.L.17.9:</td>
<td>Use a food web to identify and distinguish producers, consumers, and decomposers. Explain the pathway of energy transfer through trophic levels and the reduction of available energy at successive trophic levels.</td>
</tr>
<tr>
<td>SC.912.L.17.10:</td>
<td>Diagram and explain the biogeochemical cycles of an ecosystem, including water, carbon, and nitrogen cycle.</td>
</tr>
<tr>
<td>SC.912.L.17.11:</td>
<td>Evaluate the costs and benefits of renewable and nonrenewable resources, such as water, energy, fossil fuels, wildlife, and forests.</td>
</tr>
<tr>
<td>SC.912.L.17.15:</td>
<td>Discuss the effects of technology on environmental quality.</td>
</tr>
<tr>
<td>SC.912.L.17.19:</td>
<td>Describe how different natural resources are produced and how their rates of use and renewal limit availability.</td>
</tr>
<tr>
<td>SC.912.L.18.1:</td>
<td>Describe the basic molecular structures and primary functions of the four major categories of biological macromolecules.</td>
</tr>
<tr>
<td>SC.912.L.18.2:</td>
<td>Describe the important structural characteristics of monosaccharides, disaccharides, and polysaccharides and explain the functions of carbohydrates in living things.</td>
</tr>
<tr>
<td>SC.912.L.18.3:</td>
<td>Describe the structures of fatty acids, triglycerides, phospholipids, and steroids. Explain the functions of lipids in living organisms. Identify some reactions that fatty acids undergo. Relate the structure and function of cell membranes.</td>
</tr>
<tr>
<td>SC.912.L.18.4:</td>
<td>Describe the structures of proteins and amino acids. Explain the functions of proteins in living organisms. Identify some reactions that amino acids undergo. Relate the structure and function of enzymes.</td>
</tr>
<tr>
<td>SC.912.L.18.7:</td>
<td>Identify the reactants, products, and basic functions of photosynthesis.</td>
</tr>
<tr>
<td>SC.912.L.18.8:</td>
<td>Identify the reactants, products, and basic functions of aerobic and anaerobic cellular respiration.</td>
</tr>
<tr>
<td>SC.912.L.18.9:</td>
<td>Explain the interrelated nature of photosynthesis and cellular respiration.</td>
</tr>
<tr>
<td>SC.912.L.18.12:</td>
<td>Discuss the special properties of water that contribute to Earth’s suitability as an environment for life: cohesive behavior, ability to moderate temperature, expansion upon freezing, and versatility as a solvent.</td>
</tr>
</tbody>
</table>

Define a problem based on a specific body of knowledge, for example: biology, chemistry, physics, and earth/space science, and do the following:

1. Pose questions about the natural world. (Articulate the purpose of the investigation and identify the relevant scientific concepts).
2. Conduct systematic observations. (Write procedures that are clear and replicable. Identify observables and examine relationships between test (independent) variable and outcome (dependent) variable. Employ appropriate methods for accurate and consistent observations; conduct and record measurements at appropriate levels of precision. Follow safety guidelines).
3. Examine books and other sources of information to see what is already known.
4. Review what is known in light of empirical evidence. (Examine whether available empirical evidence can be interpreted in terms of existing knowledge and models, and if not, modify or develop new models).
5. Plan investigations. (Design and evaluate a scientific investigation).
6. Use tools to gather, analyze, and interpret data (this includes the use of measurement in metric and other systems, and also the
Describe and explain what characterizes science and its methods.

Recognize the role of creativity in constructing scientific questions, methods and explanations.

Choose a level of accuracy appropriate to limitations on measurement when reporting quantities.

Describe how scientific inferences are drawn from scientific observations and provide examples from the content being studied.

Recognize that theories do not become laws, nor do laws become theories.

Apply concepts of density based on area and volume in modeling situations (e.g., persons per square mile, BTUs per cubic foot).

Explain how scientific knowledge and reasoning provide an empirically-based perspective to inform society's decision making.

Recognize that time, length, and energy depend on the frame of reference.

Interpret and apply Newton's three laws of motion.

Identify examples of pseudoscience (such as astrology, phrenology) in society.

Explore the scientific theory of atoms (also known as atomic theory) by describing changes in the atomic model over time and why those changes were necessitated by experimental evidence.

Explain that all objects emit and absorb electromagnetic radiation and describe the structure of atoms in terms of protons, neutrons and electrons, and differentiate among these particles in terms of their mass, electrical charges and locations within the atom.

Differentiate among the various forms of energy and recognize that they can be transformed from one form to others.

Describe heat as the energy transferred by convection, conduction, and radiation, and explain the connection of heat to change in temperature or states of matter.

Distinguish between endothermic and exothermic chemical processes.

Explain entropy's role in determining the efficiency of processes that convert energy to work.

Recognize that nothing travels faster than the speed of light in vacuum which is the same for all observers no matter how they or the light source are moving.

Recognize that Newton's Laws are a limiting case of Einstein's Special Theory of Relativity at speeds that are much smaller than the speed of light.

Recognize that time, length, and energy depend on the frame of reference.

For a function that models a relationship between two quantities, interpret key features of graphs and tables in terms of the quantities, and sketch graphs showing key features given a verbal description of the relationship. Key features include: intercepts; intervals where the function is increasing, decreasing, positive, or negative; relative maximums and minimums; symmetries; end behavior; and periodicity. ★

Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases. ★

a. Graph linear and quadratic functions and show intercepts, maxima, and minima.

b. Graph square root, cube root, and piecewise-defined functions, including step functions and absolute value functions.

c. Graph polynomial functions, identifying zeros when suitable factorizations are available, and showing end behavior.

d. Graph rational functions, identifying zeros and asymptotes when suitable factorizations are available, and showing end behavior.

e. Graph exponential and logarithmic functions, showing intercepts and end behavior, and trigonometric functions, showing period, midline, and amplitude, and using phase shift.

Apply concepts of density based on area and volume in modeling situations (e.g., persons per square mile, BTUs per cubic foot). ★

Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays. ★

Choose a level of accuracy appropriate to limitations on measurement when reporting quantities. ★

Solve problems involving velocity and other quantities that can be represented by vectors.

Evaluate reports based on data. ★
Represent data with plots on the real number line (dot plots, histograms, and box plots). ★

Clariﬁcations:
In grades 6 – 8, students describe center and spread in a data distribution. Here they choose a summary statistic appropriate to the characteristics of the data distribution, such as the shape of the distribution or the existence of extreme data points.

Use statistics appropriate to the shape of the data distribution to compare center (median, mean) and spread (interquartile range, standard deviation) of two or more different data sets. ★

Clariﬁcations:
In grades 6 – 8, students describe center and spread in a data distribution. Here they choose a summary statistic appropriate to the characteristics of the data distribution, such as the shape of the distribution or the existence of extreme data points.

Interpret differences in shape, center, and spread in the context of the data sets, accounting for possible effects of extreme data points (outliers). ★

Clariﬁcations:
In grades 6 – 8, students describe center and spread in a data distribution. Here they choose a summary statistic appropriate to the characteristics of the data distribution, such as the shape of the distribution or the existence of extreme data points.

Use the mean and standard deviation of a data set to ﬁt it to a normal distribution and to estimate population percentages. Recognize that there are data sets for which such a procedure is not appropriate. Use calculators, spreadsheets, and tables to estimate areas under the normal curve. ★

Summarize categorical data for two categories in two-way frequency tables. Interpret relative frequencies in the context of the data (including joint, marginal, and conditional relative frequencies). Recognize possible associations and trends in the data. ★

Represen data on two quantitative variables on a scatter plot, and describe how the variables are related. ★

a. Fit a function to the data; use functions ﬁtted to data to solve problems in the context of the data. Use given functions or choose a function suggested by the context. Emphasize linear, and exponential models.

b. Informally assess the ﬁt of a function by plotting and analyzing residuals.

c. Fit a linear function for a scatter plot that suggests a linear association.

Clariﬁcations:
Students take a more sophisticated look at using a linear function to model the relationship between two numerical variables. In addition to ﬁtting a line to data, students assess how well the model ﬁts by analyzing residuals.

Make sense of problems and persevere in solving them.

Mathematically proficient students start by explaining to themselves the meaning of a problem and looking for entry points to its solution. They analyze given, constraints, relationships, and goals. They make conjectures about the form and meaning of the solution and plan a solution pathway rather than simply jumping into a solution attempt. They consider analogous problems, and try special cases and simpler forms of the original problem in order to gain insight into its solution. They monitor and evaluate their progress and change course if necessary. Older students might, depending on the context of the problem, transform algebraic expressions or change the viewing window on their graphing calculator to get the information they need. Mathematically proficient students can explain correspondences between equations, verbal descriptions, tables, and graphs or draw diagrams of important features and relationships, graph data, and search for regularity or trends. Younger students might rely on using concrete objects or pictures to help conceptualize and solve a problem. Mathematically proficient students check their answers to problems using a different method, and they continually ask themselves, “Does this make sense?” They can understand the approaches of others to solving complex problems and identify correspondences between different approaches.

Standard Relation to Course: Supporting

Reason abstractly and quantitatively.

Mathematically proficient students make sense of quantities and their relationships in problem situations. They bring two complementary abilities to bear on problems involving quantitative relationships: the ability to decontextualize—to abstract a given situation and represent it symbolically and manipulate the representing symbols as if they have a life of their own, without necessarily attending to their referents—and the ability to contextualize, to pause as needed during the manipulation process in order to probe into the referents for the symbols involved. Quantitative reasoning entails creating a coherent representation of the problem at hand; considering the units involved; attending to the meaning of quantities, not just how to compute them; and knowing and ﬂexibly using different properties of operations and objects.

Standard Relation to Course: Supporting

Construct viable arguments and critique the reasoning of others.

Mathematically proficient students understand and use stated assumptions, deﬁnitions, and previously established results in constructing arguments. They make conjectures and build a logical progression of statements to explore the truth of their conjectures. They are able to analyze situations by breaking them into cases, and can recognize and use counterexamples. They justify their conclusions, communicate them to others, and respond to the arguments of others. They reason inductively about data, making plausible arguments that take into account the context from which the data arose. Mathematically proficient students are also able to compare the effectiveness of two plausible arguments, distinguish correct logic or reasoning from that which is flawed, and— if there is a flaw in an argument—explain what it is. Elementary students can construct arguments using concrete referents such as objects, drawings, diagrams, and actions. Such arguments can make sense and be correct, even though they are not generalized or made formal until later grades. Later, students learn to determine domains to which an argument applies. Students at all grades can listen or read the arguments of others, decide whether they make sense, and ask useful questions to clarify or improve the arguments.

Standard Relation to Course: Supporting

Model with mathematics.

Mathematically proficient students can apply the mathematics they know to solve problems arising in everyday life, society, and the workplace. In early grades, this might be as simple as writing an addition equation to describe a situation. In middle grades, a student might apply proportional reasoning to plan a school event or analyze a problem in the community. By high school, a student might use geometry to solve a design problem or use a function to describe how one quantity of interest depends on another. Mathematically proficient students who can apply what they know are comfortable making assumptions and approximations to simplify a complicated situation, realizing that these may need revision later. They are able to identify important quantities in a practical situation and map their relationships using such tools as diagrams, two-way tables, graphs, flowcharts and formulas. They can analyze those relationships mathematically to draw conclusions. They routinely interpret their mathematical results in the context of the situation and reflect on whether the results make sense, possibly improving the model if it has not served its purpose.
### Standard Relation to Course: Supporting

**MAFS.K12.MP.5.1**

Mathematically proficient students consider the available tools when solving a mathematical problem. These tools might include pencil and paper, concrete models, a ruler, a protractor, a calculator, a spreadsheet, a computer algebra system, a statistical package, or dynamic geometry software.

Proficient students are sufficiently familiar with tools appropriate for their grade or course to make sound decisions about when each of these tools might be helpful, recognizing both the insight to be gained and their limitations. For example, mathematically proficient high school students analyze graphs of functions and solutions generated using a graphing calculator. They detect possible errors by strategically using estimation and other mathematical knowledge. When making mathematical models, they know that technology can enable them to visualize the results of varying assumptions, explore consequences, and compare predictions with data. Mathematically proficient students at various grade levels are able to identify relevant external mathematical resources, such as digital content located on a website, and use them to pose or solve problems. They are able to use technological tools to explore and deepen their understanding of concepts.

### Standard Relation to Course: Supporting

**MAFS.K12.MP.6.1**

Mathematically proficient students try to communicate precisely to others. They try to use clear definitions in discussion with others and in their own reasoning. They state the meaning of the symbols they choose, including using the equal sign consistently and appropriately. They are careful about specifying units of measure, and labeling axes to clarify the correspondence with quantities in a problem. They calculate accurately and efficiently, express numerical answers with a degree of precision appropriate for the problem context. In the elementary grades, students give carefully formulated explanations to each other. By the time they reach high school they have learned to examine claims and make explicit use of definitions.

### Standard Relation to Course: Supporting

**MAFS.K12.MP.7.1**

Mathematically proficient students look closely to discern a pattern or structure. Young students, for example, might notice that three and seven more is the same amount as seven and three more, or they may sort a collection of shapes according to how many sides the shapes have. Later, students will see 7 × 8 equals the well remembered 7 × 5 + 7 × 3, in preparation for learning about the distributive property. In the expression x² + 9x + 14, older students can see the 14 as 2 × 7 and the 9 as 2 + 7. They recognize the significance of an existing line in a geometric figure and can use the strategy of drawing an auxiliary line for solving problems. They also can step back for an overview and shift perspective. They can see complicated things, such as some algebraic expressions, as single objects or as being composed of several objects. For example, they can see 5 – 3(x – y²) as 5 minus a positive number times a square and use that to realize that its value cannot be more than 5 for any real numbers x and y.

### Standard Relation to Course: Supporting

**Look for and express regularity in repeated reasoning.**

Mathematically proficient students notice if calculations are repeated, and look both for general methods and for shortcuts. Upper elementary students might notice when dividing by 11 that they are repeating the same calculations over and over again, and conclude they have a repeating decimal. By paying attention to the calculation of slope as they repeatedly check whether points are on the line through (1, 2) with slope 3, middle school students might abstract the equation (y – 2)/(x – 1) = 3. Noticing the regularity in the way terms cancel when expanding (x – 1)(x + 1), (x – 1)(x² + x + 1), and (x – 1)(x³ + x² + x + 1) might lead them to the general formula for the sum of a geometric series. As they work to solve a problem, mathematically proficient students maintain oversight of the process, while attending to the details. They continually evaluate the reasonableness of their intermediate results.

### Standard Relation to Course: Supporting

**MAFS.K12.MP.8.1**

Mathematically proficient students notice if calculations are repeated, and look both for general methods and for shortcuts. Upper elementary students might notice when dividing by 11 that they are repeating the same calculations over and over again, and conclude they have a repeating decimal. By paying attention to the calculation of slope as they repeatedly check whether points are on the line through (1, 2) with slope 3, middle school students might abstract the equation (y – 2)/(x – 1) = 3. Noticing the regularity in the way terms cancel when expanding (x – 1)(x + 1), (x – 1)(x² + x + 1), and (x – 1)(x³ + x² + x + 1) might lead them to the general formula for the sum of a geometric series. As they work to solve a problem, mathematically proficient students maintain oversight of the process, while attending to the details. They continually evaluate the reasonableness of their intermediate results.

### Standard Relation to Course: Supporting

**LAFS.910.RST.1.1**

Cite specific textual evidence to support analysis of science and technical texts, attending to the precise details of explanations or descriptions.

**LAFS.910.RST.1.2**

Determine the central ideas or conclusions of a text; trace the text's explanation or depiction of a complex process, phenomenon, or concept; provide an accurate summary of the text.

**LAFS.910.RST.1.3**

Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks, attending to special cases or exceptions defined in the text.

**LAFS.910.RST.2.4**

Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 9–10 texts and topics.

**LAFS.910.RST.2.5**

Analyze the structure of the relationships among concepts in a text, including relationships among key terms (e.g., force, friction, reaction force, energy).

**LAFS.910.RST.2.6**

Analyze the author's purpose in providing an explanation, describing a procedure, or discussing an experiment in a text, defining the question the author seeks to address.

**LAFS.910.RST.3.7**

Translate quantitative or technical information expressed in words in a text into visual form (e.g., a table or chart) and translate information expressed visually or mathematically (e.g., in an equation) into words.

**LAFS.910.RST.3.8**

Assess the extent to which the reasoning and evidence in a text support the author's claim or a recommendation for solving a scientific or technical problem.

**LAFS.910.RST.3.9**

Compare and contrast findings presented in a text to those from other sources (including their own experiments), noting when the findings support or contradict previous explanations or accounts.

**LAFS.910.RST.4.10**

By the end of grade 10, read and comprehend science/technical texts in the grades 9–10 text complexity band independently and proficiently.

**LAFS.910.WHST.1.1**

Write arguments focused on discipline-specific content.

a. Introduce precise claim(s), distinguish the claim(s) from alternate or opposing claims, and create an organization that establishes clear relationships among the claim(s), counterclaims, reasons, and evidence.

b. Develop claim(s) and counterclaims fairly, supplying data and evidence for each while pointing out the strengths and limitations of both claim(s) and counterclaims in a discipline-appropriate form and in a manner that anticipates the audience's knowledge level and concerns.

c. Use words, phrases, and clauses to link the major sections of the text, create cohesion, and clarify the relationships between claim(s) and reasons, between reasons and evidence, and between claim(s) and counterclaims.

d. Establish and maintain a formal style and objective tone while attending to the norms and conventions of the discipline in which they are writing.

e. Provide a concluding statement or section that follows from or supports the argument presented.

**LAFS.910.WHST.1.2**

Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes.

a. Introduce a topic and organize ideas, concepts, and information to make important connections and distinctions; include formatting (e.g., headings), graphics (e.g., figures, tables), and multimedia when useful to aiding comprehension.

b. Develop the topic with well-chosen, relevant, and sufficient facts, extended definitions, concrete details, quotations, or other information and
Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.

LAFS.910.WHST.1.2:
- Use varied transitions and sentence structures to link the major sections of the text, create cohesion, and clarify the relationships among ideas and concepts.
- Use precise language and domain-specific vocabulary to manage the complexity of the topic and convey a style appropriate to the discipline and context as well as to the expertise of likely readers.
- Establish and maintain a formal style and objective tone while attending to the norms and conventions of the discipline in which they are writing.
- Provide a concluding statement or section that follows from and supports the information or explanation presented (e.g., articulating implications or the significance of the topic).
- Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the usefulness of each source in answering the research question; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and following a standard format for citation.

LAFS.910.WHST.2.4:
- Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience.

LAFS.910.WHST.2.5:
- Use technology, including the internet, to produce, publish, and update individual or shared writing products, taking advantage of technology's capacity to link to other information and to display information flexibly and dynamically.

LAFS.910.WHST.3.7:
- Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation.

LAFS.910.WHST.3.8:
- Write routinely over extended time frames (time for reflection and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences.

LAFS.910.WHST.4.10:
- Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the usefulness of each source in answering the research question; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and following a standard format for citation.

LAFS.910.WHST.4.11:
- Draw evidence from informational texts to support analysis, reflection, and research.

ELD.K12.ELL.SC.1:
- English language learners communicate information, ideas and concepts necessary for academic success in the content area of Science.

ELD.K12.ELL.SI.1:
- English language learners communicate for social and instructional purposes within the school setting.

General Course Information and Notes

GENERAL NOTES

While the content focus of this course is consistent with the Integrated Science 1 course, students will explore these concepts in greater depth. In general, the academic pace and rigor will be greatly increased for honors level course work. Laboratory investigations that include the use of scientific inquiry, research, measurement, problem solving, laboratory apparatus and technologies, experimental procedures, and safety procedures are an integral part of this course. The National Science Teachers Association (NSTA) recommends that at the high school level, all students should be in the science lab or field, collecting data every week. School laboratory investigations (labs) are defined by the National Research Council (NRC) as an experience in the laboratory, classroom, or the field that provides students with opportunities to interact directly with natural phenomena or with data collected by others using tools, equipment used to make observations. Learners should understand the application, analysis, evaluation, and creation of complex ideas that are often abstract and multi-faceted. Students are challenged to think and collaborate critically on the content they are learning. Honors level lab will be achieved by increasing text complexity through text selection, focus on high-level qualitative measures, and complexity of task. Instruction will be structured to give students a deeper understanding of conceptual themes and organization within and across disciplines. Academic rigor is more than simply assigning to students a greater quantity of work.

Instructional Practices

Teaching from a range of complex text is optimized when teachers in all subject areas implement the following strategies on a routine basis:

1. Ensuring wide reading from complex text that varies in length.
2. Making close reading and rereading of texts central to lessons.
3. Emphasizing text-specific complex questions, and cognitively complex tasks, reinforce focus on the text and cultivate independence.
4. Emphasizing students supporting answers based upon evidence from the text.
5. Providing extensive research and writing opportunities (claims and evidence).


- Asking questions (for science) and defining problems (for engineering).
- Developing and using models.
- Planning and carrying out investigations.
- Analyzing and interpreting data.
- Using mathematics, information and computer technology, and computational thinking.
- Constructing explanations (for science) and designing solutions (for engineering).
- Engaging in argument from evidence.
- Obtaining, evaluating, and communicating information.

Honors and Advanced Level Course Note

Advanced courses require a greater demand on students through increased academic rigor. Academic rigor is obtained through the application, analysis, evaluation, and creation of complex ideas that are often abstract and multi-faceted. Students are challenged to think and collaborate critically on the content they are learning. Honors level lab will be achieved by increasing text complexity through text selection, focus on high-level qualitative measures, and complexity of task. Instruction will be structured to give students a deeper understanding of conceptual themes and organization within and across disciplines. Academic rigor is more than simply assigning to students a greater quantity of work.

Literacy Standards in Science

Secondary science courses include reading standards for literacy in science and technical subjects 6-12 and writing standards for literacy in history/social studies, science, and technical subjects 6-12. The courses also include speaking and listening standards. For a complete list of standards required for this course click on the blue tile labeled course standards. You may also download the complete course including all required standards and notes sections using the export function located at the top of this page.

English Language Development ELD Standards Special Notes Section:

Teachers are required to provide listening, speaking, reading and writing instruction that allows English language learners (ELL) to communicate information, ideas and
concepts for academic success in the content area of Science. For the given level of English language proficiency and with visual, graphic, or interactive support, students will interact with grade level words, expressions, sentences and discourse to process or produce language necessary for academic success. The ELD standard should specify a relevant content area concept or topic of study chosen by curriculum developers and teachers which maximizes an ELL's need for communication and social skills.

To access an ELL supporting document which delineates performance definitions and descriptors, please click on the following link:
https://cpalmsmediaprod.blob.core.windows.net/uploads/docs/standards/eld/sc.pdf

Additional Instructional Resources:
A.V.E. for Success Collection is provided by the Florida Association of School Administrators: http://www.fasa.net/4DCGI/cms/review.html?Action=CMS_Document&DocID=139. Please be aware that these resources have not been reviewed by CPALMS and there may be a charge for the use of some of them in this collection.

GENERAL INFORMATION

Course Number: 2002410
Course Path: Section: Grades PreK to 12 Education Courses >Grade Group: Grades 9 to 12 and Adult Education Courses >Subject: Science >SubSubject: Integrated Sciences
Abbreviated Title: INTEG SCI 1 HON
Course Level: 3
Course Attributes:
- Honors
- Class Size Core Required

Number of Credits: One (1) credit

Course Type: Core Academic Course
Course Status: Course Approved
Grade Level(s): 9,10,11,12
Graduation Requirement: Equally Rigorous Science

Educator Certifications

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<tr>
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<tr>
<td>Chemistry (Grades 6-12)</td>
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</table>
Define a problem based on a specific body of knowledge, for example: biology, chemistry, physics, and earth/space science, and do the following:

1. Pose questions about the natural world. (Articulate the purpose of the investigation and identify the relevant scientific concepts).

2. Conduct systematic observations. (Write procedures that are clear and replicable. Identify observables and examine relationships between test (independent) variable and outcome (dependent) variable. Employ appropriate methods for accurate and consistent observations; conduct and record measurements at appropriate levels of precision. Follow safety guidelines).

3. Examine books and other sources of information to see what is already known.

4. Review what is known in light of empirical evidence. (Examine whether available empirical evidence can be interpreted in terms of existing knowledge and models, and if not, modify or develop new models).

5. Plan investigations. (Design and evaluate a scientific investigation).

6. Use tools to gather, analyze, and interpret data (this includes the use of measurement in metric and other systems, and also the
Describe and explain what characterizes science and its methods.

Identify sources of information and assess their reliability according to the strict standards of scientific investigation.

Interpret formula representations of molecules and compounds in terms of composition and structure.

Explore the scientific theory of atoms (also known as atomic theory) by

Differentiate among the four states of matter.

Identify examples of pseudoscience (such as astrology, phrenology) in society.

Describe the function of models in science, and identify the wide range of models used in science.

Weigh the merits of alternative strategies for solving a specific problem.

Explain that all objects emit and absorb electromagnetic radiation and explain the connection of heat to change in temperature or states of matter.

Recognize that the strength or usefulness of a scientific claim is evaluated through scientific argumentation, which depends on critical and logical thinking, and the active consideration of competing interpretations (explanations) of scientists are a strength of science as a source of new, testable ideas that have the potential to add new evidence to support one or another of the explanations.

Describe instances in which scientists' varied backgrounds, talents, interests, and goals influence the inferences and thus the explanations that they make about observations of natural phenomena and describe that competing interpretations (explanations) of scientists are a strength of science as they are a source of new, testable ideas that have the potential to add new evidence to support one or another of the explanations.

Recognize that scientific knowledge is both durable and robust and open to change. Scientific knowledge can change because it is often examined and re-examined by new investigations and scientific argumentation. Because of these frequent examinations, scientific knowledge becomes stronger, leading to its durability.

Describe instances in which scientists' varied backgrounds, talents, interests, and goals influence the inferences and thus the explanations that they make about observations of natural phenomena and describe that competing interpretations (explanations) of scientists are a strength of science as they are a source of new, testable ideas that have the potential to add new evidence to support one or another of the explanations.

Explain that scientific laws are descriptions of specific relationships among them and how these properties change when the wave moves from one medium to another.

Distinguish between endothermic and exothermic chemical processes.

Describe heat as the energy transferred by convection, conduction, and radiation, and explain the connection of heat to change in temperature or states of matter.

Distinguish between enthalpy and exothermic chemical processes.

Explain entropy's role in determining the efficiency of processes that convert energy to work.

Describe the measurable properties of waves and explain the relationships among them and how these properties change when the wave moves from one medium to another.

Interpret and apply Newton's three laws of motion.

Recognize that nothing travels faster than the speed of light in vacuum which is the same for all observers no matter how they or the light source are moving.

Recognize that Newton's Laws are a limiting case of Einstein's Special Theory of Relativity at speeds that are much smaller than the speed of light.

Recognize that time, length, and energy depend on the frame of reference.

Mathematicians who participate in effortful learning both individually and with others:

- Analyze the problem in a way that makes sense given the task.
- Ask questions that will help with solving the task.
- Build perseverance by modifying methods as needed while solving a challenging task.
- Stay engaged and maintain a positive mindset when working to solve tasks.
- Help and support each other when attempting a new method or approach.

Demonstrate understanding by representing problems in multiple ways.

Mathematicians who demonstrate understanding by representing problems in multiple ways:

- Build understanding through modeling and using manipulatives.
- Represent solutions to problems in multiple ways using objects, drawings, tables, graphs and equations.
MA.K12.MTR.2.1: Progress from modeling problems with objects and drawings to using algorithms and equations. Express connections between concepts and representations.

Choose a representation based on the given context or purpose.

**Clarifications:**
- Teachers who encourage students to demonstrate understanding by representing problems in multiple ways:
  - Help students make connections between concepts and representations.
  - Provide opportunities for students to use manipulatives when investigating concepts.
  - Guide students from concrete to pictorial to abstract representations as understanding progresses.
  - Show students that various representations can have different purposes and can be useful in different situations.

Complete tasks with mathematical fluency.

Mathematicians who complete tasks with mathematical fluency:

- Select efficient and appropriate methods for solving problems within the given context.
- Maintain flexibility and accuracy while performing procedures and mental calculations.
- Complete tasks accurately and with confidence.
- Adapt procedures to apply them to a new context.
- Use feedback to improve efficiency when performing calculations.

**Clarifications:**
- Teachers who encourage students to complete tasks with mathematical fluency:
  - Provide students with the flexibility to solve problems by selecting a procedure that allows them to solve efficiently and accurately.
  - Offer multiple opportunities for students to practice efficient and generalizable methods.
  - Provide opportunities for students to reflect on the method they used and determine if a more efficient method could have been used.

Engage in discussions that reflect on the mathematical thinking of self and others.

Mathematicians who engage in discussions that reflect on the mathematical thinking of self and others:

- Communicate mathematical ideas, vocabulary and methods effectively.
- Analyze the mathematical thinking of others.
- Compare the efficiency of a method to those expressed by others.
- Recognize errors and suggest how to correctly solve the task.
- Justify results by explaining methods and processes.
- Construct possible arguments based on evidence.

**Clarifications:**
- Teachers who encourage students to engage in discussions that reflect on the mathematical thinking of self and others:
  - Establish a culture in which students ask questions of the teacher and their peers, and error is an opportunity for learning.
  - Create opportunities for students to discuss their thinking with peers.
  - Select, sequence and present student work to advance and deepen understanding of correct and increasingly efficient methods.
  - Develop students' ability to justify methods and compare their responses to the responses of their peers.

Use patterns and structure to help understand and connect mathematical concepts.

Mathematicians who use patterns and structure to help understand and connect mathematical concepts:

- Focus on relevant details within a problem.
- Create plans and procedures to logically order events, steps or ideas to solve problems.
- Decompose a complex problem into manageable parts.
- Relate previously learned concepts to new concepts.
- Look for similarities among problems.
- Connect solutions of problems to more complicated large-scale situations.

**Clarifications:**
- Teachers who encourage students to use patterns and structure to help understand and connect mathematical concepts:
  - Help students recognize the patterns in the world around them and connect these patterns to mathematical concepts.
  - Support students to develop generalizations based on the similarities found among problems.
  - Provide opportunities for students to create plans and procedures to solve problems.
  - Develop students' ability to construct relationships between their current understanding and more sophisticated ways of thinking.

Assess the reasonableness of solutions.

Mathematicians who assess the reasonableness of solutions:

- Estimate to discover possible solutions.
- Use benchmark quantities to determine if a solution makes sense.
- Check calculations when solving problems.
- Verify possible solutions by explaining the methods used.
- Evaluate results based on the given context.

**Clarifications:**
- Teachers who encourage students to assess the reasonableness of solutions:
  - Have students estimate or predict solutions prior to solving.
  - Prompt students to continually ask, “Does this solution make sense? How do you know?”
  - Reinforce that students check their work as they progress within and after a task.
  - Strengthen students' ability to verify solutions through justifications.

Apply mathematics to real-world contexts.

Mathematicians who apply mathematics to real-world contexts:

- Connect mathematical concepts to everyday experiences.
Use models and methods to understand, represent and solve problems.

Perform investigations to gather data or determine if a method is appropriate. Redesign models and methods to improve accuracy or efficiency.

Clarifications:

- Teachers who encourage students to apply mathematics to real-world contexts:
  - Provide opportunities for students to create models, both concrete and abstract, and perform investigations.
  - Challenge students to question the accuracy of their models and methods.
  - Support students as they validate conclusions by comparing them to the given situation.
  - Indicate how various concepts can be applied to other disciplines.

Cite evidence to explain and justify reasoning.

Clarifications:

- K-1 Students include textual evidence in their oral communication with guidance and support from adults. The evidence can consist of details from the text without naming the text. During 1st grade, students learn how to incorporate the evidence in their writing.
- 2-3 Students include relevant textual evidence in their written and oral communication. Students should name the text when they refer to it. In 3rd grade, students should use a combination of direct and indirect citations.
- 4-5 Students continue with previous skills and reference comments made by speakers and peers. Students cite texts that they've directly quoted, paraphrased, or used for information. When writing, students will use the form of citation dictated by the instructor or the style guide referenced by the instructor.
- 6-8 Students continue with previous skills and use a style guide to create a proper citation.
- 9-12 Students continue with previous skills and should be aware of existing style guides and the ways in which they differ.

General Course Information and Notes

GENERAL NOTES

While the content focus of this course is consistent with the Integrated Science 1 course, students will explore these concepts in greater depth. In general, the academic pace and rigor will be greatly increased for honors level course work. Laboratory investigations that include the use of scientific inquiry, research, measurement, problem solving, laboratory apparatus and technologies, experimental procedures, and safety procedures are an integral part of this course. The National Science Teachers Association (NSTA) recommends that at the high school level, all students should be in the science lab or field, collecting data every week. School laboratory investigations (labs) are defined by the National Research Council (NRC) as an experience in the laboratory, classroom, or the field that provides students with opportunities to interact directly with natural phenomena or with data collected by others using tools, materials, data collection techniques, and models (NRC, 2006, p. 3). Laboratory investigations in the high school classroom should help all students develop a growing understanding of the complexity and ambiguity of empirical work, as well as the skills to calibrate and troubleshoot equipment used to make observations. Learners should understand measurement error; and have the skills to aggregate, interpret, and present the resulting data (National Research Council, 2006, p. 77; NSTA, 2007).

Special Notes:

Instructional Practices
Teaching from a range of complex text is optimized when teachers in all subject areas implement the following strategies on a routine basis:

1. Ensuring wide reading from complex text that varies in length.
2. Making close reading and rereading of texts central to lessons.
3. Emphasizing text-specific complex questions, and cognitively complex tasks, reinforce focus on the text and cultivate independence.
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- Analyzing and interpreting data.
- Using mathematics, information and computer technology, and computational thinking.
- Constructing explanations (for science) and designing solutions (for engineering).
- Engaging in argument from evidence.
- Obtaining, evaluating, and communicating information.

Honors and Advanced Level Course Note: Advanced courses require a greater demand on students through increased academic rigor. Academic rigor is obtained through the application, analysis, evaluation, and creation of complex ideas that are often abstract and multi-faceted. Students are challenged to think and collaborate critically on the content they are learning. Honors level rigor will be achieved by increasing text complexity through text selection, focus on high-level qualitative measures, and complexity of task. Instruction will be structured to give students a deeper understanding of conceptual themes and organization within and across disciplines. Academic rigor is more than simply assigning to students a greater quantity of work.

Florida's Benchmarks for Excellent Student Thinking (B.E.S.T.) Standards

This course includes Florida's B.E.S.T. ELA Expectations (EE) and Mathematical Thinking and Reasoning Standards (MTRs) for students. Florida educators should intentionally embed these standards within the content and their instruction as applicable. For guidance on the implementation of the EEs and MTRs, please visit https://www.cpalms.org/Standards/BEST_Standards.aspx and select the appropriate B.E.S.T. Standards package.

English Language Development ELD Standards Special Notes Section:

Teachers are required to provide listening, speaking, reading and writing instruction that allows English language learners (ELL) to communicate information, ideas and concepts for academic success in the content area of Science. For the given level of English language proficiency and with visual, graphic, or interactive support, students will interact with grade level words, expressions, sentences and concepts for academic success in the content area of Science. For the given level of English language proficiency and with visual, graphic, or interactive support, students will interact with grade level words, expressions, sentences and discourse to process or produce language necessary for academic success. The ELD standard should specify a relevant content area concept or topic of study chosen by curriculum developers and teachers which maximizes an ELL's need for communication and social skills.

To access an ELL supporting document which delineates performance definitions and descriptors, please click on the following link: https://cpalmsmediaprod.blob.core.windows.net/uploads/docs/standards/eld/sc.pdf

Additional Instructional Resources:

A V.E. for Success Collection is provided by the Florida Association of School Administrators: http://www.fasa.net/4DCGI/cms/review.html?Action=CMS_Document&DocID=139

Please be aware that these resources have not been reviewed by CPALMS and there may be a charge for the use of some of them in this collection.

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<td><strong>Abbreviated Title:</strong> INTEG SCI 1 HON</td>
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<td><strong>Number of Credits:</strong> One (1) credit</td>
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<td><strong>Graduation Requirement:</strong> Equally Rigorous Science</td>
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### Educator Certifications

- Earth/Space Science (Grades 6-12)
- Physics (Grades 6-12)
- Science (Secondary Grades 7-12)
- Biology (Grades 6-12)
- Middle Grades General Science (Middle Grades 5-9)
- Chemistry (Grades 6-12)
General Course Information and Notes

GENERAL NOTES

The curriculum description for this IB course is provided at http://www.ibo.org/en/programmes/.

GENERAL INFORMATION

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Course Path: Section: Grades PreK to 12 Education Courses > Grade Group: Grades 9 to 12 and Adult Education Courses > Subject: Science > SubSubject: Integrated Sciences > Abbreviated Title: IB MYP INTEG SCI

Course Length: Year (Y)

Course Attributes:
- International Baccalaureate (IB)

Course Level: 3

Educator Certifications

| Science (Secondary Grades 7-12) |
| Middle Grades General Science (Middle Grades 5-9) |
| Chemistry (Grades 6-12) |
| Biology (Grades 6-12) |
| Physics (Grades 6-12) |
| Earth/Space Science (Grades 6-12) |
Describe the relationships to lakes and oceans.

SC.912.L.16.6: Explain the significance of genetic factors, environmental factors, and pathogenic agents to health from the perspectives of both individual and public health.

SC.912.L.14.26: Identify the major parts of the brain on diagrams or models.

SC.912.L.14.36: Describe the factors affecting blood flow through the cardiovascular system.

SC.912.L.14.52: Explain the basic functions of the human immune system, including specific and nonspecific immune response, vaccines, and antibiotics.

SC.912.L.15.8: Describe the scientific explanations of the origin of life on Earth.

SC.912.L.15.15: Describe how mutation and genetic recombination increase genetic variation.


SC.912.L.16.2: Discuss observed inheritance patterns caused by various modes of inheritance, including dominant, recessive, codominant, sex-linked, polygenic, and multiple alleles.

SC.912.L.16.3: Describe the basic process of DNA replication and how it relates to the transmission and conservation of the genetic information.

SC.912.L.16.4: Explain how mutations in the DNA sequence may or may not result in phenotypic change. Explain how mutations in gametes may result in phenotypic changes in offspring.

SC.912.L.16.5: Explain the basic processes of transcription and translation, and how they result in the expression of genes.

SC.912.L.16.9: Explain how and why the genetic code is universal and is common to almost all organisms.

SC.912.L.16.10: Evaluate the impact of biotechnology on the individual, society and the environment, including medical and ethical issues.

SC.912.L.16.13: Describe the basic anatomy and physiology of the human reproductive system. Describe the process of human development from fertilization to birth and major changes that occur in each trimester of pregnancy.

SC.912.L.16.16: Describe the process of meiosis, including independent assortment and crossing over. Explain how reduction division results in the formation of haploid gametes or spores.

SC.912.L.16.17: Compare and contrast mitosis and meiosis and relate to the processes of sexual and asexual reproduction and their consequences for genetic variation.

SC.912.L.17.9: Use a food web to identify and distinguish producers, consumers, and decomposers. Explain the pathway of energy transfer through trophic levels and the reduction of available energy at successive trophic levels.

SC.912.L.18.1: Describe the basic molecular structures and primary functions of the four major categories of biological macromolecules.

SC.912.L.18.7: Identify the reactants, products, and basic functions of photosynthesis.

SC.912.L.18.8: Identify the reactants, products, and basic functions of aerobic and anaerobic cellular respiration.

SC.912.L.18.9: Explain the interrelated nature of photosynthesis and cellular respiration.

SC.912.L.18.10: Connect the role of adenosine triphosphate (ATP) to energy transfers within a cell.

SC.912.L.18.11: Explain the role of enzymes as catalysts that lower the activation energy of biochemical reactions. Identify factors, such as pH and temperature, and their effect on enzyme activity.

Define a problem based on a specific body of knowledge, for example: biology, chemistry, physics, and earth/space science, and do the following:

1. Pose questions about the natural world, (Articulate the purpose of the investigation and identify the relevant scientific concepts).

2. Conduct systematic observations, (Write procedures that are clear and replicable. Identify observables and examine relationships between test (independent) variable and outcome (dependent) variable. Employ appropriate methods for accurate and consistent observations; conduct and record measurements at appropriate levels of precision. Follow safety guidelines).

3. Examine books and other sources of information to see what is already known,

4. Review what is known in light of empirical evidence, (Examine whether available empirical evidence can be interpreted in terms of existing knowledge and models, and if not, modify or develop new models).

5. Plan investigations, (Design and evaluate a scientific investigation).

6. Use tools to gather, analyze, and interpret data (this includes the use of measurement in metric and other systems, and also the generation and interpretation of graphical representations of data, including data tables and graphs), (Collect data or evidence in an organized way. Properly use instruments, equipment, and materials (e.g., scales, probeware, meter sticks, microscopes, computers) including set-up, calibration, technique, maintenance, and storage).

7. Pose answers, explanations, or descriptions of events,

8. Generate explanations that explicate or describe natural phenomena (inferences),

9. Use appropriate evidence and reasoning to justify these explanations to others,

10. Communicate results of scientific investigations, and

11. Evaluate the merits of the explanations produced by others.

SC.912.N.1.4: Identify sources of information and assess their reliability according to the strict standards of scientific investigation.

SC.912.N.1.6: Describe how scientific inferences are drawn from scientific observations and provide examples from the content being studied.

SC.912.N.1.7: Recognize the role of creativity in constructing scientific questions, methods and explanations.

Explain that scientific knowledge is both durable and robust and open to change. Scientific knowledge can change because it is often examined and evaluated.
SC.912.N.2.4: re-examined by new investigations and scientific argumentation. Because of these frequent examinations, scientific knowledge becomes stronger, leading to its durability.

SC.912.N.2.5: Describe instances in which scientists' varied backgrounds, talents, interests, and goals influence the inferences and thus the explanations that they make about observations of natural phenomena and describe that competing interpretations (explanations) of scientists are a strength of science as they are a source of new, testable ideas that have the potential to add new evidence to support one or another of the explanations.

SC.912.N.3.1: Explain that a scientific theory is the culmination of many scientific investigations drawing together all the current evidence concerning a substantial range of phenomena; thus, a scientific theory represents the most powerful explanation scientists have to offer.

SC.912.N.3.2: Describe the role consensus plays in the historical development of a theory in any one of the disciplines of science.

SC.912.P.8.6: Distinguish between bonding forces holding compounds together and other attractive forces, including hydrogen bonding and van der Waals forces.

SC.912.P.8.8: Characterize types of chemical reactions, for example: redox, acid-base, synthesis, and single and double replacement reactions.

SC.912.P.8.9: Apply the mole concept and the law of conservation of mass to calculate quantities of chemicals participating in reactions.

SC.912.P.8.11: Relate acidity and basicity to hydronium and hydroxyl ion concentration and pH.

SC.912.P.8.12: Describe the properties of the carbon atom that make the diversity of carbon compounds possible.

SC.912.P.8.13: Identify selected functional groups and relate how they contribute to properties of carbon compounds.

SC.912.P.10.5: Relate temperature to the average molecular kinetic energy.

SC.912.P.10.10: Compare the magnitude and range of the four fundamental forces (gravitational, electromagnetic, weak nuclear, strong nuclear).

SC.912.P.10.12: Differentiate between chemical and nuclear reactions.


SC.912.P.10.15: Investigate and explain the relationships among current, voltage, resistance, and power.

SC.912.P.12.1: Distinguish between scalar and vector quantities and assess which should be used to describe an event.

SC.912.P.12.2: Analyze the motion of an object in terms of its position, velocity, and acceleration (with respect to a frame of reference) as functions of time.

SC.912.P.12.4: Describe how the gravitational force between two objects depends on their masses and the distance between them.

LAFS.910.RST.1.1: Cite specific textual evidence to support analysis of science and technical texts, attending to the precise details of explanations or descriptions.

LAFS.910.RST.1.2: Determine the central ideas or conclusions of a text; trace the text's explanation or depiction of a complex process, phenomenon, or concept; provide an accurate summary of the text.

LAFS.910.RST.2.4: Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 9–10 texts and topics.

LAFS.910.RST.2.5: Analyze the structure of the relationships among concepts in a text, including relationships among key terms (e.g., force, friction, reaction force, energy).

LAFS.910.RST.2.6: Analyze the author's purpose in providing an explanation, describing a procedure, or discussing an experiment in a text, defining the question the author seeks to address.

LAFS.910.RST.3.7: Translate quantitative or technical information expressed in words in a text into visual form (e.g., in an equation) and translate information expressed visually or mathematically (e.g., in an equation) into words.

LAFS.910.RST.3.8: Assess the extent to which the reasoning and evidence in a text support the author's claim or a recommendation for solving a scientific or technical problem.

LAFS.910.RST.3.9: Compare and contrast findings presented in a text to those from other sources (including their own experiments), noting when the findings support or contradict previous explanations or accounts.

LAFS.910.RST.4.10: By the end of grade 10, read and comprehend science/technical texts in the grades 9–10 text complexity band independently and proficiently.

LAFS.910.SL.1.1: Initiate and participate effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grades 9–10 topics, texts, and issues, building on others' ideas and expressing their own clearly and persuasively. a. Come to discussions prepared, having read and researched material under study; explicitly draw on that preparation by referring to evidence from texts and other research on the topic or issue to stimulate a thoughtful, well-reasoned exchange of ideas.

b. Work with peers to set rules for collegial discussions and decision-making (e.g., informal consensus, taking votes on key issues, presentation of alternate views), clear goals and deadlines, and individual roles as needed.

c. Propose conversations by posing and responding to questions that relate the current discussion to broader themes or larger ideas; actively incorporate others into the discussion; and clarify, verify, or challenge ideas and conclusions.

d. Respond thoughtfully to diverse perspectives, summarize points of agreement and disagreement, and, when warranted, qualify or justify their own views and understanding and make new connections in light of the evidence and reasoning presented.

LAFS.910.SL.1.2: Integrate multiple sources of information presented in diverse media or formats (e.g., visually, quantitatively, orally) evaluating the credibility and accuracy of each source.

LAFS.910.SL.1.3: Evaluate a speaker's point of view, reasoning, and use of evidence and rhetoric, identifying any fallacious reasoning or exaggerated or distorted evidence.

LAFS.910.SL.2.4: Present information, findings, and supporting evidence clearly, concisely, and logically such that listeners can follow the line of reasoning and the organization, development, substance, and style are appropriate to purpose, audience, and task.

LAFS.910.SL.2.5: Make strategic use of digital media (e.g., textual, graphical, audio, visual, and interactive elements) in presentations to enhance understanding of findings, reasoning, and evidence and to add interest.

LAFS.910.WHST.1.1: Write arguments focused on discipline-specific content. a. Introduce precise claim(s), distinguish the claim(s) from alternate or opposing claims, and create an organization that establishes clear relationships among the claim(s), counterclaims, reasons, and evidence.

b. Develop claim(s) and counterclaims fairly, supplying data and evidence for each while pointing out the strengths and limitations of both claim(s) and counterclaims in a discipline-appropriate form and in a manner that anticipates the audience's knowledge level and concerns.

c. Use words, phrases, and clauses to link the major sections of the text, create cohesion, and clarify the relationships between claim(s) and reasons, between reasons and evidence, and between claim(s) and counterclaims.

d. Establish and maintain a formal style and objective tone while attending to the norms and conventions of the discipline in which they are writing.

e. Provide a concluding statement or section that follows from or supports the argument presented.

LAFS.910.WHST.1.2: Write informative/explanatory texts including the narration of historical events, scientific procedures/ experiments, or technical processes. a. Introduce a topic and organize ideas, concepts, and information to make important connections and distinctions; include formatting (e.g., headings), graphics (e.g., figures, tables), and multimedia when useful to aiding comprehension.
b. Develop the topic with well-chosen, relevant, and sufficient facts, extended definitions, concrete details, quotations, or other information and examples appropriate to the audience's knowledge of the topic.

c. Use varied transitions and sentence structures to link the major sections of the text, create cohesion, and clarify the relationships among ideas and concepts.

d. Use precise language and domain-specific vocabulary to manage the complexity of the topic and convey a style appropriate to the discipline and context as well as to the expertise of likely readers.

e. Establish and maintain a formal style and objective tone while attending to the norms and conventions of the discipline in which they are writing.

f. Provide a concluding statement or section that follows from and supports the information or explanation presented (e.g., articulating implications or the significance of the topic).

LAFS.910.WHST.2.4: Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.

LAFS.910.WHST.2.5: Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience.

LAFS.910.WHST.2.6: Use technology, including the Internet, to produce, publish, and update individual or shared writing products, taking advantage of technology's capacity to link to other information and to display information flexibly and dynamically.

LAFS.910.WHST.3.7: Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation.

LAFS.910.WHST.3.8: Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the usefulness of each source in answering the research question; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and following a standard format for citation.

LAFS.910.WHST.3.9: Draw evidence from informational texts to support analysis, reflection, and research.

LAFS.910.WHST.4.10: Write routinely over extended time frames (time for reflection and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences.

MAFS.912.N.VM.1.3: Solve problems involving velocity and other quantities that can be represented by vectors.

**Make sense of problems and persevere in solving them.**

Mathematically proficient students start by explaining to themselves the meaning of a problem and looking for entry points to its solution. They analyze givens, constraints, relationships, and goals. They make conjectures about the form and meaning of the solution and plan a solution pathway rather than simply jumping into a solution attempt. They consider analogous problems and try special cases and simpler forms of the original problem in order to gain insight into its solution. They monitor and evaluate their progress and change course if necessary. Older students might, depending on the context of the problem, transform algebraic expressions or change the viewing window on their graphing calculator to get the information they need. Mathematically proficient students can explain correspondences between equations, verbal descriptions, tables, and graphs or draw diagrams of important features and relationships, graph data, and search for regularity or trends. Younger students might rely on using concrete objects or pictures to help conceptualize and solve a problem. Mathematically proficient students check their answers to problems using different methods, and they continually ask themselves, “Does this make sense?” They can understand the approaches of others to solving complex problems and identify correspondences between different approaches.

**Reason abstractly and quantitatively.**

Mathematically proficient students make sense of quantities and their relationships in problem situations. They bring two complementary abilities to bear on problems involving quantitative relationships: the ability to decontextualize—to abstract a given situation and represent it symbolically and manipulate the representing symbols as if they have a life of their own, without necessarily attending to their referents—and the ability to contextualize, to pause as needed during the manipulation process in order to probe into the referents for the symbols involved. Quantitative reasoning entails habits of creating a coherent representation of the problem at hand; considering the units involved; attending to the meaning of quantities, not just how to compute them; and knowing and flexibly using different properties of operations and objects.

**Construct viable arguments and critique the reasoning of others.**

Mathematically proficient students understand and use stated assumptions, definitions, and previously established results in constructing arguments. They make conjectures and build a logical progression of statements to explore the truth of their conjectures. They are able to analyze situations by breaking them into cases, and can recognize and use counterexamples. They justify their conclusions, communicate them to others, and respond to the arguments of others. They reason inductively about data, making conjectures and noticing patterns and regularities; they reason deductively by examining cases, generalizing from them, and using logical reasoning to reach conclusions about abstract situations.

**Model with mathematics.**

Mathematically proficient students can apply the mathematics they know to solve problems arising in everyday life, society, and the workplace. In early grades, this might be as simple as writing an addition equation to describe a situation. In middle grades, a student might apply proportional reasoning to plan a school event or analyze a problem in the community. By high school, a student might use geometry to solve a design problem or use a function to describe how one quantity depends on another. Mathematically proficient students who can apply what they know are comfortable making assumptions and approximations to simplify a complicated situation, realizing that these may need revision later. They are able to identify important quantities in a practical situation and map their relationships using such tools as diagrams, two-way tables, graphs, flowcharts and formulas. They can analyze those relationships mathematically to draw conclusions. They routinely interpret their mathematical results in the context of the situation and reflect on whether the results make sense, possibly improving the model if it has not served its purpose.

**Use appropriate tools strategically.**

Mathematically proficient students consider the available tools when solving a mathematical problem. These tools might include pencil and paper, concrete models, a ruler, a protractor, a calculator, a spreadsheet, a computer algebra system, a statistical package, or dynamic geometry software. Proficient students are sufficiently familiar with tools appropriate for their grade or course to make sound decisions about when each of these tools...
**MAFS.K12.MP.5.1:**  
Mathematically proficient students try to communicate precisely to others. They try to use clear definitions in discussion with others and in their own reasoning. They state the meaning of the symbols they choose, including using the equal sign consistently and appropriately. They are careful about specifying units of measure, and labeling axes to clarify the correspondence with quantities in a problem. They calculate accurately and efficiently, express numerical answers with a degree of precision appropriate for the problem context. In the elementary grades, students give carefully formulated explanations to each other. By the time they reach high school they have learned to examine claims and make explicit use of definitions.

**Standard Relation to Course:** Supporting

**Attend to precision.**

Mathematically proficient students try to communicate precisely to others. They try to use clear definitions in discussion with others and in their own reasoning. They state the meaning of the symbols they choose, including using the equal sign consistently and appropriately. They are careful about specifying units of measure, and labeling axes to clarify the correspondence with quantities in a problem. They calculate accurately and efficiently, express numerical answers with a degree of precision appropriate for the problem context. In the elementary grades, students give carefully formulated explanations to each other. By the time they reach high school they have learned to examine claims and make explicit use of definitions.

**Standard Relation to Course:** Supporting

**MAFS.K12.MP.6.1:**

Mathematically proficient students look closely to discern a pattern or structure. Young students, for example, might notice that three and seven more is the same amount as seven and three more, or they may sort a collection of shapes according to how many sides the shapes have. Later, students will see $7 + 8$ equals the well remembered $7 \times 5 + 7 \times 3$, in preparation for learning about the distributive property. In the expression $x^2 + 9x + 14$, older students can see the $14$ as $2 \times 7$ and the $9$ as $2 + 7$. They recognize the significance of an existing line in a geometric figure and can use the strategy of drawing an auxiliary line for solving problems. They also can step back for an overview and shift perspective. They can see complicated things, such as some algebraic expressions, as single objects or as being composed of several objects. For example, they can see $5 - 3(x - y)^2$ as $5$ minus a positive number times a square and use that to realize that its value cannot be more than $5$ for any real numbers $x$ and $y$.

**Standard Relation to Course:** Supporting

**Look for and make use of structure.**

Mathematically proficient students look closely to discern a pattern or structure. Young students, for example, might notice that three and seven more is the same amount as seven and three more, or they may sort a collection of shapes according to how many sides the shapes have. Later, students will see $7 + 8$ equals the well remembered $7 \times 5 + 7 \times 3$, in preparation for learning about the distributive property. In the expression $x^2 + 9x + 14$, older students can see the $14$ as $2 \times 7$ and the $9$ as $2 + 7$. They recognize the significance of an existing line in a geometric figure and can use the strategy of drawing an auxiliary line for solving problems. They also can step back for an overview and shift perspective. They can see complicated things, such as some algebraic expressions, as single objects or as being composed of several objects. For example, they can see $5 - 3(x - y)^2$ as $5$ minus a positive number times a square and use that to realize that its value cannot be more than $5$ for any real numbers $x$ and $y$.

**Standard Relation to Course:** Supporting

**MAFS.K12.MP.7.1:**

Look for and express regularity in repeated reasoning.

Mathematically proficient students notice if calculations are repeated, and look both for general methods and for shortcuts. Upper elementary students might notice when dividing $25$ by $11$ that they are repeating the same calculations over and over again, and conclude they have a repeating decimal. By paying attention to the calculation of slope as they repeatedly check whether points are on the line through $(1, 2)$ with slope $3$, middle school students might abstract the equation $(y - 2) = 3$. Noticing the regularity in the way terms cancel when expanding $(x - 1)(x + 1), (x - 1)x^2 + x + 1)$, and $(x - 1)x^3 + x + 1)$ might lead them to the general formula for the sum of a geometric series. As they work to solve a problem, mathematically proficient students maintain oversight of the process, while attending to the details. They continually evaluate the reasonableness of their intermediate results.

**Standard Relation to Course:** Supporting

**MAFS.K12.MP.8.1:**

Look for and express regularity in repeated reasoning.

Mathematically proficient students notice if calculations are repeated, and look both for general methods and for shortcuts. Upper elementary students might notice when dividing $25$ by $11$ that they are repeating the same calculations over and over again, and conclude they have a repeating decimal. By paying attention to the calculation of slope as they repeatedly check whether points are on the line through $(1, 2)$ with slope $3$, middle school students might abstract the equation $(y - 2) = 3$. Noticing the regularity in the way terms cancel when expanding $(x - 1)(x + 1), (x - 1)x^2 + x + 1)$, and $(x - 1)x^3 + x + 1)$ might lead them to the general formula for the sum of a geometric series. As they work to solve a problem, mathematically proficient students maintain oversight of the process, while attending to the details. They continually evaluate the reasonableness of their intermediate results.

**Standard Relation to Course:** Supporting

**HE.912.C.1.3:**  
Evaluate how environment and personal health are interrelated.

**Clarifications:**  
Food options within a community; prenatal-care services; availability of recreational facilities; air quality; weather-safety awareness; and weather, air, and water conditions.

**HE.912.C.1.5:**  
Analyze strategies for prevention, detection, and treatment of communicable and chronic diseases.

**Clarifications:**  
Health prevention, detection, and treatment of: breast and testicular cancer, suicide, obesity, and industrial-related chronic disease.

**HE.912.C.1.7:**  
Analyze how heredity and family history can impact personal health.

**Clarifications:**  
Drug use, family obesity, heart disease, mental health, and non-communicable illness or disease.

**ELD.K12.ELL.SC.1:**  
English language learners communicate information, ideas and concepts necessary for academic success in the content area of Science.

**ELD.K12.ELL.SI.1:**  
English language learners communicate for social and instructional purposes within the school setting.

### General Course Information and Notes

#### GENERAL NOTES

Laboratory investigations that include the use of scientific inquiry, research, measurement, problem solving, laboratory apparatus and technologies, experimental procedures, and safety procedures are an integral part of this course. The National Science Teachers Association (NSTA) recommends that at the high school level, all students should be in the science lab or field, collecting data every week. School laboratory investigations (labs) are defined by the National Research Council (NRC) as an experience in the laboratory, classroom, or the field that provides students with opportunities to interact directly with natural phenomena or with data collected by others using tools, materials, data collection techniques, and models (NRC, 2006, p. 3). Laboratory investigations in the high school classroom should help all students develop a growing understanding of the complexity and ambiguity of empirical work, as well as the skills to calibrate and troubleshoot equipment used to make observations. Learners should understand measurement error; and have the skills to aggregate, interpret, and present the resulting data (National Research Council, 2006, p. 77; NSTA, 2007).

#### Special Notes:

**Instructional Practices**

Teaching from a range of complex text is optimized when teachers in all subject areas implement the following strategies on a routine basis:

1. Ensuring wide reading from complex text that varies in length.
2. Making close reading and rereading of texts central to lessons.
3. Emphasizing text-specific complex questions, and cognitively complex tasks, reinforce focus on the text and cultivate independence.
4. Emphasizing students supporting answers based upon evidence from the text.
5. Providing extensive research and writing opportunities (claims and evidence).

- Asking questions (for science) and defining problems (for engineering).
- Developing and using models.
- Planning and carrying out investigations.
- Analyzing and interpreting data.
- Using mathematics, information and computer technology, and computational thinking.
- Constructing explanations (for science) and designing solutions (for engineering).
- Engaging in argument from evidence.
- Obtaining, evaluating, and communicating information.

Literacy Standards in Science

Secondary science courses include reading standards for literacy in science and technical subjects 6-12 and writing standards for literacy in history/social studies, science, and technical subjects 6-12. The courses also include speaking and listening standards. For a complete list of standards required for this course click on the blue tile labeled course standards. You may also download the complete course including all required standards and notes sections using the export function located at the top of this page.

English Language Development ELD Standards Special Notes Section:

Teachers are required to provide listening, speaking, reading and writing instruction that allows English language learners (ELL) to communicate information, ideas and concepts for academic success in the content area of Science. For the given level of English language proficiency and with visual, graphic, or interactive support, students will interact with grade level words, expressions, sentences and discourse to process or produce language necessary for academic success. The ELD standard should specify a relevant content area concept or topic of study chosen by curriculum developers and teachers which maximizes an ELL's need for communication and social skills. To access an ELL supporting document which delineates performance definitions and descriptors, please click on the following link: https://cpalmsmediaprod.blob.core.windows.net/uploads/docs/standards/eld/sc.pdf

### GENERAL INFORMATION

- **Course Number:** 2002420
- **Course Path:** Section: Grades PreK to 12 Education Courses > Grade Group: Grades 9 to 12 and Adult Education Courses > Subject: Science > SubSubject: Integrated Sciences
- **Abbreviated Title:** INTEG SCI 2
- **Course Length:** Year (Y)
- **Course Attributes:**
  - Class Size Core Required
- **Course Level:** 2
- **Number of Credits:** One (1) credit
- **Course Type:** Core Academic Course
- **Course Status:** Course Approved
- **Grade Level(s):** 9,10,11,12
- **Graduation Requirement:** Equally Rigorous Science

### Educator Certifications

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Describe how mutation and genetic recombination increase genetic variation.

Explain the interrelated nature of photosynthesis and cellular respiration.

Explain the basic processes of transcription and translation, and how they result in the expression of genes.

Compare and contrast mitosis and meiosis and relate to the processes of sexual and asexual reproduction and their consequences for genetic variation.

Explain the formation of planetary systems based on our knowledge of the solar system and apply this knowledge to newly discovered planetary systems.

Develop logical connections through physical principles, including Kepler's and Newton's laws about the relationships and the effects of Earth, Moon, and Sun on each other.

Summarize the conditions that contribute to the climate of a geographic area, including the relationships to lakes and oceans.

Identify, analyze, and relate to the internal (Earth system) and external (astronomical) conditions that contribute to global climate change.

Explain the significance of genetic factors, environmental factors, and pathogenic agents to health from the perspectives of both individual and public health.

Identify the major parts of the brain on diagrams or models.

Describe the factors affecting blood flow through the cardiovascular system.

Explain the basic functions of the human immune system, including specific and nonspecific immune response, vaccines, and antibiotics.

Describe the scientific explanations of the origin of life on Earth.

Describe how mutation and genetic recombination increase genetic variation.

Use Mendel's laws of segregation and independent assortment to analyze patterns of inheritance.

Discuss observed inheritance patterns caused by various modes of inheritance, including dominant, recessive, codominant, sex-linked, polygenic, and multiple alleles.

Describe the basic process of DNA replication and how it relates to the transmission and conservation of the genetic information.

Explain how mutations in the DNA sequence may or may not result in phenotypic change. Explain how mutations in gametes may result in phenotypic changes in offspring.

Explain the basic processes of transcription and translation, and how they result in the expression of genes.

Explain how and why the genetic code is universal and is common to almost all organisms.

Evaluate the impact of biotechnology on the individual, society, and the environment, including medical and ethical issues.

Define a problem based on a specific body of knowledge, for example: biology, chemistry, physics, and earth/space science, and do the following:

1. Pose questions about the natural world, (Articulate the purpose of the investigation and identify the relevant scientific concepts).

2. Conduct systematic observations, (Write procedures that are clear and replicable. Identify observable and examine relationships between test (independent) variable and outcome (dependent) variable. Employ appropriate methods for accurate and consistent observations; conduct and record measurements at appropriate levels of precision. Follow safety guidelines).

3. Examine books and other sources of information to see what is already known,

4. Review what is known in light of empirical evidence, (Examine whether available empirical evidence can be interpreted in terms of existing knowledge and models, and if not, modify or develop new models).

5. Plan investigations, (Design and evaluate a scientific investigation).

6. Use tools to gather, analyze, and interpret data (this includes the use of measurement in metric and other systems, and also the generation and interpretation of graphical representations of data, including data tables and graphs), (Collect data or evidence in an organized way. Properly use instruments, equipment, and materials (e.g., scales, probeware, meter sticks, microscopes, computers) including set-up, calibration, technique, maintenance, and storage).

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9. Use appropriate evidence and reasoning to justify these explanations to others,

10. Communicate results of scientific investigations, and

11. Evaluate the merits of the explanations produced by others.

Explain that scientific knowledge is both durable and robust and open to change. Scientific knowledge can change because it is often examined and
SC.912.N.2.4: re-examined by new investigations and scientific argumentation. Because of these frequent examinations, scientific knowledge becomes stronger, leading to its durability.

SC.912.N.2.5: Describe instances in which scientists’ varied backgrounds, talents, interests, and goals influence the inferences and thus the explanations that they make about observations of natural phenomena and describe that competing interpretations (explanations) of scientists are a strength of science as they are a source of new, testable ideas that have the potential to add new evidence to support one or another of the explanations.

SC.912.N.3.1: Explain that a scientific theory is the culmination of many scientific investigations drawing together all the current evidence concerning a substantial range of phenomena; thus, a scientific theory represents the most powerful explanation scientists have to offer.

SC.912.N.3.2: Describe the role consensus plays in the historical development of a theory in any one of the disciplines of science.

SC.912.P.8.6: Distinguish between bonding forces holding compounds together and other attractive forces, including hydrogen bonding and van der Waals forces.

SC.912.P.8.8: Characterize types of chemical reactions, for example: redox, acid-base, synthesis, and single and double replacement reactions.

SC.912.P.8.9: Apply the mole concept and the law of conservation of mass to calculate quantities of chemicals participating in reactions.

SC.912.P.8.11: Relate acidity and basicity to hydronium and hydroxyl ion concentration and pH.

SC.912.P.8.12: Describe the properties of the carbon atom that make the diversity of carbon compounds possible.

SC.912.P.8.13: Identify selected functional groups and relate how they contribute to properties of carbon compounds.

SC.912.P.8.15: Relate temperature to the average molecular kinetic energy.

SC.912.P.10.5: Compare the magnitude and range of the four fundamental forces (gravitational, electromagnetic, weak nuclear, strong nuclear).

SC.912.P.10.10: Differentiate between chemical and nuclear reactions.


SC.912.P.10.14: Investigate and explain the relationships among current, voltage, resistance, and power.

SC.912.P.12.1: Distinguish between scalar and vector quantities and assess which should be used to describe an event.

SC.912.P.12.2: Analyze the motion of an object in terms of its position, velocity, and acceleration (with respect to a frame of reference) as functions of time.

SC.912.P.12.4: Describe how the gravitational force between two objects depends on their masses and the distance between them.

Mathematicians who participate in effortful learning both individually and with others:
- Analyze the problem in a way that makes sense given the task.
- Ask questions that will help with solving the task.
- Build perseverance by modifying methods as needed while solving a challenging task.
- Stay engaged and maintain a positive mindset when working to solve tasks.
- Help and support each other when attempting a new method or approach.

Clarifications:
Teachers who encourage students to participate actively in effortful learning both individually and with others:
- Cultivate a community of growth mindset learners.
- Foster perseverance in students by choosing tasks that are challenging.
- Develop students’ ability to analyze and problem solve.
- Recognize students’ effort when solving challenging problems.

Mathematicians who demonstrate understanding by representing problems in multiple ways:
- Build understanding through modeling and using manipulatives.
- Represent solutions to problems in multiple ways using objects, drawings, tables, graphs and equations.
- Progress from modeling problems with objects and drawings to using algorithms and equations.
- Express connections between concepts and representations.
- Choose a representation based on the given context or purpose.

Clarifications:
Teachers who encourage students to demonstrate understanding by representing problems in multiple ways:
- Help students make connections between concepts and representations.
- Provide opportunities for students to use manipulatives when investigating concepts.
- Guide students from concrete to pictorial to abstract representations as understanding progresses.
- Show students that various representations can have different purposes and can be useful in different situations.

Complete tasks with mathematical fluency.
Mathematicians who complete tasks with mathematical fluency:
- Select efficient and appropriate methods for solving problems within the given context.
- Maintain flexibility and accuracy while performing procedures and mental calculations.
- Complete tasks accurately and with confidence.
- Adapt procedures to apply them to a new context.
- Use feedback to improve efficiency when performing calculations.

Clarifications:
Teachers who encourage students to complete tasks with mathematical fluency:
- Provide students with the flexibility to solve problems by selecting a procedure that allows them to solve efficiently and accurately.
- Offer multiple opportunities for students to practice efficient and generalizable methods.
- Provide opportunities for students to reflect on the method they used and determine if a more efficient method could have been used.

Engage in discussions that reflect on the mathematical thinking of self and others.
Mathematicians who engage in discussions that reflect on the mathematical thinking of self and others:
- Communicate mathematical ideas, vocabulary and methods effectively.
- Analyze the mathematical thinking of others.
- Compare the efficiency of a method to those expressed by others.
- Recognize errors and suggest how to correctly solve the task.
- Justify results by explaining methods and processes.
- Construct possible arguments based on evidence.

MA.K12.MTR.1.1:

MA.K12.MTR.2.1:

MA.K12.MTR.3.1:

MA.K12.MTR.4.1:
Teachers who encourage students to engage in discussions that reflect on the mathematical thinking of self and others:
- Establish a culture in which students ask questions of the teacher and their peers, and error is an opportunity for learning.
- Create opportunities for students to discuss their thinking with peers.
- Select, sequence and present student work to advance and deepen understanding of correct and increasingly efficient methods.
- Develop students' ability to justify methods and compare their responses to the responses of their peers.

Use patterns and structure to help understand and connect mathematical concepts.
Mathematicians who use patterns and structure to help understand and connect mathematical concepts:
- Focus on relevant details within a problem.
- Create plans and procedures to logically order events, steps or ideas to solve problems.
- Decompose a complex problem into manageable parts.
- Relate previously learned concepts to new concepts.
- Look for similarities among problems.
- Connect solutions of problems to more complicated large-scale situations.

Assess the reasonableness of solutions.
Mathematicians who assess the reasonableness of solutions:
- Estimate to discover possible solutions.
- Use benchmark quantities to determine if a solution makes sense.
- Check calculations when solving problems.
- Verify possible solutions by explaining the methods used.
- Evaluate results based on the given context.

Apply mathematics to real-world contexts.
Mathematicians who apply mathematics to real-world contexts:
- Connect mathematical concepts to everyday experiences.
- Use models and methods to understand, represent and solve problems.
- Perform investigations to gather data or determine if a method is appropriate. • Redesign models and methods to improve accuracy or efficiency.

Cite evidence to explain and justify reasoning.
K-1 Students include textual evidence in their oral communication with guidance and support from adults. The evidence can consist of details from the text without naming the text. During 1st grade, students learn to incorporate the evidence in their writing. 2-3 Students include relevant textual evidence in their written and oral communication. Students should name the text when they refer to it. In 3rd grade, students should use a combination of direct and indirect citations.
4-5 Students continue with previous skills and reference comments made by speakers and peers. Students cite texts that they've directly quoted, paraphrased, or used for information. When writing, students will use the form of citation dictated by the instructor or the style guide referenced by the instructor.
6-8 Students continue with previous skills and use a style guide to create a proper citation.
9-12 Students continue with previous skills and should be aware of existing style guides and the ways in which they differ.

Read and comprehend grade-level complex texts proficiently.
See Text Complexity for grade-level complexity bands and a text complexity rubric.

Make inferences to support comprehension.
Students will make inferences before the words infer or inference are introduced. Kindergarten students will answer questions like “Why is the girl smiling?” or make predictions about what will happen based on the title page. Students will use the terms and apply them in 2nd grade and beyond.

Use appropriate collaborative techniques and active listening skills when engaging in discussions in a variety of situations.
General Course Information and Notes

GENERAL NOTES

Laboratory investigations that include the use of scientific inquiry, research, measurement, problem solving, laboratory apparatus and technologies, experimental procedures, and safety procedures are an integral part of this course. The National Science Teachers Association (NSTA) recommends that at the high school level, all students should be in the science lab or field, collecting data every week. School laboratory investigations (labs) are defined by the National Research Council (NRC) as an experience in the laboratory, classroom, or the field that provides students with opportunities to interact directly with natural phenomena or with data collected by others using tools, materials, data collection techniques, and models (NRC, 2006, p. 3). Laboratory investigations in the high school classroom should help all students develop a growing understanding of the complexity and ambiguity of empirical work, as well as the skills to calibrate and troubleshoot equipment used to make observations. Learners should understand measurement error; and have the skills to aggregate, interpret, and present the resulting data (National Research Council, 2006, p. 77; NSTA, 2007).

Special Notes:

Instructional Practices

Teaching from a range of complex text is optimized when teachers in all subject areas implement the following strategies on a routine basis:

1. Ensuring wide reading from complex text that varies in length.
2. Making close reading and rereading of texts central to lessons.
3. Emphasizing text-specific complex questions, and cognitively complex tasks, reinforce focus on the text and cultivate independence.
4. Emphasizing students supporting answers based upon evidence from the text.
5. Providing extensive research and writing opportunities (claims and evidence).


- Asking questions (for science) and defining problems (for engineering).
- Developing and using models.
- Planning and carrying out investigations.
- Analyzing and interpreting data.
- Using mathematics, information and computer technology, and computational thinking.
- Constructing explanations (for science) and designing solutions (for engineering).
- Engaging in argument from evidence.
- Obtaining, evaluating, and communicating information.

Florida's Benchmarks for Excellent Student Thinking (B.E.S.T.) Standards

This course includes Florida's B.E.S.T. ELA Expectations (EE) and Mathematical Thinking and Reasoning Standards (MTRs) for students. Florida educators should intentionally embed these standards within the content and their instruction as applicable. For guidance on the implementation of the EE and MTRs, please visit https://www.cpalms.org/Standards/BEST_Standards.aspx and select the appropriate B.E.S.T. Standards package.

English Language Development ELD Standards Special Notes Section:

- Use the accepted rules governing a specific format to create quality work.
- Use appropriate voice and tone when speaking or writing.
- Evaluate how environment and personal health are interrelated.
- Analyze strategies for prevention, detection, and treatment of communicable and chronic diseases.
- Analyze how heredity and family history can impact personal health.
- English language learners communicate for social and instructional purposes within the school setting.
Teachers are required to provide listening, speaking, reading and writing instruction that allows English language learners (ELL) to communicate information, ideas and concepts for academic success in the content area of Science. For the given level of English language proficiency and with visual, graphic, or interactive support, students will interact with grade level words, expressions, sentences and discourse to process or produce language necessary for academic success. The ELD standard should specify a relevant content area concept or topic of study chosen by curriculum developers and teachers which maximizes an ELL's need for communication and social skills.

To access an ELL supporting document which delineates performance definitions and descriptors, please click on the following link:
https://cpalmsmediaprod.blob.core.windows.net/uploads/docs/standards/eld/sc.pdf

### GENERAL INFORMATION

<table>
<thead>
<tr>
<th>Course Number: 2002420</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Course Path:</strong> Section: Grades PreK to 12 Education Courses &gt; Grade Group: Grades 9 to 12 and Adult Education Courses &gt; Subject: Science &gt; SubSubject: Integrated Sciences</td>
</tr>
<tr>
<td><strong>Abbreviated Title:</strong> INTEG SCI 2</td>
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<tr>
<td><strong>Course Length:</strong> Year (Y)</td>
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<tr>
<td><strong>Course Attributes:</strong></td>
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<tr>
<td>• Class Size Core Required</td>
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<tr>
<td><strong>Course Level:</strong> 2</td>
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</tbody>
</table>

| **Number of Credits:** One (1) credit |
| **Course Type:** Core Academic Course |
| **Course Status:** State Board Approved |
| **Grade Level(s):** 9,10,11,12 |
| **Graduation Requirement:** Equally Rigorous Science |

### Educator Certifications

| **Earth/Space Science (Grades 6-12)** |
| **Physics (Grades 6-12)** |
| **Science (Secondary Grades 7-12)** |
| **Biology (Grades 6-12)** |
| **Chemistry (Grades 6-12)** |
Course Standards

<table>
<thead>
<tr>
<th>Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>SC.912.E.5.3:</td>
<td>Describe and predict how the initial mass of a star determines its evolution.</td>
</tr>
<tr>
<td>SC.912.E.5.5:</td>
<td>Explain the formation of planetary systems based on our knowledge of our Solar System and apply this knowledge to newly discovered planetary systems.</td>
</tr>
<tr>
<td>SC.912.E.5.6:</td>
<td>Develop logical connections through physical principles, including Kepler’s and Newton’s Laws about the relationships and the effects of Earth, Moon, and Sun on each other.</td>
</tr>
<tr>
<td>SC.912.E.7.2:</td>
<td>Analyze the causes of the various kinds of surface and deep water motion within the oceans and their impacts on the transfer of energy between the poles and the equator.</td>
</tr>
<tr>
<td>SC.912.E.7.4:</td>
<td>Summarize the conditions that contribute to the climate of a geographic area, including the relationships to lakes and oceans.</td>
</tr>
<tr>
<td>SC.912.E.7.7:</td>
<td>Identify, analyze, and relate the internal (Earth system) and external (astronomical) conditions that contribute to global climate change.</td>
</tr>
<tr>
<td>SC.912.L.14.5:</td>
<td>Explain the evidence supporting the scientific theory of the origin of eukaryotic cells (endosymbiosis).</td>
</tr>
<tr>
<td>SC.912.L.14.6:</td>
<td>Explain the significance of genetic factors, environmental factors, and pathogenic agents to health from the perspectives of both individual and public health.</td>
</tr>
<tr>
<td>SC.912.L.14.7:</td>
<td>Relate the structure of each of the major plant organs and tissues to physiological processes.</td>
</tr>
<tr>
<td>SC.912.L.14.26:</td>
<td>Identify the major parts of the brain on diagrams or models.</td>
</tr>
<tr>
<td>SC.912.L.14.27:</td>
<td>Identify the functions of the major parts of the brain, including the meninges, medulla,pons,midbrain,hypothalamus,thalamus,cerebellum and cerebrum.</td>
</tr>
<tr>
<td>SC.912.L.14.52:</td>
<td>Explain the basic functions of the human immune system, including specific and nonspecific immune response, vaccines, and antibiotics.</td>
</tr>
<tr>
<td>SC.912.L.15.15:</td>
<td>Describe how mutation and genetic recombination increase genetic variation.</td>
</tr>
<tr>
<td>SC.912.L.16.2:</td>
<td>Discuss observed inheritance patterns caused by various modes of inheritance, including dominant, recessive, codominant, sex-linked, polygenic, and multiple alleles.</td>
</tr>
<tr>
<td>SC.912.L.16.3:</td>
<td>Describe the basic process of DNA replication and how it relates to the transmission and conservation of the genetic information.</td>
</tr>
<tr>
<td>SC.912.L.16.4:</td>
<td>Explain how mutations in the DNA sequence may or may not result in phenotypic change. Explain how mutations in gametes may result in phenotypic changes in offspring.</td>
</tr>
<tr>
<td>SC.912.L.16.5:</td>
<td>Explain the basic processes of transcription and translation, and how they result in the expression of genes.</td>
</tr>
<tr>
<td>SC.912.L.16.7:</td>
<td>Describe how viruses and bacteria transfer genetic material between cells and the role of this process in biotechnology.</td>
</tr>
<tr>
<td>SC.912.L.16.9:</td>
<td>Explain how and why the genetic code is universal and is common to almost all organisms.</td>
</tr>
<tr>
<td>SC.912.L.16.10:</td>
<td>Evaluate the impact of biotechnology on the individual, society and the environment, including medical and ethical issues.</td>
</tr>
<tr>
<td>SC.912.L.16.12:</td>
<td>Describe how basic DNA technology (restriction digestion by endonucleases, gel electrophoresis, polymerase chain reaction, ligation, and transformation) is used to construct recombinant DNA molecules (DNA cloning).</td>
</tr>
<tr>
<td>SC.912.L.16.13:</td>
<td>Describe the basic anatomy and physiology of the human reproductive system. Describe the process of human development from fertilization to birth and major changes that occur in each trimester of pregnancy.</td>
</tr>
<tr>
<td>SC.912.L.16.14:</td>
<td>Describe the cell cycle, including the process of mitosis. Explain the role of mitosis in the formation of new cells and its importance in maintaining chromosome number during asexual reproduction.</td>
</tr>
<tr>
<td>SC.912.L.16.16:</td>
<td>Describe the process of meiosis, including independent assortment and crossing over. Explain how reduction division results in the formation of haploid gametes or spores.</td>
</tr>
<tr>
<td>SC.912.L.16.17:</td>
<td>Compare and contrast mitosis and meiosis and relate to the processes of sexual and asexual reproduction and their consequences for genetic variation.</td>
</tr>
<tr>
<td>SC.912.L.17.9:</td>
<td>Use a food web to identify and distinguish producers, consumers, and decomposers. Explain the pathway of energy transfer through trophic levels and the reduction of available energy at successive trophic levels.</td>
</tr>
<tr>
<td>SC.912.L.17.10:</td>
<td>Diagram and explain the biogeochemical cycles of an ecosystem, including water, carbon, and nitrogen cycle.</td>
</tr>
<tr>
<td>SC.912.L.18.1:</td>
<td>Describe the basic molecular structures and primary functions of the four major categories of biological macromolecules.</td>
</tr>
<tr>
<td>SC.912.L.18.7:</td>
<td>Identify the reactants, products, and basic functions of photosynthesis.</td>
</tr>
<tr>
<td>SC.912.L.18.8:</td>
<td>Identify the reactants, products, and basic functions of aerobic and anaerobic cellular respiration.</td>
</tr>
<tr>
<td>SC.912.L.18.9:</td>
<td>Explain the interrelated nature of photosynthesis and cellular respiration.</td>
</tr>
<tr>
<td>SC.912.L.18.10:</td>
<td>Connect the role of adenosine triphosphate (ATP) to energy transfers within a cell.</td>
</tr>
<tr>
<td>SC.912.L.18.11:</td>
<td>Explain the role of enzymes as catalysts that lower the activation energy of biochemical reactions. Identify factors, such as pH and temperature, and their effect on enzyme activity.</td>
</tr>
</tbody>
</table>

Define a problem based on a specific body of knowledge, for example: biology, chemistry, physics, and earth/space science, and do the following:

1. Pose questions about the natural world, (Articulate the purpose of the investigation and identify the relevant scientific concepts).
2. Conduct systematic observations, (Write procedures that are clear and replicable. Identify observables and examine relationships between test (independent) variable and outcome (dependent) variable. Employ appropriate methods for accurate and consistent observations; conduct and record measurements at appropriate levels of precision. Follow safety guidelines).
3. Examine books and other sources of information to see what is already known,
4. Review what is known in light of empirical evidence, (Examine whether available empirical evidence can be interpreted in terms of existing knowledge and models, and if not, modify or develop new models).
5. Plan investigations, (Design and evaluate a scientific investigation).
6. Use tools to gather, analyze, and interpret data (this includes the use of measurement in metric and other systems, and also the generation and interpretation of graphical representations of data, including data tables and graphs), (Collect data or evidence in an organized way. Properly use instruments, equipment, and materials (e.g., scales, probeware, meter sticks, microscopes, computers) including set-up, calibration, technique, maintenance, and storage).
<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
<th>Clarifications</th>
</tr>
</thead>
<tbody>
<tr>
<td>LAFS.910.SL.2.5</td>
<td>Make strategic use of digital media (e.g., textual, graphical, audio, visual, and interactive elements) in presentations to enhance understanding of findings, reasoning, and evidence and to add interest.</td>
<td></td>
</tr>
</tbody>
</table>
| LAFS.910.WHST.1.1 | Write arguments focused on discipline-specific content.  
|               |   a. Introduce precise claim(s), distinguish the claim(s) from alternate or opposing claims, and create an organization that establishes clear relationships among the claim(s), counterclaims, reasons, and evidence.  
|               |   b. Develop claim(s) and counterclaims fairly, supplying data and evidence for each while pointing out the strengths and limitations of both claim(s) and counterclaims in a discipline-appropriate form and in a manner that anticipates the audience's knowledge level and concerns.  
|               |   c. Use words, phrases, and clauses to link the major sections of the text, create cohesion, and clarify the relationships between claim(s) and reasons, between reasons and evidence, and between claim(s) and counterclaims.  
|               |   d. Establish and maintain a formal style and objective tone while attending to the norms and conventions of the discipline in which they are writing.  
|               |   e. Provide a concluding statement or section that follows from or supports the argument presented.                                                                                                      |                                                                                                         |
| LAFS.910.WHST.1.2 | Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes.  
|               |   a. Introduce a topic and organize ideas, concepts, and information to make important connections and distinctions; include formatting (e.g., headings), graphics (e.g., figures, tables), and multimedia when useful to aiding comprehension.  
|               |   b. Develop the topic with well-chosen, relevant, and sufficient facts, extended definitions, concrete details, quotations, or other information and examples appropriate to the audience's knowledge of the topic.  
|               |   c. Use varied transitions and sentence structures to link the major sections of the text, create cohesion, and clarify the relationships among ideas and concepts.  
|               |   d. Use precise language and domain-specific vocabulary to manage the complexity of the topic and convey a style appropriate to the discipline and context as well as likely audience.  
|               |   e. Establish and maintain a formal style and objective tone while attending to the norms and conventions of the discipline in which they are writing.  
|               |   f. Provide a concluding statement or section that follows from and supports the information or explanation presented (e.g., articulating implications or the significance of the topic).                                                                 |                                                                                                         |
| LAFS.910.WHST.2.4 | Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.                                                                                   |                                                                                                         |
| LAFS.910.WHST.2.5 | Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience.                                    |                                                                                                         |
| LAFS.910.WHST.2.6 | Use technology, including the Internet, to produce, publish, and update individual or shared writing products, taking advantage of technology's capacity to link to other information and display information flexibly and dynamically. |                                                                                                         |
| LAFS.910.WHST.3.7 | Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation. | ★                                                                                                         |
| LAFS.910.WHST.3.8 | Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the usefulness of each source in answering the research question; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and following a standard format for citation. | ★                                                                                                         |
| LAFS.910.WHST.3.9 | Draw evidence from informational texts to support analysis, reflection, and research.                                                                                                                                                                           | ★                                                                                                         |
| LAFS.910.WHST.4.10 | Write routinely over extended time frames (time for reflection and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences.                        | ★                                                                                                         |
| MAFS.912.F-IF.2.4 | For a function that models a relationship between two quantities, interpret key features of graphs and tables in terms of the quantities, and sketch graphs showing key features given a verbal description of the relationship. Key features include: intercepts; intervals where the function is increasing, decreasing, positive, or negative; relative maximums and minimums; symmetries; end behavior; and periodicity. | ★                                                                                                         |
| MAFS.912.F-IF.3.7 | Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases.                                                                 | ★                                                                                                         |
| MAFS.912.G-MG.1.2 | Apply concepts of density based on area and volume in modeling situations (e.g., persons per square mile, BTUs per cubic foot).                                                                                   | ★                                                                                                         |
| MAFS.912.N-Q.1.1 | Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays. | ★                                                                                                         |
| MAFS.912.N-Q.1.3 | Choose a level of accuracy appropriate to limitations on measurement when reporting quantities.                                                                                                             | ★                                                                                                         |
| MAFS.912.N-VM.1.3 | Solve problems involving velocity and other quantities that can be represented by vectors.                                                                                                                                                                         | ★                                                                                                         |
| MAFS.912.S-IC.2.6 | Evaluate reports based on data.                                                                                                                                                                           | ★                                                                                                         |
| MAFS.912.S-ID.1.1 | Represent data with plots on the real number line (dot plots, histograms, and box plots).                                                                                                                                                                         | ★                                                                                                         |
| MAFS.912.S-ID.1.2 | Use statistics appropriate to the shape of the data distribution to compare center (median, mean) and spread (interquartile range, standard deviation) of two or more different data sets. | ★                                                                                                         |
| MAFS.912.S-ID.1.3 | Interpret differences in shape, center, and spread in the context of the data sets, accounting for possible effects of extreme data points (outliers).                                                            | ★                                                                                                         |
| MAFS.912.S-ID.1.4 | Use the mean and standard deviation of a data set to fit it to a normal distribution and to estimate population percentages. Recognize that there are data sets for which such a procedure is not appropriate. Use calculators, spreadsheets, and tables to estimate areas under the normal curve. | ★                                                                                                         |
Summarize categorical data for two categories in two-way frequency tables. Interpret relative frequencies in the context of the data (including joint, marginal, and conditional relative frequencies). Recognize possible associations and trends in the data. ★

Represent data on two quantitative variables on a scatter plot, and describe how the variables are related. ★

a. Fit a function to the data; use functions fitted to data to solve problems in the context of the data. Use given functions or choose a function suggested by the context. Emphasize linear, and exponential models.

b. Informally assess the fit of a function by plotting and analyzing residuals.

c. Fit a linear function for a scatter plot that suggests a linear association.

Clarifications:
Students take a more sophisticated look at using a linear function to model the relationship between two numerical variables. In addition to fitting a line to data, students assess how well the model fits by analyzing residuals.

Make sense of problems and persevere in solving them.
Mathematically proficient students start by explaining to themselves the meaning of a problem and looking for entry points to its solution. They analyze givens, constraints, relationships, and goals. They make conjectures about the form and meaning of the solution and plan a solution pathway rather than simply jumping into a solution attempt. They consider analogous problems, and try special cases and simpler forms of the original problem in order to gain insight into its solution. They monitor and evaluate their progress and change course if necessary. Older students might, depending on the context of the problem, transform algebraic expressions or change the viewing window on their graphing calculator to get the information they need. Mathematically proficient students can explain correspondences between equations, verbal descriptions, tables, and graphs or draw diagrams of important features and relationships, graph data, and search for regularity or trends. Younger students might rely on using concrete objects or pictures to help conceptualize and solve a problem. Mathematically proficient students check their answers to problems using a different method, and they continually ask themselves, “Does this make sense?” They can understand the approaches of others to solving complex problems and identify correspondences between different approaches.

Reason abstractly and quantitatively.
Mathematically proficient students make sense of quantities and their relationships in problem situations. They bring two complementary abilities to bear on problems involving quantitative relationships: the ability to decontextualize—to abstract a given situation and represent it symbolically—and manipulate the representing symbols as if they have a life of their own, without necessarily attending to their referents—and the ability to contextualize, to pause as needed during the manipulation process in order to probe into the referents for the symbols involved. Quantitative reasoning entails habits of creating a coherent representation of the problem at hand; considering the units involved; attending to the meaning of quantities, not just how to compute them; and knowing and flexibly using different properties of operations and objects.

Construct viable arguments and critique the reasoning of others.
Mathematically proficient students understand and use stated assumptions, definitions, and previously established results in constructing arguments. They make conjectures and build a logical progression of statements to explore the truth of their conjectures. They are able to analyze situations by breaking them into cases, and can recognize and use counterexamples. They justify their conclusions, communicate them to others, and respond to the arguments of others. They reason inductively about data, making plausible arguments that take into account the context from which the data arose. Mathematically proficient students are also able to compare the effectiveness of two plausible arguments, distinguish correct logic or reasoning from that which is flawed, and—if there is a flaw in an argument—explain what it is. Elementary students can construct arguments using concrete referents such as objects, drawings, diagrams, and actions. Such arguments can make sense and be correct, even though they are not generalized or made formal until later grades. Later, students learn to determine domains to which an argument applies. Students at all grades can listen or read the arguments of others, decide whether they make sense, and ask useful questions to clarify or improve the arguments.

Model with mathematics.
Mathematically proficient students can apply the mathematics they know to solve problems arising in everyday life, society, and the workplace. In early grades, this might be as simple as writing an addition equation to describe a situation. In middle grades, a student might apply proportional reasoning to plan a school event or analyze a problem in the community. By high school, a student might use geometry to solve a design problem or use a function to describe how one quantity of interest depends on another. Mathematically proficient students who can apply what they know are comfortable making assumptions and approximations to simplify a complicated situation, realizing that these may need revision later. They are able to identify important quantities in a practical situation and map their relationships using such tools as diagrams, two-way tables, graphs, flowcharts and formulas. They can analyze those relationships mathematically to draw conclusions. They routinely interpret their mathematical results in the context of the situation and reflect on whether the results make sense, possibly improving the model if it has not served its purpose.

Use appropriate tools strategically.
Mathematically proficient students consider the available tools when solving a mathematical problem. These tools might include pencil and paper, concrete models, a ruler, a protractor, a calculator, a spreadsheet, a computer algebra system, a statistical package, or dynamic geometry software. Proficient students are sufficiently familiar with tools appropriate for their grade or course to make sound decisions about when each of these tools might be helpful, recognizing both the insight to be gained and their limitations. For example, mathematically proficient high school students analyze graphs of functions and solutions generated using a graphing calculator. They detect possible errors by strategically using estimation and other mathematical knowledge. When making mathematical models, they know that technology can enable them to visualize the results of varying assumptions, explore consequences, and compare predictions with data. Mathematically proficient students at various grade levels are able to identify relevant external mathematical resources, such as digital content located on a website, and use them to pose or solve problems. They are able to use technological tools to explore and deepen their understanding of concepts.

Attend to precision.
Mathematically proficient students try to communicate precisely to others. They try to use clear definitions in discussion with others and in their own reasoning. They state the meaning of the symbols they choose, including using the equal sign consistently and appropriately. They are careful
### General Course Information and Notes

**GENERAL NOTES**

While the content focus of this course is consistent with the Integrated Science 2 course, students will explore these concepts in greater depth. In general, the academic pace and rigor will be greatly increased for honors level course work. Laboratory investigations that include the use of scientific inquiry, research, measurement, problem solving, laboratory apparatus and technologies, experimental procedures, and safety procedures are an integral part of this course. The National Science Teachers Association (NSTA) recommends that at the high school level, all students should be in the science lab or field, collecting data every week. School laboratory investigations (labs) are defined by the National Research Council (NRC) as an experience in the laboratory, classroom, or the field that provides students with opportunities to interact directly with natural phenomena or with data collected by others using tools, materials, data collection techniques, and models (NRC, 2006, p. 3). Laboratory investigations in the high school classroom should help all students develop a growing understanding of the complexity and ambiguity of empirical work, as well as the skills to calibrate and troubleshoot equipment used to make observations. Learners should understand measurement error; and have the skills to aggregate, interpret, and present the resulting data (National Research Council, 2006, p. 77; NSTA, 2007).

**Special Notes:**

**Instructional Practices**

Teaching from a range of complex text is optimized when teachers in all subject areas implement the following strategies on a routine basis:

1. Ensuring wide reading from complex text that varies in length.
2. Making close reading and rereading of texts central to lessons.
3. Emphasizing text-specific complex questions, and cognitively complex tasks, reinforce focus on the text and cultivate independence.
4. Emphasizing students supporting answers based upon evidence from the text.
5. Providing extensive research and writing opportunities (claims and evidence).

**Science and Engineering Practices** (NRC Framework for K-12 Science Education, 2010)

- Asking questions (for science) and defining problems (for engineering).
- Developing and using models.
- Planning and carrying out investigations.
- Analyzing and interpreting data.
- Using mathematics, information and computer technology, and computational thinking.

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<table>
<thead>
<tr>
<th>Standard Relation to Course: Supporting</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Look for and make use of structure.</strong></td>
</tr>
<tr>
<td>Mathematically proficient students look closely to discern a pattern or structure. Young students, for example, might notice that three and seven are the same amount as seven and three more, or they may sort a collection of shapes according to how many sides the shapes have. Later, students will see $7 \times 8$ equals the well remembered $7 \times 5 + 7 \times 3$, in preparation for learning about the distributive property. In the expression $x^2 + 9x + 14$, older students can see the $14$ as $2 \times 7$ and the $9$ as $2 + 7$. They recognize the significance of an existing line in a geometric figure and can use the strategy of drawing an auxiliary line for solving problems. They also can step back for an overview and shift perspective. They can see complicated things, such as some algebraic expressions, as single objects or as being composed of several objects. For example, they can see $5 - 3(x - y)^2$ as $5$ minus a positive number times a square and use that to realize that its value cannot be more than $5$ for any real numbers $x$ and $y$.</td>
</tr>
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<tr>
<th>Standard Relation to Course: Supporting</th>
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<tbody>
<tr>
<td><strong>Look for and express regularity in repeated reasoning.</strong></td>
</tr>
<tr>
<td>Mathematically proficient students notice if calculations are repeated, and look both for general methods and for shortcuts. Upper elementary students might notice when dividing $25$ by $11$ that they are repeating the same calculations over and over again, and conclude they have a repeating decimal. By paying attention to the calculation of slope as they repeatedly check whether points are on the line through $(1, 2)$ with slope $3$, middle school students might abstract the equation $y - 2 = 3(x - 1)$. Noticing the regularity in the way terms cancel when expanding $(x - 1)(x + 1)$, $(x - 1)(x^2 + x + 1)$, and $(x - 1)(x^3 + x^2 + x + 1)$ might lead them to the general formula for the sum of a geometric series. As they work to solve a problem, mathematically proficient students maintain oversight of the process, while attending to the details. They continually evaluate the reasonableness of their intermediate results.</td>
</tr>
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</table>

<table>
<thead>
<tr>
<th>Standard Relation to Course: Supporting</th>
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</thead>
<tbody>
<tr>
<td><strong>Evaluate how environment and personal health are interrelated.</strong></td>
</tr>
<tr>
<td><strong>Clarifications:</strong> Food options within a community; prenatal-care services; availability of recreational facilities; air quality; weather-safety awareness; and weather, air, and water conditions.</td>
</tr>
</tbody>
</table>

<table>
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<tr>
<th>Standard Relation to Course: Supporting</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Analyze strategies for prevention, detection, and treatment of communicable and chronic diseases.</strong></td>
</tr>
<tr>
<td><strong>Clarifications:</strong> Health prevention, detection, and treatment of: breast and testicular cancer, suicide, obesity, and industrial-related chronic disease.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Standard Relation to Course: Supporting</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Analyze how heredity and family history can impact personal health.</strong></td>
</tr>
<tr>
<td><strong>Clarifications:</strong> Drug use, family obesity, heart disease, mental health, and non-communicable illness or disease.</td>
</tr>
</tbody>
</table>

| English language learners communicate information, ideas and concepts necessary for academic success in the content area of Science. |
| English language communicate for social and instructional purposes within the school setting. |
Constructing explanations (for science) and designing solutions (for engineering).
Engaging in argument from evidence.
Obtaining, evaluating, and communicating information.

Honors and Advanced Level Course Note: Advanced courses require a greater demand on students through increased academic rigor. Academic rigor is obtained through the application, analysis, evaluation, and creation of complex ideas that are often abstract and multi-faceted. Students are challenged to think and collaborate critically on the content they are learning. Honors level rigor will be achieved by increasing text complexity through text selection, focus on high-level qualitative measures, and complexity of task. Instruction will be structured to give students a deeper understanding of conceptual themes and organization within and across disciplines. Academic rigor is more than simply assigning to students a greater quantity of work.

Literacy Standards in Science
Secondary science courses include reading standards for literacy in science and technical subjects 6-12 and writing standards for literacy in history/social studies, science, and technical subjects 6-12. The courses also include speaking and listening standards. For a complete list of standards required for this course click on the blue tile labeled course standards. You may also download the complete course including all required standards and notes sections using the export function located at the top of this page.

English Language Development ELD Standards Special Notes Section:
Teachers are required to provide listening, speaking, reading and writing instruction that allows English language learners (ELL) to communicate information, ideas and concepts for academic success in the content area of Science. For the given level of English language proficiency and with visual, graphic, or interactive support, students will interact with grade level words, expressions, sentences and discourse to process or produce language necessary for academic success. The ELD standard should specify a relevant content area concept or topic of study chosen by curriculum developers and teachers which maximizes an ELL's need for communication and social skills. To access an ELL supporting document which delineates performance definitions and descriptors, please click on the following link: https://cpalmsmediaprod.blob.core.windows.net/uploads/docs/standards/eld/sc.pdf

GENERAL INFORMATION

Course Number: 2002430
Course Path: Grades PreK to 12 Education Courses > Grade Group: Grades 9 to 12 and Adult Education Courses > Subject: Science > SubSubject: Integrated Sciences
Abbreviated Title: INTEG SCI 2 HON
Number of Credits: One (1) credit
Course Type: Core Academic Course
Course Status: Course Approved
Grade Level(s): 9,10,11,12
Graduation Requirement: Equally Rigorous Science

Course Length: Year (Y)
Course Attributes:
- Honors
- Class Size Core Required
Course Level: 3

Educator Certifications

<table>
<thead>
<tr>
<th>Earth/Space Science (Grades 6-12)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Physics (Grades 6-12)</td>
</tr>
<tr>
<td>Science (Secondary Grades 7-12)</td>
</tr>
<tr>
<td>Biology (Grades 6-12)</td>
</tr>
<tr>
<td>Chemistry (Grades 6-12)</td>
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</tbody>
</table>
Course Standards

<table>
<thead>
<tr>
<th>Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>SC.912.E.5.3</td>
<td>Describe and predict how the initial mass of a star determines its evolution.</td>
</tr>
<tr>
<td>SC.912.E.5.5</td>
<td>Explain the formation of planetary systems based on our knowledge of our Solar System and apply this knowledge to newly discovered planetary systems.</td>
</tr>
<tr>
<td>SC.912.E.5.6</td>
<td>Develop logical connections through physical principles, including Kepler's and Newton's Laws about the relationships and the effects of Earth, Moon, and Sun on each other.</td>
</tr>
<tr>
<td>SC.912.E.7.2</td>
<td>Analyze the causes of the various kinds of surface and deep water motion within the oceans and their impacts on the transfer of energy between the poles and the equator.</td>
</tr>
<tr>
<td>SC.912.E.7.4</td>
<td>Summarize the conditions that contribute to the climate of a geographic area, including the relationships to lakes and oceans.</td>
</tr>
<tr>
<td>SC.912.E.7.7</td>
<td>Identify, analyze, and relate the internal (Earth system) and external (astronomical) conditions that contribute to global climate change.</td>
</tr>
<tr>
<td>SC.912.L.14.5</td>
<td>Explain the evidence supporting the scientific theory of the origin of eukaryotic cells (endosymbiosis).</td>
</tr>
<tr>
<td>SC.912.L.14.6</td>
<td>Explain the significance of genetic factors, environmental factors, and pathogenic agents to health from the perspectives of both individual and public health.</td>
</tr>
<tr>
<td>SC.912.L.14.7</td>
<td>Relate the structure of each of the major plant organs and tissues to physiological processes.</td>
</tr>
<tr>
<td>SC.912.L.14.26</td>
<td>Identify the major parts of the brain on diagrams or models.</td>
</tr>
<tr>
<td>SC.912.L.14.27</td>
<td>Identify the functions of the major parts of the brain, including the meninges, medulla, pons, midbrain, hypothalamus, thalamus, cerebellum and cerebrum.</td>
</tr>
<tr>
<td>SC.912.L.14.52</td>
<td>Explain the basic functions of the human immune system, including specific and nonspecific immune response, vaccines, and antibiotics.</td>
</tr>
<tr>
<td>SC.912.L.15.15</td>
<td>Describe how mutation and genetic recombination increase genetic variation.</td>
</tr>
<tr>
<td>SC.912.L.16.1</td>
<td>Use Mendel's laws of segregation and independent assortment to analyze patterns of inheritance.</td>
</tr>
<tr>
<td>SC.912.L.16.2</td>
<td>Discuss observed inheritance patterns caused by various modes of inheritance, including dominant, recessive, codominant, sex-linked, polygenic, and multiple alleles.</td>
</tr>
<tr>
<td>SC.912.L.16.3</td>
<td>Describe the basic process of DNA replication and how it relates to the transmission and conservation of the genetic information.</td>
</tr>
<tr>
<td>SC.912.L.16.4</td>
<td>Explain how mutations in the DNA sequence may or may not result in phenotypic change. Explain how mutations in gametes may result in phenotypic changes in offspring.</td>
</tr>
<tr>
<td>SC.912.L.16.5</td>
<td>Explain the basic processes of transcription and translation, and how they result in the expression of genes.</td>
</tr>
<tr>
<td>SC.912.L.16.7</td>
<td>Describe how viruses and bacteria transfer genetic material between cells and the role of this process in biotechnology.</td>
</tr>
<tr>
<td>SC.912.L.16.9</td>
<td>Explain how and why the genetic code is universal and is common to all organisms.</td>
</tr>
<tr>
<td>SC.912.L.16.10</td>
<td>Evaluate the impact of biotechnology on the individual, society and the environment, including medical and ethical issues.</td>
</tr>
<tr>
<td>SC.912.L.16.12</td>
<td>Describe how basic DNA technology (restriction digestion by endonucleases, gel electrophoresis, polymerase chain reaction, ligation, and transformation) is used to construct recombinant DNA molecules (DNA cloning).</td>
</tr>
<tr>
<td>SC.912.L.16.13</td>
<td>Describe the basic anatomy and physiology of the human reproductive system. Describe the process of human development from fertilization to birth and major changes that occur in each trimester of pregnancy.</td>
</tr>
<tr>
<td>SC.912.L.16.14</td>
<td>Describe the cell cycle, including the process of mitosis. Explain the role of mitosis in the formation of new cells and its importance in maintaining chromosome number during asexual reproduction.</td>
</tr>
<tr>
<td>SC.912.L.16.16</td>
<td>Describe the process of meiosis, including independent assortment and crossing over. Explain how reduction division results in the formation of haploid gametes or spores.</td>
</tr>
<tr>
<td>SC.912.L.16.17</td>
<td>Compare and contrast mitosis and meiosis and relate to the processes of sexual and asexual reproduction and their consequences for genetic variation.</td>
</tr>
<tr>
<td>SC.912.L.17.9</td>
<td>Use a food web to identify and distinguish producers, consumers, and decomposers. Explain the pathway of energy transfer through trophic levels and the reduction of available energy at successive trophic levels.</td>
</tr>
<tr>
<td>SC.912.L.17.10</td>
<td>Diagram and explain the biogeochemical cycles of an ecosystem, including water, carbon, and nitrogen cycle.</td>
</tr>
<tr>
<td>SC.912.L.18.1</td>
<td>Describe the basic molecular structures and primary functions of the four major categories of biological macromolecules.</td>
</tr>
<tr>
<td>SC.912.L.18.7</td>
<td>Identify the reactants, products, and basic functions of photosynthesis.</td>
</tr>
<tr>
<td>SC.912.L.18.8</td>
<td>Identify the reactants, products, and basic functions of aerobic and anaerobic cellular respiration.</td>
</tr>
<tr>
<td>SC.912.L.18.9</td>
<td>Explain the interrelated nature of photosynthesis and cellular respiration.</td>
</tr>
<tr>
<td>SC.912.L.18.10</td>
<td>Connect the role of adenosine triphosphate (ATP) to energy transfers within a cell.</td>
</tr>
<tr>
<td>SC.912.L.18.11</td>
<td>Explain the role of enzymes as catalysts that lower the activation energy of biochemical reactions. Identify factors, such as pH and temperature, and their effect on enzyme activity.</td>
</tr>
</tbody>
</table>

Define a problem based on a specific body of knowledge, for example: biology, chemistry, physics, and earth/space science, and do the following:

1. Pose questions about the natural world, (Articulate the purpose of the investigation and identify the relevant scientific concepts).
2. Conduct systematic observations, (Write procedures that are clear and replicable. Identify observables and examine relationships between test (independent) variable and outcome (dependent) variable. Employ appropriate methods for accurate and consistent observations; conduct and record measurements at appropriate levels of precision. Follow safety guidelines).
3. Examine books and other sources of information to see what is already known,
4. Review what is known in light of empirical evidence, (Examine whether available empirical evidence can be interpreted in terms of existing knowledge and models, and if not, modify or develop new models).
5. Plan investigations, (Design and evaluate a scientific investigation).
6. Use tools to gather, analyze, and interpret data (this includes the use of measurement in metric and other systems, and also the generation and interpretation of graphical representations of data, including data tables and graphs), (Collect data or evidence in an organized way. Properly use instruments, equipment, and materials (e.g., scales, probeware, meter sticks, microscopes, computers) including set-up, calibration, technique, maintenance, and storage).
7. Pose answers, explanations, or descriptions of events,
8. Generate explanations that explicate or describe natural phenomena (inferences),
9. Use appropriate evidence and reasoning to justify these explanations to others,
10. Communicate results of scientific investigations, and
11. Evaluate the merits of the explanations produced by others.

SC.912.N.1.5: Describe and provide examples of how similar investigations conducted in many parts of the world result in the same outcome.
SC.912.N.1.7: Recognize the role of creativity in constructing scientific questions, methods and explanations.
SC.912.N.2.1: Identify what is science, what clearly is not science, and what superficially resembles science (but fails to meet the criteria for science).
SC.912.N.2.3: Identify examples of pseudoscience (such as astrology, phrenology) in society.
SC.912.N.2.4: Explain that scientific knowledge is both durable and robust and open to change. Scientific knowledge can change because it is often examined and re-examined by new investigations and scientific argumentation. Because of these frequent examinations, scientific knowledge becomes stronger, leading to its durability.
SC.912.N.3.1: Explain that a scientific theory is the culmination of many scientific investigations drawing together all the current evidence concerning a substantial range of phenomena; thus, a scientific theory represents the most powerful explanation scientists have to offer.
SC.912.P.8.6: Distinguish between bonding forces holding compounds together and other attractive forces, including hydrogen bonding and van der Waals forces.
SC.912.P.8.8: Characterize types of chemical reactions, for example: redox, acid-base, synthesis, and single and double replacement reactions.
SC.912.P.8.9: Apply the mole concept and the law of conservation of mass to calculate quantities of chemicals participating in reactions.
SC.912.P.8.11: Relate acidity and basicity to hydronium and hydroxyl ion concentration and pH.
SC.912.P.8.12: Describe the properties of the carbon atom that make the diversity of carbon compounds possible.
SC.912.P.8.13: Identify selected functional groups and relate how they contribute to properties of carbon compounds.
SC.912.P.10.5: Relate temperature to the average molecular kinetic energy.
SC.912.P.10.6: Create and interpret potential energy diagrams, for example: chemical reactions, orbits around a central body, motion of a pendulum.
SC.912.P.10.9: Describe the quantization of energy at the atomic level.
SC.912.P.10.10: Compare the magnitude and range of the four fundamental forces (gravitational, electromagnetic, weak nuclear, strong nuclear).
SC.912.P.10.12: Differentiate between chemical and nuclear reactions.
SC.912.P.10.15: Investigate and explain the relationships among current, voltage, resistance, and power.
SC.912.P.10.20: Describe the measurable properties of waves and explain the relationships among them and how these properties change when the wave moves from one medium to another.
SC.912.P.10.21: Qualitatively describe the shift in frequency in sound or electromagnetic waves due to the relative motion of a source or a receiver.
SC.912.P.10.22: Construct ray diagrams and use thin lens and mirror equations to locate the images formed by lenses and mirrors.
SC.912.P.12.1: Distinguish between scalar and vector quantities and assess which should be used to describe an event.
SC.912.P.12.2: Analyze the motion of an object in terms of its position, velocity, and acceleration (with respect to a frame of reference) as functions of time.
SC.912.P.12.4: Describe how the gravitational force between two objects depends on their masses and the distance between them.
SC.912.P.12.11: Describe phase transitions in terms of kinetic molecular theory.
SC.912.P.12.12: Explain how various factors, such as concentration, temperature, and presence of a catalyst affect the rate of a chemical reaction.

Clarifications:
Teachers who encourage students to participate actively in effortful learning both individually and with others:
- Analyze the problem in a way that makes sense given the task.
- Ask questions that will help with solving the task.
- Build perseverance by modifying methods as needed while solving a challenging task.
- Stay engaged and maintain a positive mindset when working to solve tasks.
- Help and support each other when attempting a new method or approach.

MA.K12.MTR.1.1: Demonstrate understanding by representing problems in multiple ways. Mathematicians who demonstrate understanding by representing problems in multiple ways:
- Build understanding through modeling and using manipulatives.
- Represent solutions to problems in multiple ways using objects, drawings, tables, graphs and equations.
- Progress from modeling problems with objects and drawings to using algorithms and equations.
- Express connections between concepts and representations.
- Choose a representation based on the given context or purpose.

Clarifications:
Teachers who encourage students to demonstrate understanding by representing problems in multiple ways:
- Help students make connections between concepts and representations.
- Provide opportunities for students to use manipulatives when investigating concepts.
- Guide students from concrete to pictorial to abstract representations as understanding progresses.
- Show students that various representations can have different purposes and can be useful in different situations.

MA.K12.MTR.2.1: Complete tasks with mathematical fluency. Mathematicians who complete tasks with mathematical fluency:
- Select efficient and appropriate methods for solving problems within the given context.
- Maintain flexibility and accuracy while performing procedures and mental calculations.
- Complete tasks accurately and with confidence.
- Adapt procedures to apply them to a new context.
- Use feedback to improve efficiency when performing calculations.
<table>
<thead>
<tr>
<th><strong>Clarifications:</strong></th>
<th><strong>Teachers who encourage students to complete tasks with mathematical fluency:</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>• Provide students with the flexibility to solve problems by selecting a procedure that allows them to solve efficiently and accurately.</td>
</tr>
<tr>
<td></td>
<td>• Offer multiple opportunities for students to practice efficient and generalizable methods.</td>
</tr>
<tr>
<td></td>
<td>• Provide opportunities for students to reflect on the method they used and determine if a more efficient method could have been used.</td>
</tr>
</tbody>
</table>

| **Engage in discussions that reflect on the mathematical thinking of self and others:** |
| Mathematics who engage in discussions that reflect on the mathematical thinking of self and others: |
| • Communicate mathematical ideas, vocabulary and methods effectively. |
| • Analyze the mathematical thinking of others. |
| • Compare the efficiency of a method to those expressed by others. |
| • Recognize errors and suggest how to correctly solve the task. |
| • Justify results by explaining methods and processes. |
| • Construct possible arguments based on evidence. |

| **MA.K12.MTR.4.1:** |
| Use patterns and structure to help understand and connect mathematical concepts. |
| Mathematicians who use patterns and structure to help understand and connect mathematical concepts: |
| • Focus on relevant details within a problem. |
| • Create plans and procedures to logically order events, steps or ideas to solve problems. |
| • Decompose a complex problem into manageable parts. |
| • Relate previously learned concepts to new concepts. |
| • Look for similarities among problems. |
| • Connect solutions of problems to more complicated large-scale situations. |

| **MA.K12.MTR.5.1:** |
| Assess the reasonableness of solutions. |
| Mathematicians who assess the reasonableness of solutions: |
| • Estimate to discover possible solutions. |
| • Use benchmark quantities to determine if a solution makes sense. |
| • Check calculations when solving problems. |
| • Verify possible solutions by explaining the methods used. |
| • Evaluate results based on the given context. |

| **MA.K12.MTR.6.1:** |
| Apply mathematics to real-world contexts. |
| Mathematicians who apply mathematics to real-world contexts: |
| • Connect mathematical concepts to everyday experiences. |
| • Use models and methods to understand, represent and solve problems. |
| • Perform investigations to gather data or determine if a method is appropriate. • Redesign models and methods to improve accuracy or efficiency. |

| **MA.K12.MTR.7.1:** |
| Cite evidence to explain and justify reasoning. |
| **Clarifications:** |
| K-1 Students include textual evidence in their oral communication with guidance and support from adults. The evidence can consist of details from the text without naming the text. During 1st grade, students learn how to incorporate the evidence in their writing. |
| 2-3 Students include relevant textual evidence in their written and oral communication. Students should name the text when they refer to it. In 3rd grade, students should use a combination of direct and indirect citations. |
| 4-5 Students continue with previous skills and reference comments made by speakers and peers. Students cite texts that they've directly quoted, paraphrased, or used for information. When writing, students will use the form of citation dictated by the instructor or the style guide. |

<p>| <strong>ELA.K12.EE.1.1:</strong> |</p>
<table>
<thead>
<tr>
<th>ELA.K12.EE.2.1:</th>
<th>Read and comprehend grade-level complex texts proficiently.</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Clarifications:</strong></td>
<td>See Text Complexity for grade-level complexity bands and a text complexity rubric.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>ELA.K12.EE.3.1:</th>
<th>Make inferences to support comprehension.</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Clarifications:</strong></td>
<td>Students will make inferences before the words infer or inference are introduced. Kindergarten students will answer questions like “Why is the girl smiling?” or make predictions about what will happen based on the title page. Students will use the terms and apply them in 2nd grade and beyond.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>ELA.K12.EE.4.1:</th>
<th>Use appropriate collaborative techniques and active listening skills when engaging in discussions in a variety of situations.</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Clarifications:</strong></td>
<td>In kindergarten, students learn to listen to one another respectfully. In grades 1-2, students build upon these skills by justifying what they are thinking. For example: “I think ______ because ______.” The collaborative conversations are becoming academic conversations. In grades 3-12, students engage in academic conversations discussing claims and justifying their reasoning, refining and applying skills. Students build on ideas, propel the conversation, and support claims and counterclaims with evidence.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>ELA.K12.EE.5.1:</th>
<th>Use the accepted rules governing a specific format to create quality work.</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Clarifications:</strong></td>
<td>Students will incorporate skills learned into work products to produce quality work. For students to incorporate these skills appropriately, they must receive instruction. A 3rd grade student creating a poster board display must have instruction in how to effectively present information to do quality work.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>ELA.K12.EE.6.1:</th>
<th>Use appropriate voice and tone when speaking or writing.</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Clarifications:</strong></td>
<td>In kindergarten and 1st grade, students learn the difference between formal and informal language. For example, the way we talk to our friends differs from the way we speak to adults. In 2nd grade and beyond, students practice appropriate social and academic language to discuss texts.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>HE.912.C.1.3:</th>
<th>Evaluate how environment and personal health are interrelated.</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Clarifications:</strong></td>
<td>Food options within a community; prenatal-care services; availability of recreational facilities; air quality; weather-safety awareness; and weather, air, and water conditions.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>HE.912.C.1.5:</th>
<th>Analyze strategies for prevention, detection, and treatment of communicable and chronic diseases.</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Clarifications:</strong></td>
<td>Health prevention, detection, and treatment of: breast and testicular cancer, suicide, obesity, and industrial-related chronic disease.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>HE.912.C.1.7:</th>
<th>Analyze how heredity and family history can impact personal health.</th>
</tr>
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<tbody>
<tr>
<td><strong>Clarifications:</strong></td>
<td>Drug use, family obesity, heart disease, mental health, and non-communicable illness or disease.</td>
</tr>
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</table>

<table>
<thead>
<tr>
<th>ELD.K12.ELL.SC.1:</th>
<th>English language learners communicate information, ideas and concepts necessary for academic success in the content area of Science.</th>
</tr>
</thead>
<tbody>
<tr>
<td>ELD.K12.ELL.SI.1:</td>
<td>English language learners communicate for social and instructional purposes within the school setting.</td>
</tr>
</tbody>
</table>

**General Course Information and Notes**

**GENERAL NOTES**

While the content focus of this course is consistent with the Integrated Science 2 course, students will explore these concepts in greater depth. In general, the academic pace and rigor will be greatly increased for honors level course work. Laboratory investigations that include the use of scientific inquiry, research, measurement, problem solving, laboratory apparatus and technologies, experimental procedures, and safety procedures are an integral part of this course. The National Science Teachers Association (NSTA) recommends that at the high school level, all students should be in the science lab or field, collecting data every week. School laboratory investigations (labs) are defined by the National Research Council (NRC) as an experience in the laboratory, classroom, or the field that provides students with opportunities to interact directly with natural phenomena or with data collected by others using tools, materials, data collection techniques, and models (NRC, 2006, p. 3). Laboratory investigations in the high school classroom should help all students develop a growing understanding of the complexity and ambiguity of empirical work, as well as the skills to calibrate and troubleshoot equipment used to make observations. Learners should understand measurement error; and have the skills to aggregate, interpret, and present the resulting data (National Research Council, 2006, p.77; NSTA, 2007).

**Special Notes:**

**Instructional Practices**

Teaching from a range of complex text is optimized when teachers in all subject areas implement the following strategies on a routine basis:

1. Ensuring wide reading from complex text that varies in length.
2. Making close reading and rereading of texts central to lessons.
3. Emphasizing text-specific complex questions, and cognitively complex tasks, reinforce focus on the text and cultivate independence.
4. Emphasizing students supporting answers based upon evidence from the text.
5. Providing extensive research and writing opportunities (claims and evidence).

- Asking questions (for science) and defining problems (for engineering).
- Developing and using models.
- Planning and carrying out investigations.
- Analyzing and interpreting data.
- Using mathematics, information and computer technology, and computational thinking.
- Constructing explanations (for science) and designing solutions (for engineering).
- Engaging in argument from evidence.
- Obtaining, evaluating, and communicating information.

Honors and Advanced Level Course Note: Advanced courses require a greater demand on students through increased academic rigor. Academic rigor is obtained through the application, analysis, evaluation, and creation of complex ideas that are often abstract and multi-faceted. Students are challenged to think and collaborate critically on the content they are learning. Honors level rigor will be achieved by increasing text complexity through text selection, focus on high-level qualitative measures, and complexity of task. Instruction will be structured to give students a deeper understanding of conceptual themes and organization within and across disciplines. Academic rigor is more than simply assigning to students a greater quantity of work.

Florida's Benchmarks for Excellent Student Thinking (B.E.S.T.) Standards
This course includes Florida's B.E.S.T. ELA Expectations (EE) and Mathematical Thinking and Reasoning Standards (MTRs) for students. Florida educators should intentionally embed these standards within the content and their instruction as applicable. For guidance on the implementation of the EEs and MTRs, please visit https://www.cpalms.org/Standards/BEST_Standards.aspx and select the appropriate B.E.S.T. Standards package.

English Language Development ELD Standards Special Notes Section:
Teachers are required to provide listening, speaking, reading and writing instruction that allows English language learners (ELL) to communicate information, ideas and concepts for academic success in the content area of Science. For the given level of English language proficiency and with visual, graphic, or interactive support, students will interact with grade level words, expressions, sentences and discourse to process or produce language necessary for academic success. The ELD standard should specify a relevant content area concept or topic of study chosen by curriculum developers and teachers which maximizes an ELL's need for communication and social skills. To access an ELL supporting document which delineates performance definitions and descriptors, please click on the following link: https://cpalmsmediaprod.blob.core.windows.net/uploads/docs/standards/eld/sc.pdf

GENERAL INFORMATION

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<tr>
<th>Course Number:</th>
<th>2002430</th>
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<tbody>
<tr>
<td>Course Path: Section:</td>
<td>Grades PreK to 12 Education</td>
</tr>
<tr>
<td>Courses:</td>
<td>Education Courses</td>
</tr>
<tr>
<td>Grade Group:</td>
<td>Grades 9 to 12 and Adult</td>
</tr>
<tr>
<td>Subject:</td>
<td>Science</td>
</tr>
<tr>
<td>SubSubject:</td>
<td>Integrated Sciences</td>
</tr>
<tr>
<td>Abbreviated Title:</td>
<td>INTEG SCI 2 HON</td>
</tr>
<tr>
<td>Course Length:</td>
<td>Year (Y)</td>
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<tr>
<td>Course Level:</td>
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<tr>
<td>Honors</td>
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<td>Class Size Core Required</td>
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<td>Number of Credits:</td>
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<tr>
<td>Course Attributes:</td>
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<tr>
<td>Grade Level(s):</td>
<td>9,10,11,12</td>
</tr>
<tr>
<td>Graduation Requirement:</td>
<td>Equally Rigorous Science</td>
</tr>
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Educator Certifications

<p>| Earth/Space Science (Grades 6-12) |
| Physics (Grades 6-12) |
| Science (Secondary Grades 7-12) |
| Biology (Grades 6-12) |
| Chemistry (Grades 6-12) |</p>
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<tr>
<th>Name</th>
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<tbody>
<tr>
<td>SC.912.E.5.9:</td>
<td>Analyze the broad effects of space exploration on the economy and culture of Florida.</td>
</tr>
<tr>
<td>SC.912.E.6.4:</td>
<td>Analyze how specific geologic processes and features are expressed in Florida and elsewhere.</td>
</tr>
<tr>
<td>SC.912.E.7.6:</td>
<td>Relate the formation of severe weather to the various physical factors.</td>
</tr>
<tr>
<td>SC.912.E.7.8:</td>
<td>Explain how various atmospheric, oceanic, and hydrologic conditions in Florida have influenced and can influence human behavior, both individually and collectively.</td>
</tr>
<tr>
<td>SC.912.E.7.9:</td>
<td>Cite evidence that the ocean has had a significant influence on climate change by absorbing, storing, and moving heat, carbon, and water.</td>
</tr>
<tr>
<td>SC.912.L.15.1:</td>
<td>Explain how the scientific theory of evolution is supported by the fossil record, comparative anatomy, comparative embryology, biogeography, molecular biology, and observed evolutionary change.</td>
</tr>
<tr>
<td>SC.912.L.15.6:</td>
<td>Discuss distinguishing characteristics of the domains and kingdoms of living organisms.</td>
</tr>
<tr>
<td>SC.912.L.15.10:</td>
<td>Identify basic trends in hominid evolution from early ancestors six million years ago to modern humans, including brain size, jaw size, language, and manufacture of tools.</td>
</tr>
<tr>
<td>SC.912.L.15.13:</td>
<td>Describe the conditions required for natural selection, including: overproduction of offspring, inherited variation, and the struggle to survive, which result in differential reproductive success.</td>
</tr>
<tr>
<td>SC.912.L.15.14:</td>
<td>Discuss mechanisms of evolutionary change other than natural selection such as genetic drift and gene flow.</td>
</tr>
<tr>
<td>SC.912.L.15.15:</td>
<td>Describe how mutation and genetic recombination increase genetic variation.</td>
</tr>
<tr>
<td>SC.912.L.16.4:</td>
<td>Explain how mutations in the DNA sequence may or may not result in phenotypic change. Explain how mutations in gametes may result in phenotypic changes in offspring.</td>
</tr>
<tr>
<td>SC.912.L.16.8:</td>
<td>Explain the relationship between mutation, cell cycle, and uncontrolled cell growth potentially resulting in cancer.</td>
</tr>
<tr>
<td>SC.912.L.16.10:</td>
<td>Evaluate the impact of biotechnology on the individual, society and the environment, including medical and ethical issues.</td>
</tr>
<tr>
<td>SC.912.L.16.13:</td>
<td>Describe the basic anatomy and physiology of the human reproductive system. Describe the process of human development from fertilization to birth and major changes that occur in each trimester of pregnancy.</td>
</tr>
<tr>
<td>SC.912.L.17.5:</td>
<td>Analyze how population size is determined by births, deaths, immigration, emigration, and limiting factors (biotic and abiotic) that determine carrying capacity.</td>
</tr>
<tr>
<td>SC.912.L.17.8:</td>
<td>Recognize the consequences of the losses of biodiversity due to catastrophic events, climate changes, human activity, and the introduction of invasive, non-native species.</td>
</tr>
<tr>
<td>SC.912.L.17.11:</td>
<td>Evaluate the costs and benefits of renewable and nonrenewable resources, such as water, energy, fossil fuels, wildfire, and forests.</td>
</tr>
<tr>
<td>SC.912.L.17.13:</td>
<td>Discuss the need for adequate monitoring of environmental parameters when making policy decisions.</td>
</tr>
<tr>
<td>SC.912.L.17.20:</td>
<td>Predict the impact of individuals on environmental systems and examine how human lifestyles affect sustainability.</td>
</tr>
<tr>
<td>SC.912.L.18.10:</td>
<td>Connect the role of adenosine triphosphate (ATP) to energy transfers within a cell.</td>
</tr>
<tr>
<td>SC.912.L.18.11:</td>
<td>Explain the role of enzymes as catalysts that lower the activation energy of biochemical reactions. Identify factors, such as pH and temperature, and their effect on enzyme activity.</td>
</tr>
<tr>
<td>SC.912.L.18.12:</td>
<td>Define a problem based on a specific body of knowledge, for example: biology, chemistry, physics, and earth/space science, and do the following: 1. Pose questions about the natural world, (Articulate the purpose of the investigation and identify the relevant scientific concepts). 2. Conduct systematic observations, (Write procedures that are clear and replicable. Identify observables and examine relationships between test (independent) variable and outcome (dependent) variable. Employ appropriate methods for accurate and consistent observations; conduct and record measurements at appropriate levels of precision. Follow safety guidelines). 3. Examine books and other sources of information to see what is already known, 4. Review what is known in light of empirical evidence, (Examine whether available empirical evidence can be interpreted in terms of existing knowledge and models, and if not, modify or develop new models). 5. Plan investigations, (Design and evaluate a scientific investigation). 6. Use tools to gather, analyze, and interpret data (this includes the use of measurement in metric and other systems, and also the generation and interpretation of graphical representations of data, including data tables and graphs), (Collect data or evidence in an organized way. Properly use instruments, equipment, and materials (e.g., scales, probeware, meter sticks, microscopes, computers) including set-up, calibration, technique, maintenance, and storage). 7. Pose answers, explanations, or descriptions of events, 8. Generate explanations that explicate or describe natural phenomena (inferences), 9. Use appropriate evidence and reasoning to justify these explanations to others, 10. Communicate results of scientific investigations, and 11. Evaluate the merits of the explanations produced by others.</td>
</tr>
<tr>
<td>SC.912.N.1.1:</td>
<td>Describe and explain what characterizes science and its methods.</td>
</tr>
<tr>
<td>SC.912.N.1.2:</td>
<td>Recognize that the strength or usefulness of a scientific claim is evaluated through scientific argumentation, which depends on critical and logical thinking, and the active consideration of alternative scientific explanations to explain the data presented.</td>
</tr>
<tr>
<td>SC.912.N.1.5:</td>
<td>Describe and provide examples of how similar investigations conducted in many parts of the world result in the same outcome.</td>
</tr>
<tr>
<td>SC.912.N.1.6:</td>
<td>Describe how scientific inferences are drawn from scientific observations and provide examples from the content being studied.</td>
</tr>
<tr>
<td>SC.912.N.1.7:</td>
<td>Recognize the role of creativity in constructing scientific questions, methods and explanations.</td>
</tr>
<tr>
<td>SC.912.N.2.1:</td>
<td>Identify what is science, what clearly is not science, and what superficially resembles science (but fails to meet the criteria for science).</td>
</tr>
</tbody>
</table>
Identify which questions can be answered through science and which questions are outside the boundaries of scientific investigation, such as questions addressed by other methods such as art, philosophy, and religion.

Explain that scientific knowledge is both durable and robust and open to change. Scientific knowledge can change because it is often examined and re-examined by new investigations and scientific argumentation. Because of these frequent examinations, scientific knowledge becomes stronger, leading to its durability.

Describe instances in which scientists’ varied backgrounds, talents, interests, and goals influence the inferences and thus the explanations that they make about observations of natural phenomena and describe that competing interpretations (explanations) of scientists are a strength of science as they are a source of new, testable ideas that have the potential to add new evidence to support one or another of the explanations.

Explain that a scientific theory is the culmination of many scientific investigations drawing together all the current evidence concerning a substantial range of phenomena; thus, a scientific theory represents the most powerful explanation scientists have to offer.

Describe the role consensus plays in the historical development of a theory in any one of the disciplines of science.

Explain how scientific knowledge and reasoning provide an empirically-based perspective to inform society’s decision making.

Weigh the merits of alternative or opposing perspectives as they are a source of new, testable ideas that have the potential to add new evidence to support one or another of the explanations.

Describe the relationship between moving charges and magnetic fields, as well as changing magnetic fields and electric fields, and their application to modern technologies.

Qualitatively describe the shift in frequency in sound or electromagnetic waves due to the relative motion of a source or a receiver.

Describe the conservation of energy in an isolated system as a conserved quantity.

Describe oxidation-reduction reactions in living and non-living systems.

Explore the Law of Conservation of Energy by differentiating among open, closed, and isolated systems and explain that the total energy in an isolated system is conserved quantity.

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Determine the meaning of symbols, key terms, and other domain-specific concepts, processes, or information presented in a text by paraphrasing them in simpler but still accurate terms.

Explain the concept of dynamic equilibrium in terms of reversible processes occurring at the same rates.

Interpret the behavior of ideal gases in terms of kinetic molecular theory.

Explain how various factors, such as concentration, temperature, and presence of a catalyst affect the rate of a chemical reaction.

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LAFS.1112.SL.2.5: Make strategic use of digital media (e.g., textual, graphical, audio, visual, and interactive elements) in presentations to enhance understanding of findings, reasoning, and evidence and to add interest.

LAFS.1112.WHST.1.1: Write arguments focused on discipline-specific content:
   a. Introduce precise, knowledgeable claim(s), establish the significance of the claim(s), distinguish the claim(s) from alternate or opposing claims, and create an organization that logically sequences the claim(s), counterclaims, reasons, and evidence.
   b. Develop claim(s) and counterclaims fairly and thoroughly, supplying the most relevant data and evidence for each while pointing out the strengths and limitations of both claim(s) and counterclaims in a discipline-appropriate form that anticipates the audience's knowledge level, concerns, values, and possible biases.
   c. Use words, phrases, and clauses as well as varied syntax to link the major sections of the text, create cohesion, and clarify the relationships between claim(s) and reasons, between reasons and evidence, and between claim(s) and counterclaims.
   d. Establish and maintain a formal style and objective tone while attending to the norms and conventions of the discipline in which they are writing.
   e. Provide a concluding statement or section that follows from or supports the argument presented.

LAFS.1112.WHST.1.2: Write informative/explanatory texts, including the narration of historical events, scientific procedures/experiments, or technical processes.
   a. Introduce a topic and organize complex ideas, concepts, and information so that each new section builds on that which precedes it to create a unified whole; include formatting (e.g., headings), graphics (e.g., figures, tables), and multimedia when useful to aiding comprehension.
   b. Develop the topic thoroughly by selecting the most significant and relevant facts, extended definitions, concrete details, quotations, or other information and examples appropriate to the audience's knowledge of the topic.
   c. Use varied transitions and sentence structures to link the major sections of the text, create cohesion, and clarify the relationships among complex ideas and concepts.
   d. Use precise language, domain-specific vocabulary and techniques such as metaphor, simile, and analogy to manage the complexity of the topic; convey a knowledgeable stance in a style that responds to the discipline and context as well as to the expertise of likely readers.
   e. Provide a concluding statement or section that follows from and supports the information or explanation provided (e.g., articulating implications or the significance of the topic).

LAFS.1112.WHST.2.4: Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.

LAFS.1112.WHST.2.5: Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience.

LAFS.1112.WHST.2.6: Use technology, including the Internet, to produce, publish, and update individual or shared writing products in response to ongoing feedback, including new arguments or information.

LAFS.1112.WHST.2.7: Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation.

LAFS.1112.WHST.2.8: Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the strengths and limitations of each source in terms of the specific task, purpose, and audience; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and overreliance on any one source and following a standard format for citation.

LAFS.1112.WHST.3.9: Draw evidence from informational texts to support analysis, reflection, and research.

LAFS.1112.WHST.4.10: Write routinely over extended time frames (time for reflection and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences.

MAFS.912.F-IF.2.4: Use the mean and standard deviation of a data set to fit it to a normal distribution. Here they choose a summary statistic appropriate to the characteristics of the data distribution, such as the shape of the distribution or the existence of extreme data points.

MAFS.912.F-IF.3.7: Graph polynomial functions, identifying zeros when suitable factorizations are available, and showing end behavior.

MAFS.912.F-IF.3.8: Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases.
   a. Graph linear and quadratic functions and show intercepts, maximum, and minimum.
   b. Graph square root, cube root, and piecewise-defined functions, including step functions and absolute value functions.
   c. Graph polynomial functions, identifying zeros when suitable factorizations are available, and showing end behavior.
   d. Graph rational functions, identifying zeros and asymptotes when suitable factorizations are available, and showing end behavior.
   e. Graph exponential and logarithmic functions, showing intercepts and end behavior, and trigonometric functions, showing period, midline, and amplitude, and using phase shift.

MAFS.912.N-Q.1.1: Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays.

MAFS.912.N-Q.1.3: Choose a level of accuracy appropriate to limitations on measurement when reporting quantities.

MAFS.912.S-ID.1.1: Represent data with plots on the real number line (dot plots, histograms, and box plots).

MAFS.912.S-ID.1.2: Use statistics appropriate to the shape of the data distribution to compare center (median, mean) and spread (interquartile range, standard deviation) of two or more different data sets.

MAFS.912.S-ID.1.3: Collect data to make inferences about population proportions. Recognize that there are data sets for which such a procedure is not appropriate. Use calculators, spreadsheets, and tables to estimate areas under the normal curve.

MAFS.912.S-ID.2.5: Summarize categorical data for two categories in two-way frequency tables. Interpret relative frequencies in the context of the data (including joint, marginal, and conditional relative frequencies). Recognize possible associations and trends in the data.
Make sense of problems and persevere in solving them.

Mathematically proficient students start by explaining to themselves the meaning of a problem and looking for entry points to its solution. They analyze givens, constraints, relationships, and goals. They make conjectures about the form and meaning of the solution and plan a solution pathway rather than simply jumping into a solution attempt. They consider analogous problems, and try special cases and simpler forms of the original problem in order to gain insight into its solution. They monitor and evaluate their progress and change course if necessary. Older students might, depending on the context of the problem, transform algebraic expressions or change the viewing window on their graphing calculator to get the information they need. Mathematically proficient students can explain correspondences between equations, verbal descriptions, tables, and graphs or draw diagrams of important features and relationships, graph data, and search for regularity or trends. Younger students might rely on using concrete objects or pictures to help conceptualize and solve a problem. Mathematically proficient students check their answers to problems using a different method, and they continually ask themselves, “Does this make sense?” They can understand the approaches of others to solving complex problems and identify correspondences between different approaches.

Standard Relation to Course: Supporting

Reason abstractly and quantitatively.

Mathematically proficient students make sense of quantities and their relationships in problem situations. They bring two complementary abilities to bear on problems involving quantitative relationships: the ability to decontextualize—to abstract a given situation and represent it symbolically and manipulate the representations as if they have a life of their own, without necessarily attending to their referents—and the ability to contextualize, to pause as needed during the manipulation process in order to probe into the referents for the symbols involved. Quantitative reasoning entails habits of creating a coherent representation of the problem at hand; considering the units involved; attending to the meaning of quantities, not just how to compute them; and knowing and flexibly using different properties of operations and objects.

Standard Relation to Course: Supporting

Construct viable arguments and critique the reasoning of others.

Mathematically proficient students understand and use stated assumptions, definitions, and previously established results in constructing arguments. They make conjectures and build a logical progression of statements to explore the truth of their conjectures. They are able to analyze situations by breaking them into cases, and can recognize and use counterexamples. They justify their conclusions, communicate them to others, and respond to the arguments of others. They reason inductively about data, making plausible arguments that take into account the context from which the data arose. Mathematically proficient students are also able to compare the effectiveness of two plausible arguments, distinguish correct logic or reasoning from that which is flawed, and—if there is a flaw in an argument—explain what it is. Elementary students can construct arguments using concrete referents such as objects, drawings, diagrams, and actions. In middle grades, a student might apply proportional reasoning to plan a school event or analyze a problem in the community. By high school, a student might use geometry to solve a design problem or use a function to describe how one quantity of interest depends on another. Mathematically proficient students who can apply what they know are comfortable making assumptions and approximations to simplify a complicated situation, realizing that these may need revision later. They are able to identify important quantities in a practical situation and map their relationships using such tools as diagrams, two-way tables, graphs, flowcharts and formulas. They can analyze those relationships mathematically to draw conclusions. They routinely interpret their mathematical results in the context of the situation and reflect on whether the results make sense, possibly improving the model if it has not served its purpose.

Standard Relation to Course: Supporting

Use appropriate tools strategically.

Mathematically proficient students consider the available tools when solving a mathematical problem. These tools might include pencil and paper, concrete models, a ruler, a protractor, a calculator, a spreadsheet, a computer algebra system, a statistical package, or dynamic geometry software. Proficient students are sufficiently familiar with tools appropriate for their grade or course to make sound decisions about when each of these tools might be helpful, recognizing both the insight to be gained and their limitations. For example, mathematically proficient high school students analyze graphs of functions and solutions generated using a graphing calculator. They detect possible errors by strategically using estimation and other mathematical knowledge. When making mathematical models, they know that technology can enable them to visualize the results of varying assumptions, explore consequences, and compare predictions with data. Mathematically proficient students at various grade levels are able to identify relevant external mathematical resources, such as digital content located on a website, and use them to pose or solve problems. They are able to use technological tools to explore and deepen their understanding of concepts.

Standard Relation to Course: Supporting

Attend to precision.

Mathematically proficient students try to communicate precisely to others. They try to use clear definitions in discussion with others and in their own reasoning. They state the meaning of the symbols they choose, including using the equal sign consistently and appropriately. They are careful about specifying units of measure, and labeling axes to clarify the correspondence with quantities in a problem. They calculate accurately and efficiently, express numerical answers with a degree of precision appropriate for the problem context. In the elementary grades, students give correctly formulated explanations to each other. By the time they reach high school they have learned to examine claims and make explicit use of definitions.

Standard Relation to Course: Supporting

Look for and make use of structure.

Mathematically proficient students look closely to discern a pattern or structure. Young students, for example, might notice that three and seven more is the same amount as seven and three more, or they may sort a collection of shapes according to how many sides the shapes have. Later, students will see 7 + 8 equals the well remembered 7 + 5 = 12, in preparation for learning about the distributive property. In the expression 2 × 5 + 3 × 5, older students can see the 5 as 2 × 3 and the 9 as 3 × 3. They recognize the significance of an existing line in a geometric figure and can use the strategy of drawing an auxiliary line for solving problems. They also can step back for an overview and shift perspective. They can see complicated things, such as some algebraic expressions, as single objects or as being composed of several objects. For example, they can see 5 – 3(x – y)² as 5 minus a positive number times a square and use that to realize that its value cannot be more than 5 for any real numbers x and y.
General Course Information and Notes

GENERAL NOTES

Laboratory investigations that include the use of scientific inquiry, research, measurement, problem solving, laboratory apparatus and technologies, experimental procedures, and safety procedures are an integral part of this course. The National Research Council (NRC) recommends that at the high school level, all students should be in the science lab or field, collecting data every week. School laboratory investigations (labs) are defined by the National Research Council (NRC) as an experience in the laboratory, classroom, or the field that provides students with opportunities to interact directly with natural phenomena or with data collected by others using tools, materials, data collection techniques, and models (NRC, 2006, p.3). Laboratory investigations in the high school classroom should help all students develop a growing understanding of the complexity and ambiguity of empirical work, as well as the skills to calibrate and troubleshoot equipment used to make observations. Learners should understand measurement error; and have the skills to aggregate, interpret, and present the resulting data (National Research Council, 2006, p.77; NSTA, 2007).

Special Notes:

Instructional Practices
Teaching from a range of complex text is optimized when teachers in all subject areas implement the following strategies on a routine basis:
1. Ensuring wide reading from complex text that varies in length.
2. Making close reading and rereading of texts central to lessons.
3. Emphasizing text-specific complex questions, and cognitively complex tasks, reinforce focus on the text and cultivate independence.
4. Emphasizing students supporting answers based upon evidence from the text.
5. Providing extensive research and writing opportunities (claims and evidence).

- Asking questions (for science) and defining problems (for engineering).
- Developing and using models.
- Planning and carrying out investigations.
- Analyzing and interpreting data.
- Using mathematics, information and computer technology, and computational thinking.
- Constructing explanations (for science) and designing solutions (for engineering).
- Engaging in argument from evidence.
- Obtaining, evaluating, and communicating information.

Literacy Standards in Science
Secondary science courses include reading standards for literacy in science and technical subjects 6-12 and writing standards for literacy in history/social studies, science, and technical subjects 6-12. The courses also include speaking and listening standards. For a complete list of standards required for this course click on the blue tile labeled course standards. You may also download the complete course including all required standards and notes sections using the export function located at the top of this page.

English Language Development ELD Standards Special Notes Section
Teachers are required to provide listening, speaking, reading and writing instruction that allows English language learners (ELL) to communicate information, ideas and concepts for academic success in the content area of Science. For the given level of English language proficiency and with visual, graphic, or interactive support, students will interact with grade level words, expressions, sentences and discourse to process or produce language necessary for academic success. The ELD standard should specify a relevant content area concept or topic of study chosen by curriculum developers and teachers which maximizes an ELL's need for communication and social skills. To access an ELL supporting document which delineates performance definitions and descriptors, please click on the following link: https://cpalmsmediaprod.blob.core.windows.net/uploads/docs/standards/eld/sc.pdf
Course Status: Course Approved
Grade Level(s): 9, 10, 11, 12
Graduation Requirement: Equally Rigorous Science

Educator Certifications

<table>
<thead>
<tr>
<th>Certification</th>
<th>Grade Level(s)</th>
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<tr>
<td>Earth/Space Science (Grades 6-12)</td>
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<tr>
<td>Physics (Grades 6-12)</td>
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<tr>
<td>Science (Secondary Grades 7-12)</td>
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<tr>
<td>Biology (Grades 6-12)</td>
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<tr>
<td>Chemistry (Grades 6-12)</td>
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</table>
### Course Standards

<table>
<thead>
<tr>
<th>Name</th>
<th>Description</th>
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<tbody>
<tr>
<td>SC.912.E.5.9</td>
<td>Analyze the broad effects of space exploration on the economy and culture of Florida.</td>
</tr>
<tr>
<td>SC.912.E.6.4</td>
<td>Analyze how specific geologic processes and features are expressed in Florida and elsewhere.</td>
</tr>
<tr>
<td>SC.912.E.7.6</td>
<td>Relate the formation of severe weather to the various physical factors.</td>
</tr>
<tr>
<td>SC.912.E.7.8</td>
<td>Explain how various atmospheric, oceanic, and hydrologic conditions in Florida have influenced and can influence human behavior, both individually and collectively.</td>
</tr>
<tr>
<td>SC.912.E.7.9</td>
<td>Cite evidence that the ocean has had a significant influence on climate change by absorbing, storing, and moving heat, carbon, and water.</td>
</tr>
<tr>
<td>SC.912.L.15.1</td>
<td>Explain how the scientific theory of evolution is supported by the fossil record, comparative anatomy, comparative embryology, biogeography, molecular biology, and observed evolutionary change.</td>
</tr>
<tr>
<td>SC.912.L.15.6</td>
<td>Discuss distinguishing characteristics of the domains and kingdoms of living organisms.</td>
</tr>
<tr>
<td>SC.912.L.15.10</td>
<td>Identify basic trends in hominid evolution from early ancestors six million years ago to modern humans, including brain size, jaw size, language, and manufacture of tools.</td>
</tr>
<tr>
<td>SC.912.L.15.13</td>
<td>Describe the conditions required for natural selection, including: overproduction of offspring, inherited variation, and the struggle to survive, which result in differential reproductive success.</td>
</tr>
<tr>
<td>SC.912.L.15.14</td>
<td>Discuss mechanisms of evolutionary change other than natural selection such as genetic drift and gene flow.</td>
</tr>
<tr>
<td>SC.912.L.15.15</td>
<td>Describe how mutation and genetic recombination increase genetic variation.</td>
</tr>
<tr>
<td>SC.912.L.16.4</td>
<td>Explain how modifications in the DNA sequence may or may not result in phenotypic change. Explain how mutations in gametes may result in phenotypic changes in offspring.</td>
</tr>
<tr>
<td>SC.912.L.16.8</td>
<td>Explain the relationship between mutation, cell cycle, and uncontrolled cell growth potentially resulting in cancer.</td>
</tr>
<tr>
<td>SC.912.L.16.10</td>
<td>Evaluate the impact of biotechnology on the individual, society and the environment, including medical and ethical issues.</td>
</tr>
<tr>
<td>SC.912.L.16.13</td>
<td>Describe the basic anatomy and physiology of the human reproductive system. Describe the process of human development from fertilization to birth and major changes that occur in each trimester of pregnancy.</td>
</tr>
<tr>
<td>SC.912.L.17.5</td>
<td>Analyze how population size is determined by births, deaths, immigration, emigration, and limiting factors (biotic and abiotic) that determine carrying capacity.</td>
</tr>
<tr>
<td>SC.912.L.17.6</td>
<td>Compare and contrast the relationships among organisms, including predation, parasitism, competition, commensalism, and mutualism.</td>
</tr>
<tr>
<td>SC.912.L.17.8</td>
<td>Recognize the consequences of the losses of biodiversity due to catastrophic events, climate changes, human activity, and the introduction of invasive, non-native species.</td>
</tr>
<tr>
<td>SC.912.L.17.11</td>
<td>Evaluate the costs and benefits of renewable and non-renewable resources, such as water, energy, fossil fuels, wildlife, and forests.</td>
</tr>
<tr>
<td>SC.912.L.17.13</td>
<td>Discuss the need for adequate monitoring of environmental parameters when making policy decisions.</td>
</tr>
<tr>
<td>SC.912.L.17.20</td>
<td>Predict the impact of individuals on environmental systems and examine how human lifestyles affect sustainability.</td>
</tr>
<tr>
<td>SC.912.L.18.10</td>
<td>Connect the role of adenosine triphosphate (ATP) to energy transfers within a cell.</td>
</tr>
<tr>
<td>SC.912.L.18.11</td>
<td>Explain the role of enzymes as catalysts that lower the activation energy of biochemical reactions. Identify factors, such as pH and temperature, and their effect on enzyme activity.</td>
</tr>
<tr>
<td>SC.912.L.18.12</td>
<td>Discuss the special properties of water that contribute to Earth’s suitability as an environment for life: cohesive behavior, ability to moderate temperature, expansion upon freezing, and versatility as a solvent.</td>
</tr>
<tr>
<td>SC.912.L.18.1</td>
<td>Define a problem based on a specific body of knowledge, for example: biology, chemistry, physics, and earth/space science, and do the following: 1. Pose questions about the natural world, (Articulate the purpose of the investigation and identify the relevant scientific concepts). 2. Conduct systematic observations, (Write procedures that are clear and replicable. Identify observables and examine relationships between test (independent) variable and outcome (dependent) variable. Employ appropriate methods for accurate and consistent observations; conduct and record measurements at appropriate levels of precision. Follow safety guidelines). 3. Examine books and other sources of information to see what is already known, 4. Review what is known in light of empirical evidence, (Examine whether available empirical evidence can be interpreted in terms of existing knowledge and models, and if not, modify or develop new models). 5. Plan investigations, (Design and evaluate a scientific investigation). 6. Use tools to gather, analyze, and interpret data (this includes the use of measurement in metric and other systems, and also the generation and interpretation of graphical representations of data, including data tables and graphs). (Collect data or evidence in an organized way. Properly use instruments, equipment, and materials (e.g., scales, probeware, meter sticks, microscopes, computers) including set-up, calibration, technique, maintenance, and storage). 7. Pose answers, explanations, or descriptions of events, 8. Generate explanations that explicate or describe natural phenomena (inferences), 9. Use appropriate evidence and reasoning to justify these explanations to others, 10. Communicate results of scientific investigations, and 11. Evaluate the merits of the explanations produced by others.</td>
</tr>
<tr>
<td>SC.912.N.1.1</td>
<td>Describe and explain what characterizes science and its methods.</td>
</tr>
<tr>
<td>SC.912.N.1.2</td>
<td>Recognize that the strength or usefulness of a scientific claim is evaluated through scientific argumentation, which depends on critical and logical thinking, and the active consideration of alternative scientific explanations to explain the data presented.</td>
</tr>
<tr>
<td>SC.912.N.1.5</td>
<td>Describe and provide examples of how similar investigations conducted in many parts of the world result in the same outcome.</td>
</tr>
<tr>
<td>SC.912.N.1.6</td>
<td>Describe how scientific inferences are drawn from scientific observations and provide examples from the content being studied.</td>
</tr>
<tr>
<td>SC.912.N.1.7</td>
<td>Recognize the role of creativity in constructing scientific questions, methods and explanations.</td>
</tr>
<tr>
<td>SC.912.N.2.1</td>
<td>Identify what is science, what clearly is not science, and what superficially resembles science (but fails to meet the criteria for science).</td>
</tr>
</tbody>
</table>
SC.912.N.2.2: Identify which questions can be answered through science and which questions are outside the boundaries of scientific investigation, such as questions addressed by other ways of knowing, such as art, philosophy, and religion.

SC.912.N.2.4: Explain that scientific knowledge is both durable and robust and open to change. Scientific knowledge can change because it is often examined and re-examined by new investigations and scientific argumentation. Because of these frequent examinations, scientific knowledge becomes stronger, leading to its durability.

SC.912.N.2.5: Describe instances in which scientists' varied backgrounds, talents, interests, and goals influence the inferences and thus the explanations that they make about observations of natural phenomena and describe that competing interpretations (explanations) of scientists are a strength of science as they are a source of new, testable ideas that have the potential to add new evidence to support one or another of the explanations.

SC.912.N.3.1: Explain that a scientific theory is the culmination of many scientific investigations drawing together all the current evidence concerning a substantial range of phenomena; thus, a scientific theory represents the most powerful explanation scientists have to offer.

SC.912.N.3.2: Describe the role consensus plays in the historical development of a theory in any one of the disciplines of science.

SC.912.N.4.1: Explain how scientific knowledge and reasoning provide an empirically-based perspective to inform society's decision making.

SC.912.N.4.2: Weigh the merits of alternative strategies for solving a specific societal problem by comparing a number of different costs and benefits, such as human, economic, and environmental.

SC.912.P.8.10: Explore the Law of Conservation of Energy by differentiating among open, closed, and isolated systems and explain that the total energy in an isolated system is a conserved quantity.

SC.912.P.10.3: Compare and contrast work and power qualitatively and quantitatively.

SC.912.P.10.6: Create and interpret potential energy diagrams, for example: chemical reactions, orbits around a central body, motion of a pendulum.

SC.912.P.10.9: Describe the quantization of energy at the atomic level.

SC.912.P.10.11: Explain and compare nuclear reactions (radioactive decay, fission and fusion), the energy changes associated with them and their associated safety issues.

SC.912.P.10.16: Explain the relationship between moving charges and magnetic fields, as well as changing magnetic fields and electric fields, and their application to modern technologies.

SC.912.P.10.18: Explore the theory of electromagnetism by comparing and contrasting the different parts of the electromagnetic spectrum in terms of wavelength, frequency, and energy, and relate them to phenomena and applications.

SC.912.P.10.21: Qualitatively describe the shift in frequency in sound or electromagnetic waves due to the relative motion of a source or a receiver.

SC.912.P.10.22: Construct ray diagrams and use thin lens and mirror equations to locate the images formed by lenses and mirrors.

SC.912.P.12.5: Apply the law of conservation of linear momentum to interactions, such as collisions between objects.

SC.912.P.12.6: Qualitatively apply the concept of angular momentum.

SC.912.P.12.7: Recognize that nothing travels faster than the speed of light in vacuum which is the same for all observers no matter how they or the light source are moving.

SC.912.P.12.9: Recognize that time, length, and energy depend on the frame of reference.

SC.912.P.12.10: Interpret the behavior of ideal gases in terms of kinetic molecular theory.

SC.912.P.12.11: Describe phase transitions in terms of kinetic molecular theory.

SC.912.P.12.12: Explain how various factors, such as concentration, temperature, and presence of a catalyst affect the rate of a chemical reaction.

SC.912.P.12.13: Explain the concept of dynamic equilibrium in terms of reversible processes occurring at the same rates.

Mathematicians who participate in effortful learning both individually and with others:
- Analyze the problem in a way that makes sense given the task.
- Ask questions that will help with solving the task.
- Build perseverance by modifying methods as needed while solving a challenging task.
- Stay engaged and maintain a positive mindset when working to solve tasks.
- Help and support each other when attempting a new method or approach.

MA.K12.MTR.1.1:
Clarifications:
Teachers who encourage students to participate actively in effortful learning both individually and with others:
- Cultivate a community of growth mindset learners.
- Foster perseverance in students by choosing tasks that are challenging.
- Develop students' ability to analyze and problem solve.
- Recognize students' effort when solving challenging problems.

Mathematicians who demonstrate understanding by representing problems in multiple ways:
- Build understanding through modeling and using manipulatives.
- Represent solutions to problems in multiple ways using objects, drawings, tables, graphs and equations.
- Progress from modeling problems with objects and drawings to using algorithms and equations.
- Express connections between concepts and representations.
- Choose a representation based on the given context or purpose.

MA.K12.MTR.2.1:
Clarifications:
Teachers who encourage students to demonstrate understanding by representing problems in multiple ways:
- Help students make connections between concepts and representations.
- Provide opportunities for students to use manipulatives when investigating concepts.
- Guide students from concrete to pictorial to abstract representations as understanding progresses.
- Show students that various representations can have different purposes and can be useful in different situations.

Complete tasks with mathematical fluency:
Mathematicians who complete tasks with mathematical fluency:
- Select efficient and appropriate methods for solving problems within the given context.
- Maintain flexibility and accuracy while performing procedures and mental calculations.
- Complete tasks accurately and with confidence.
- Adapt procedures to apply them to a new context.
- Use feedback to improve efficiency when performing calculations.
Teachers who encourage students to complete tasks with mathematical fluency:
- Provide students with the flexibility to solve problems by selecting a procedure that allows them to solve efficiently and accurately.
- Offer multiple opportunities for students to practice efficient and generalizable methods.
- Provide opportunities for students to reflect on the method they used and determine if a more efficient method could have been used.

Engage in discussions that reflect on the mathematical thinking of self and others.
Mathematicians who engage in discussions that reflect on the mathematical thinking of self and others:
- Communicate mathematical ideas, vocabulary and methods effectively.
- Analyze the mathematical thinking of others.
- Compare the efficiency of a method to those expressed by others.
- Recognize errors and suggest how to correctly solve the task.
- Justify results by explaining methods and processes.
- Construct possible arguments based on evidence.

Clarifications:
- Teachers who encourage students to engage in discussions that reflect on the mathematical thinking of self and others:
  - Establish a culture in which students ask questions of the teacher and their peers, and error is an opportunity for learning.
  - Create opportunities for students to discuss their thinking with peers.
  - Select, sequence and present work to advance and deepen understanding of correct and increasingly efficient methods.
  - Develop students' ability to justify methods and compare their responses to the responses of their peers.

Use patterns and structure to help understand and connect mathematical concepts.
Mathematicians who use patterns and structure to help understand and connect mathematical concepts:
- Focus on relevant details within a problem.
- Create plans and procedures to logically order events, steps or ideas to solve problems.
- Decompose a complex problem into manageable parts.
- Relate previously learned concepts to new concepts.
- Look for similarities among problems.
- Connect solutions of problems to more complicated large-scale situations.

Clarifications:
- Teachers who encourage students to use patterns and structure to help understand and connect mathematical concepts:
  - Help students recognize the patterns in the world around them and connect these patterns to mathematical concepts.
  - Support students to develop generalizations based on the similarities found among problems.
  - Provide opportunities for students to create plans and procedures to solve problems.
  - Develop students' ability to construct relationships between their current understanding and more sophisticated ways of thinking.

Assess the reasonableness of solutions.
Mathematicians who assess the reasonableness of solutions:
- Estimate to discover possible solutions.
- Use benchmark quantities to determine if a solution makes sense.
- Check calculations when solving problems.
- Verify possible solutions by explaining the methods used.
- Evaluate results based on the given context.

Clarifications:
- Teachers who encourage students to assess the reasonableness of solutions:
  - Have students estimate or predict solutions prior to solving.
  - Prompt students to continually ask, "Does this solution make sense? How do you know?"
  - Reinforce that students check their work as they progress within and after a task.
  - Strengthen students' ability to verify solutions through justifications.

Apply mathematics to real-world contexts.
Mathematicians who apply mathematics to real-world contexts:
- Connect mathematical concepts to everyday experiences.
- Use models and methods to understand, represent and solve problems.
- Perform investigations to gather data or determine if a method is appropriate. • Redesign models and methods to improve accuracy or efficiency.

Clarifications:
- Teachers who encourage students to apply mathematics to real-world contexts:
  - Provide opportunities for students to create models, both concrete and abstract, and perform investigations.
  - Challenge students to question the accuracy of their models and methods.
  - Support students as they validate conclusions by comparing them to the given situation.
  - Indicate how various concepts can be applied to other disciplines.

Cite evidence to explain and justify reasoning.

Clarifications:
- K-1 Students include textual evidence in their oral communication with guidance and support from adults. The evidence can consist of details from the text without naming the text. During 1st grade, students learn how to incorporate the evidence in their writing.
- 2-3 Students include relevant textual evidence in their written and oral communication. Students should name the text when they refer to it. In 3rd grade, students should use a combination of direct and indirect citations.
- 4-5 Students continue with previous skills and reference comments made by speakers and peers. Students cite texts that they've directly quoted, paraphrased, or used for information. When writing, students will use the form of citation dictated by the instructor or the style guide.
referenced by the instructor. 
6-8 Students continue with previous skills and use a style guide to create a proper citation. 
9-12 Students continue with previous skills and should be aware of existing style guides and the ways in which they differ.

<table>
<thead>
<tr>
<th>ELA.K12.EE.2.1:</th>
<th>Use appropriate collaborative techniques and active listening skills when engaging in discussions in a variety of situations.</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Clarifications:</strong></td>
<td>In kindergarten, students learn to listen to one another respectfully. In grades 1-2, students build upon these skills by justifying what they are thinking. For example: “I think _____ because ______.” The collaborative conversations are becoming academic conversations. In grades 3-12, students engage in academic conversations discussing claims and justifying their reasoning, refining and applying skills. Students build on ideas, propel the conversation, and support claims and counterclaims with evidence.</td>
</tr>
<tr>
<td>ELA.K12.EE.3.1:</td>
<td>Make inferences to support comprehension.</td>
</tr>
<tr>
<td><strong>Clarifications:</strong></td>
<td>Students will make inferences before the words infer or inference are introduced. Kindergarten students will answer questions like “Why is the girl smiling?” or make predictions about what will happen based on the title page. Students will use the terms and apply them in 2nd grade and beyond.</td>
</tr>
<tr>
<td>ELA.K12.EE.4.1:</td>
<td>Use the accepted rules governing a specific format to create quality work.</td>
</tr>
<tr>
<td><strong>Clarifications:</strong></td>
<td>Students will incorporate skills learned into work products to produce quality work. For students to incorporate these skills appropriately, they must receive instruction. A 3rd grade student creating a poster board display must have instruction in how to effectively present information to do quality work.</td>
</tr>
<tr>
<td>ELA.K12.EE.5.1:</td>
<td>Use appropriate voice and tone when speaking or writing.</td>
</tr>
<tr>
<td><strong>Clarifications:</strong></td>
<td>In kindergarten and 1st grade, students learn the difference between formal and informal language. For example, the way we talk to our friends differs from the way we speak to adults. In 2nd grade and beyond, students practice appropriate social and academic language to discuss texts.</td>
</tr>
<tr>
<td>ELA.K12.EE.6.1:</td>
<td>Plan and carry out investigations.</td>
</tr>
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<td>ELD.K12.ELL.SI.1:</td>
<td>Read and comprehend grade-level complex texts proficiently.</td>
</tr>
<tr>
<td><strong>Clarifications:</strong></td>
<td>See Text Complexity for grade-level complexity bands and a text complexity rubric.</td>
</tr>
<tr>
<td>ELD.K12.ELL.SC.1:</td>
<td>English language learners communicate information, ideas and concepts necessary for academic success in the content area of Science.</td>
</tr>
<tr>
<td>ELD.K12.ELL.SI.1:</td>
<td>English language learners communicate for social and instructional purposes within the school setting.</td>
</tr>
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</table>

**GENERAL NOTES**

Laboratory investigations that include the use of scientific inquiry, research, measurement, problem solving, laboratory apparatus and technologies, experimental procedures, and safety procedures are an integral part of this course. The National Science Teachers Association (NSTA) recommends that at the high school level, all students should be in the science lab or field, collecting data every week. School laboratory investigations (labs) are defined by the National Research Council (NRC) as an experience in the laboratory, classroom, or the field that provides students with opportunities to interact directly with natural phenomena or with data collected by others using tools, materials, data collection techniques, and models (NRC, 2006, p. 3). Laboratory investigations in the high school classroom should help all students develop a growing understanding of the complexity and ambiguity of empirical work, as well as the skills to calibrate and troubleshoot equipment used to make observations. Learners should understand measurement error; and have the skills to aggregate, interpret, and present the resulting data (National Research Council, 2006, p. 77; NSTA, 2007).

**Special Notes:**

**Instructional Practices**

Teaching from a range of complex text is optimized when teachers in all subject areas implement the following strategies on a routine basis:

1. Ensuring wide reading from complex text that varies in length.
2. Making close reading and rereading of texts central to lessons.
3. Emphasizing text-specific complex questions, and cognitively complex tasks, reinforce focus on the text and cultivate independence.
4. Emphasizing students supporting answers based upon evidence from the text.
5. Providing extensive research and writing opportunities (claims and evidence).

**Science and Engineering Practices (NRC Framework for K-12 Science Education, 2010)**

- Asking questions (for science) and defining problems (for engineering).
- Developing and using models.
- Planning and carrying out investigations.
- Analyzing and interpreting data.
- Using mathematics, information and computer technology, and computational thinking.
- Constructing explanations (for science) and designing solutions (for engineering).
- Engaging in argument from evidence.
- Obtaining, evaluating, and communicating information.

**Florida's Benchmarks for Excellent Student Thinking (B.E.S.T.) Standards**

This course includes Florida's B.E.S.T. ELA Expectations (EE) and Mathematical Thinking and Reasoning Standards (MTRs) for students. Florida educators should intentionally embed these standards within the content and their instruction as applicable. For guidance on the implementation of the EEs and MTRs, please visit...
English Language Development ELD Standards Special Notes Section:
Teachers are required to provide listening, speaking, reading and writing instruction that allows English language learners (ELL) to communicate information, ideas and concepts for academic success in the content area of Science. For the given level of English language proficiency and with visual, graphic, or interactive support, students will interact with grade level words, expressions, sentences and discourse to process or produce language necessary for academic success. The ELD standard should specify a relevant content area concept or topic of study chosen by curriculum developers and teachers which maximizes an ELL's need for communication and social skills. To access an ELL supporting document which delineates performance definitions and descriptors, please click on the following link:
https://cpalmsmediaprod.blob.core.windows.net/uploads/docs/standards/eld/sc.pdf

### GENERAL INFORMATION

**Course Number:** 2002440  
**Course Path:** Section: Grades PreK to 12 Education  
Courses > Grade Group: Grades 9 to 12 and Adult Education Courses > Subject: Science > SubSubject: Integrated Sciences  
**Abbreviated Title:** INTEG SCI 3  
**Course Length:** Year (Y)  
**Course Attributes:**  
- Class Size Core Required  
**Course Level:** 2  
**Number of Credits:** One (1) credit  
**Course Type:** Core Academic Course  
**Course Status:** State Board Approved  
**Grade Level(s):** 9,10,11,12  
**Graduation Requirement:** Equally Rigorous Science

### Educator Certifications

<table>
<thead>
<tr>
<th>Certification</th>
<th>Grades</th>
</tr>
</thead>
<tbody>
<tr>
<td>Earth/Space Science</td>
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</tr>
<tr>
<td>Physics</td>
<td>6-12</td>
</tr>
<tr>
<td>Science</td>
<td>Secondary 7-12</td>
</tr>
<tr>
<td>Biology</td>
<td>6-12</td>
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<tr>
<td>Chemistry</td>
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</table>
Identify sources of information and assess their reliability according to the strict standards of scientific investigation.

Explore the Law of Conservation of Energy by differentiating among open, closed, and isolated systems.

Synthesize information from a range of sources (e.g., texts, experiments, simulations) into a coherent understanding of a process, phenomenon, or concept, resolving conflicting information when possible.

Explain the concept of dynamic equilibrium in terms of reversible processes occurring at the same rates.

Cite specific textual evidence to support analysis of science and technological phenomena.

Describe how scientific inferences are drawn from scientific observations and provide examples from the content being studied.

Describe phase transitions in terms of kinetic molecular theory.

Explore the theory of electromagnetism by comparing and contrasting the different parts of the electromagnetic spectrum.

Recognize that time, length, and energy depend on the frame of reference.

Apply the law of conservation of linear momentum to interactions, such as collisions between objects.

Qualitatively describe the shift in frequency in sound or electromagnetic waves due to the relative motion of a source or a receiver.

Compare and contrast work and power qualitatively and quantitatively.

Interpret the behavior of ideal gases in terms of kinetic molecular theory.

Describe oxidation-reduction reactions in living and non-living systems.

Recognize that nothing travels faster than the speed of light in a vacuum.

Analyze the author's purpose in providing an explanation, describing a phenomenon, or explaining an event.

Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 11–12 texts and topics.

Identify which questions can be answered through science and which questions are outside the boundaries of scientific investigation, such as questions addressed by other ways of knowing, such as art, philosophy, and religion.

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Pose answers, explanations, or descriptions of events, set-up, calibration, technique, maintenance, and storage).

Generate explanations that explicate or describe natural phenomena (inferences).

Explain and compare nuclear reactions (radioactive decay, fission and fusion) to describe new, testable ideas that have the potential to add new evidence to support one or another of the explanations.

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Explore the theory of electromagnetism by comparing and contrasting the different parts of the electromagnetic spectrum.
c. Propose conversations by posing and responding to questions that probe reasoning and evidence; hear a full range of positions on a topic or issue; clarify, verify, or challenge ideas and conclusions; and promote divergent and creative perspectives.
d. Respond thoughtfully to diverse perspectives; synthesize comments, claims, and evidence made on all sides of an issue; resolve contradictions when possible; and determine what additional information or research is required to deepen the investigation or complete the task.

LAFS.1112.SL.1.2: Integrate multiple sources of information presented in diverse formats and media (e.g., visually, quantitatively, orally) in order to make informed decisions and solve problems, evaluating the credibility and accuracy of each source and noting any discrepancies among the data.

LAFS.1112.SL.1.3: Evaluate a speaker’s point of view, reasoning, and use of evidence and rhetoric, assessing the stance, premises, links among ideas, word choice, points of emphasis, and tone used.

LAFS.1112.SL.2.4: Present information, findings, and supporting evidence, conveying a clear and distinct perspective, such that listeners can follow the line of reasoning, alternative or opposing perspectives are addressed, and the organization, development, substance, and style are appropriate to purpose, audience, and a range of formal and informal tasks.

LAFS.1112.SL.2.5: Make strategic use of digital media (e.g., textual, graphical, audio, visual, and interactive elements) in presentations to enhance understanding of findings, reasoning, and evidence and to add interest.

Write arguments focused on discipline-specific content.

a. Introduce precise, knowledgeable claim(s), establish the significance of the claim(s), distinguish the claim(s) from alternate or opposing claims, and create an organization that logically sequences the claim(s), counterclaims, reasons, and evidence.
b. Develop claim(s) and counterclaims fairly and thoroughly, supplying the most relevant data and evidence for each while point out the strengths and limitations of both claim(s) and counterclaims in a discipline-appropriate form that anticipates the audience’s knowledge level, concerns, values, and possible biases.
c. Use words, phrases, and clauses as well as varied syntax to link the major sections of the text, create cohesion, and clarify the relationships between claim(s) and reasons, between reasons and evidence, and between claim(s) and counterclaims.
d. Establish and maintain a formal style and objective tone while attending to the norms and conventions of the discipline in which they are writing.
e. Provide a concluding statement or section that follows from or supports the argument presented.

Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes.

a. Introduce a topic and organize complex ideas, concepts, and information so that each new element builds on that which precedes it to create a unified whole; include formatting (e.g., headings), graphics (e.g., figures, tables), and multimedia when useful to aiding comprehension.
b. Develop the topic thoroughly by selecting the most significant and relevant facts, extended definitions, concrete details, quotations, or other information and examples appropriate to the audience’s knowledge of the topic.
c. Use varied transitions and sentence structures to link major sections of the text, create cohesion, and clarify the relationships among complex ideas and concepts.
d. Use precise language, domain-specific vocabulary and techniques such as metaphor, simile, and analogy to manage the complexity of the topic; convey a knowledgeable stance in a style that responds to the discipline and context as well as to the expertise of likely readers.
e. Provide a concluding statement or section that follows from and supports the information or explanation provided (e.g., articulating implications or the significance of the topic).

LAFS.1112.WHST.1.2: Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.

LAFS.1112.WHST.2.4: Develop clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.

LAFS.1112.WHST.2.5: Use technology, including the Internet, to produce, publish, and update individual or shared writing products in response to ongoing feedback, including new arguments or information.

LAFS.1112.WHST.2.6: Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation.

LAFS.1112.WHST.3.7: Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the strengths and limitations of each source in terms of the specific task, purpose, and audience; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and overreliance on any one source and following a standard format for citation.

LAFS.1112.WHST.3.8: Draw evidence from informational texts to support analysis, reflection, and research.

LAFS.1112.WHST.4.10: Write routinely over extended time frames (time for reflection and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences.

MAFS.912.F-IF.2.4: For a function that models a relationship between two quantities, interpret key features of graphs and tables in terms of the quantities, and sketch graphs showing key features given a verbal description of the relationship. Key features include: intercepts; intervals where the function is increasing, decreasing, positive, or negative; relative maximums and minimums; symmetries; end behavior; and periodicity.

Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases.

a. Graph linear and quadratic functions and show intercepts, maxima, and minima.
b. Graph square root, cube root, and piecewise-defined functions, including step functions and absolute value functions.
c. Graph polynomial functions, identifying zeros when suitable factorizations are available, and showing end behavior.
d. Graph rational functions, identifying zeros and asymptotes when suitable factorizations are available, and showing end behavior.
e. Graph exponential and logarithmic functions, showing intercepts and end behavior, and trigonometric functions, showing period, midline, and amplitude, and using phase shift.

MAFS.912.G-MG.1.2: Apply concepts of density based on area and volume in modeling situations (e.g., persons per square mile, BTUs per cubic foot).

MAFS.912.N-Q.1.1: Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays.

MAFS.912.N-Q.1.3: Choose a level of accuracy appropriate to limitations on measurement when reporting quantities.

MAFS.912.N-VM.1.3: Solve problems involving velocity and other quantities that can be represented by vectors.

MAFS.912.S-IC.2.6: Evaluate reports based on data.

Represent data with plots on the real number line (dot plots, histograms, and box plots).

Clariﬁcations:
In grades 6 – 8, students describe center and spread in a data distribution. Here they choose a summary statistic appropriate to the characteristics of the data distribution, such as the shape of the distribution, or the existence of extreme data points.
### MAFS.912.S-ID.1.2:
Use statistics appropriate to the shape of the data distribution to compare center (median, mean) and spread (interquartile range, standard deviation) of two or more different data sets. ★

**Clarifications:**
In grades 6 – 8, students describe center and spread in a data distribution. Here they choose a summary statistic appropriate to the characteristics of the data distribution, such as the shape of the distribution or the existence of extreme data points.

### MAFS.912.S-ID.1.3:
Interpret differences in shape, center, and spread in the context of the data sets, accounting for possible effects of extreme data points (outliers). ★

**Clarifications:**
In grades 6 – 8, students describe center and spread in a data distribution. Here they choose a summary statistic appropriate to the characteristics of the data distribution, such as the shape of the distribution or the existence of extreme data points.

### MAFS.912.S-ID.1.4:
Use the mean and standard deviation of a data set to fit it to a normal distribution and to estimate population percentages. Recognize that there are data sets for which such a procedure is not appropriate. Use calculators, spreadsheets, and tables to estimate areas under the normal curve. ★

### MAFS.912.S-ID.2.5:
Summarize categorical data for two categories in two-way frequency tables. Interpret relative frequencies in the context of the data (including joint, marginal, and conditional relative frequencies). Recognize possible associations and trends in the data. ★

**Clarifications:**
Represent data on two quantitative variables on a scatter plot, and describe how the variables are related. ★

a. Fit a function to the data; use functions fitted to data to solve problems in the context of the data. Use given functions or choose a function suggested by the context. Emphasize linear, and exponential models.

b. Informally assess the fit of a function by plotting and analyzing residuals.

c. Fit a linear function for a scatter plot that suggests a linear association.

### MAFS.912.S-ID.2.6:
Make sense of problems and persevere in solving them.

Mathematically proficient students start by explaining to themselves the meaning of a problem and looking for entry points to its solution. They analyze givers, constraints, relationships, and goals. They make conjectures about the form and meaning of the solution and plan a solution pathway rather than simply jumping into a solution attempt. They consider analogous problems, and try special cases and simpler forms of the original problem in order to gain insight into its solution. They monitor and evaluate their progress and change course if necessary. Older students might, depending on the context of the problem, transform algebraic expressions or change the viewing window on their graphing calculator to get the information they need. Mathematically proficient students can explain correspondences between equations, verbal descriptions, tables, and graphs or draw diagrams of important features and relationships, graph data, and search for regularity or trends. Younger students might rely on using concrete objects or pictures to help conceptualize and solve a problem. Mathematically proficient students check their answers to problems using a different method, and they continually ask themselves, “Does this make sense?” They can understand the approaches of others to solving complex problems and identify correspondences between different approaches.

**Standard Relation to Course: Supporting**

### MAFS.K12.MP.1.1:
Reason abstractly and quantitatively.

Mathematically proficient students make sense of quantities and their relationships in problem situations. They bring two complementary abilities to bear on problems involving quantitative relationships: the ability to decontextualize—to abstract a given situation and represent it symbolically and manipulate the representations such as they have a life of their own, without necessarily attending to their referents—and the ability to contextualize, to pause as needed during the manipulation process in order to probe into the referents for the symbols involved. Quantitative reasoning entails habits of creating a coherent representation of the problem at hand; considering the units involved; attending to the meaning of quantities, not just how to compute them; and knowing and flexibly using different properties of operations and objects.

**Standard Relation to Course: Supporting**

### MAFS.K12.MP.2.1:
Construct viable arguments and critique the reasoning of others.

Mathematically proficient students understand and use stated assumptions, definitions, and previously established results in constructing arguments. They make conjectures and build a logical progression of statements to explore the truth of their conjectures. They are able to analyze situations by breaking them into cases, and can recognize and use counterexamples. They justify their conclusions, communicate them to others, and respond to the arguments of others. They reason inductively about data, making plausible arguments that take into account the context from which the data arose. Mathematically proficient students are also able to compare the effectiveness of two plausible arguments, distinguish correct logic or reasoning from that which is flawed, and—if there is a flaw in an argument—explain what it is. Elementary students can construct arguments using concrete referents such as objects, drawings, diagrams, and actions. Such arguments can make sense and be correct, even though they are not generalized or made formal until later grades. Later, students learn to determine domains to which an argument applies. Students at all grades can listen or read arguments of others, decide whether they make sense, and ask useful questions to clarify or improve the arguments.

**Standard Relation to Course: Supporting**

### MAFS.K12.MP.3.1:
Model with mathematics.

Mathematically proficient students can apply the mathematics they know to solve problems arising in everyday life, society, and the workplace. In early grades, this might be as simple as writing an addition equation to describe a situation. In middle grades, a student might apply proportional reasoning to plan a school event or analyze a problem in the community. By high school, a student might use geometry to solve a design problem or use a function to describe how one quantity of interest depends on another. Mathematically proficient students who can apply what they know are comfortable making assumptions and approximations to simplify a complicated situation, realizing that these may need revision later. They are able to identify important quantities in a practical situation and map their relationships using such tools as diagrams, two-way tables, graphs, flowcharts and formulas. They can analyze those relationships mathematically to draw conclusions. They routinely interpret their mathematical results in the context of the situation and reflect on whether the results make sense, possibly improving the model if it has not served its purpose.

**Standard Relation to Course: Supporting**

### MAFS.K12.MP.4.1:
Use appropriate tools strategically.

Mathematically proficient students consider the available tools when solving a mathematical problem. These tools might include pencil and paper, concrete models, a ruler, a protractor, a calculator, a spreadsheet, a computer algebra system, a statistical package, or dynamic geometry software.
MAFS.K12.MP.5.1:
Proficient students are sufficiently familiar with tools appropriate for their grade or course to make sound decisions about when each of these tools might be helpful, recognizing both the insight to be gained and their limitations. For example, mathematically proficient high school students analyze graphs of functions and solutions generated using a graphing calculator. They detect possible errors by strategically using estimation and other mathematical knowledge. When making mathematical models, they know that technology can enable them to visualize the results of varying assumptions, explore consequences, and compare predictions with data. Mathematically proficient students at various grade levels are able to identify relevant external mathematical resources, such as digital content located on a website, and use them to pose or solve problems. They are able to use technological tools to explore and deepen their understanding of concepts.

Standard Relation to Course: Supporting

MAFS.K12.MP.6.1:
Attentively to precision.

Mathematically proficient students try to communicate precisely to others. They try to use clear definitions in discussion with others and in their own reasoning. They state the meaning of the symbols they choose, including using the equal sign consistently and appropriately. They are careful about specifying units of measure, and labeling axes to clarify the correspondence with quantities in a problem. They calculate accurately and efficiently, express numerical answers with a degree of precision appropriate for the problem context. In the elementary grades, students give carefully formulated explanations to each other. By the time they reach high school they have learned to examine claims and make explicit use of definitions.

Standard Relation to Course: Supporting

MAFS.K12.MP.7.1:
Look for and make use of structure.

Mathematically proficient students look closely to discern a pattern or structure. Young students, for example, might notice that three and seven more is the same amount as seven and three more, or they may sort a collection of shapes according to how many sides the shapes have. Later, students will see 7 × 8 equals the well remembered 7 × 5 + 7 × 3, in preparation for learning about the distributive property. In the expression 2⁴ × 3⁵, middle school students might abstract the equation (y – 2)(y – 3) = 1. Notice the regularity of the way terms cancel when expanding (x – 1)(x + 1), (x – 1)(x² + x + 1), and (x – 1)(x³ + x² + x + 1) might lead them to the general formula for the sum of a geometric series. As they work to solve a problem, mathematically proficient students maintain oversight of the process, while attending to the details. They continually evaluate the reasonableness of their intermediate results.

Standard Relation to Course: Supporting

MAFS.K12.MP.8.1:
Look for and express regularity in repeated reasoning.

Mathematically proficient students notice if calculations are repeated, and look both for general methods and for shortcuts. Upper elementary students might notice when dividing 25 by 11 that they are repeating the same calculations over and over again, and conclude they have a repeating decimal. By paying attention to the calculation of slope as they repeatedly check whether points are on the line through (1, 2) with slope 3, middle school students might abstract the equation (y – 2) / (x – 1) = 3. Noticing the regularity in the way terms cancel when expanding (x – 1)(x + 1), (x – 1)x² + x + 1), and (x – 1)x³ + x² + x + 1) might lead them to the general formula for the sum of a geometric series. As they work to solve a problem, mathematically proficient students maintain oversight of the process, while attending to the details. They continually evaluate the reasonableness of their intermediate results.

Standard Relation to Course: Supporting

ELD.K12.ELL.SC.1:
English language learners communicate information, ideas and concepts.

ELD.K12.ELL.SI.1:
English language learners communicate for social and instructional purposes within the school setting.

General Course Information and Notes

GENERAL NOTES

While the content focus of this course is consistent with the Integrated Science 3 course, students will explore these concepts in greater depth. In general, the academic pace and rigor will be greatly increased for honors level course work.

Laboratory investigations that include the use of scientific inquiry, research, measurement, problem solving, laboratory apparatus and technologies, experimental procedures, and safety procedures are an integral part of this course. The National Science Teachers Association (NSTA) recommends that at the high school level, all students should be in the science lab or field, collecting data every week. School laboratory investigations (labs) are defined by the National Research Council (NRC) as an experience in the laboratory, classroom, or the field that provides students with opportunities to interact directly with natural phenomena or with data collected by others using tools, materials, data collection techniques, and models (NRC, 2006, p. 3). Laboratory investigations in the high school classroom should help all students develop a growing understanding of the complexity and ambiguity of empirical work, as well as the skills to calibrate and troubleshoot equipment used to make observations. Learners should understand measurement error; and have the skills to aggregate, interpret, and present the resulting data (National Research Council, 2006, p.77; NSTA, 2007).

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Teaching from a range of complex text is optimized when teachers in all subject areas implement the following strategies on a routine basis:

1. Ensuring wide reading from complex text that varies in length.
2. Making close reading and rereading of texts central to lessons.
3. Emphasizing text-specific complex questions, and cognitively complex tasks, reinforce focus on the text and cultivate independence.
4. Emphasizing students supporting answers based upon evidence from the text.
5. Providing extensive research and writing opportunities (claims and evidence).


- Asking questions (for science) and defining problems (for engineering).
- Developing and using models.
- Planning and carrying out investigations.
- Analyzing and interpreting data.
- Using mathematics, information and computer technology, and computational thinking.
Constructing explanations (for science) and designing solutions (for engineering).

Engaging in argument from evidence.

Obtaining, evaluating, and communicating information.

**Honors and Advanced Level Course Note:** Advanced courses require a greater demand on students through increased academic rigor. Academic rigor is obtained through the application, analysis, evaluation, and creation of complex ideas that are often abstract and multi-faceted. Students are challenged to think and collaborate critically on the content they are learning. Honors level rigor will be achieved by increasing text complexity through text selection, focus on high-level qualitative measures, and complexity of task. Instruction will be structured to give students a deeper understanding of conceptual themes and organization within and across disciplines. Academic rigor is more than simply assigning to students a greater quantity of work.

**Literacy Standards in Science**
Secondary science courses include reading standards for literacy in science and technical subjects 6-12 and writing standards for literacy in history/social studies, science, and technical subjects 6-12. The courses also include speaking and listening standards. For a complete list of standards required for this course click on the blue tile labeled course standards. You may also download the complete course including all required standards and notes sections using the export function located at the top of this page.

**English Language Development ELD Standards Special Notes Section:** Teachers are required to provide listening, speaking, reading and writing instruction that allows English language learners (ELL) to communicate information, ideas and concepts for academic success in the content area of Science. For the given level of English language proficiency and with visual, graphic, or interactive support, students will interact with grade level words, expressions, sentences and discourse to process or produce language necessary for academic success. The ELD standard should specify a relevant content area concept or topic of study chosen by curriculum developers and teachers which maximizes an ELL's need for communication and social skills. To access an ELL supporting document which delineates performance definitions and descriptors, please click on the following link: https://cpalmsmediaprod.blob.core.windows.net/uploads/docs/standards/eld/sc.pdf

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**GENERAL INFORMATION**

**Course Number:** 2002450

**Number of Credits:** One (1) credit

**Course Type:** Core Academic Course

**Course Status:** Course Approved

**Graduation Requirement:** Equally Rigorous Science

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**Educator Certifications**

<table>
<thead>
<tr>
<th>Certification</th>
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<tbody>
<tr>
<td>Earth/Space Science (Grades 6-12)</td>
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<tr>
<td>Physics (Grades 6-12)</td>
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<tr>
<td>Science (Secondary Grades 7-12)</td>
</tr>
<tr>
<td>Biology (Grades 6-12)</td>
</tr>
<tr>
<td>Chemistry (Grades 6-12)</td>
</tr>
</tbody>
</table>
Analyze the broad effects of space exploration on the economy and culture of Florida.

Explain how various atmospheric, oceanic, and hydrologic conditions in Florida have influenced and can influence human behavior, both individually and collectively.

Cite evidence that the ocean has had a significant influence on climate change by absorbing, storing, and moving heat, carbon, and water.

Discuss how and why organisms are hierarchically classified and based on evolutionary relationships.

Describe how and why organisms are hierarchically classified and based on evolutionary relationships.

Explain how mutations in the DNA sequence may or may not result in differential reproductive success.

Discuss the special properties of water that contribute to Earth's suitability as an environment for life: cohesive behavior, ability to moderate temperature, expansion upon freezing, and versatility as a solvent.

Identify the consequences of the losses of biodiversity due to catastrophic events, climate changes, human activity, and the introduction of invasive, non-native species.

Predict future weather conditions based on present observations and conceptual models and recognize limitations and uncertainties of such predictions.

Relate the formation of severe weather to the various physical factors.

Review what is known in light of empirical evidence, (Examine whether available empirical evidence can be interpreted in terms of existing knowledge and models, and if not, modify or develop new models).

Cite evidence that the ocean has had a significant influence on climate change by absorbing, storing, and moving heat, carbon, and water.

Describe the role of enzymes as catalysts that lower the activation energy of biochemical reactions. Identify factors, such as pH and temperature, and their effect on enzyme activity.

Discuss the impact of individuals on environmental systems and examine how human lifestyles affect sustainability.

Discuss the special properties of water that contribute to Earth's suitability as an environment for life: cohesive behavior, ability to moderate temperature, expansion upon freezing, and versatility as a solvent.

Discuss the large-scale environmental impacts resulting from human activity, including waste spills, oil spills, runoff, greenhouse gases, ozone depletion, and surface and groundwater pollution.

Discuss the use of molecular clocks to estimate how long ago various groups of organisms diverged evolutionarily from one another.

Discuss the processes by which new species arise. This includes the origin of species from ancestral populations as a result of genetic drift, gene flow, and accumulation of mutations in the DNA sequence.

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Discuss the processes by which new species arise. This includes the origin of species from ancestral populations as a result of genetic drift, gene flow, and accumulation of mutations in the DNA sequence.
Identify sources of information and assess their reliability according to the strict standards of scientific investigation.

Describe and provide examples of how similar investigations conducted in many parts of the world result in the same outcome.

Explain the relationship between moving charges and magnetic fields, as well as changing magnetic fields and electric fields, and their application to different parts of the electromagnetic spectrum in terms of wavelength, frequency, and energy, and relate them to phenomena and applications.

Explore the theory of electromagnetism by comparing and contrasting the different parts of the electromagnetic spectrum in terms of wavelength, frequency, and energy, and relate them to phenomena and applications.

Qualitatively describe the shift in frequency in sound or electromagnetic waves due to the relative motion of a source or a receiver.

Construct ray diagrams and use thin lens and mirror equations to locate the images formed by lenses and mirrors.

Apply the law of conservation of linear momentum to interactions, such as collisions between objects.

Qualitatively apply the concept of angular momentum.

Recognize that nothing travels faster than the speed of light in vacuum which is the same for all observers no matter how they or the light source are moving.

Recognize that time, length, and energy depend on the frame of reference.

Interpret the behavior of ideal gases in terms of kinetic molecular theory.

Describe phase transitions in terms of kinetic molecular theory.

Identify how various factors, such as concentration, temperature, and presence of a catalyst affect the rate of a chemical reaction.

Explore the concept of dynamic equilibrium in terms of reversible processes occurring at the same rates.

Mathematicians who participate in effortful learning both individually and with others:
- Analyze the problem in a way that makes sense given the task.
- Ask questions that will help with solving the task.
- Build perseverance by modifying methods as needed while solving a challenging task.
- Stay engaged and maintain a positive mindset when working to solve tasks.
- Help and support each other when attempting a new method or approach.

**Clarifications:**
Teachers who encourage students to participate actively in effortful learning both individually and with others:
- Cultivate a community of growth mindset learners.
- Foster perseverance in students by choosing tasks that are challenging.
- Develop students' ability to analyze and problem solve.
- Recognize students' effort when solving challenging problems.

Demonstrate understanding by representing problems in multiple ways.

Mathematicians who demonstrate understanding by representing problems in multiple ways:
- Build understanding through modeling and using manipulatives.
- Represent solutions to problems in multiple ways using objects, drawings, tables, graphs and equations.
- Progress from modeling problems with objects and drawings to using algorithms and equations.
- Express connections between concepts and representations.
- Choose a representation based on the given context or purpose.

**Clarifications:**
Teachers who encourage students to demonstrate understanding by representing problems in multiple ways:
- Help students make connections between concepts and representations.
- Provide opportunities for students to use manipulatives when investigating concepts.
- Guide students from concrete to pictorial to abstract representations as understanding progresses.
- Show students that various representations can have different purposes and can be useful in different situations.

### MA.K12.MTR.3.1: Complete tasks with mathematical fluency.

Mathematicians who complete tasks with mathematical fluency:
- Select efficient and appropriate methods for solving problems within the given context.
- Maintain flexibility and accuracy while performing procedures and mental calculations.
- Complete tasks accurately and with confidence.
- Adapt procedures to apply them to a new context.
- Use feedback to improve efficiency when performing calculations.

**Clarifications:**
Teachers who encourage students to complete tasks with mathematical fluency:
- Provide students with the flexibility to solve problems by selecting a procedure that allows them to solve efficiently and accurately.
- Offer multiple opportunities for students to practice efficient and generalizable methods.
- Provide opportunities for students to reflect on the method they used and determine if a more efficient method could have been used.

### MA.K12.MTR.4.1: Engage in discussions that reflect on the mathematical thinking of self and others.

Mathematicians who engage in discussions that reflect on the mathematical thinking of self and others:
- Communicate mathematical ideas, vocabulary and methods effectively.
- Analyze the mathematical thinking of others.
- Compare the efficiency of a method to those expressed by others.
- Recognize errors and suggest how to correctly solve the task.
- Justify results by explaining methods and processes.
- Construct possible arguments based on evidence.

**Clarifications:**
Teachers who encourage students to engage in discussions that reflect on the mathematical thinking of self and others:
- Establish a culture in which students ask questions of the teacher and their peers, and error is an opportunity for learning.
- Create opportunities for students to discuss their thinking with peers.
- Select, sequence and present student work to advance and deepen understanding of correct and increasingly efficient methods.

### MA.K12.MTR.5.1: Use patterns and structure to help understand and connect mathematical concepts.

Mathematicians who use patterns and structure to help understand and connect mathematical concepts:
- Focus on relevant details within a problem.
- Create plans and procedures to logically order events, steps or ideas to solve problems.
- Decompose a complex problem into manageable parts.
- Relate previously learned concepts to new concepts.
- Look for similarities among problems.
- Connect solutions of problems to more complicated large-scale situations.

**Clarifications:**
Teachers who encourage students to use patterns and structure to help understand and connect mathematical concepts:
- Help students recognize the patterns in the world around them and connect these patterns to mathematical concepts.
- Support students to develop generalizations based on the similarities found among problems.
- Provide opportunities for students to create plans and procedures to solve problems.
- Develop students' ability to construct relationships between their current understanding and more sophisticated ways of thinking.

### MA.K12.MTR.6.1: Assess the reasonableness of solutions.

Mathematicians who assess the reasonableness of solutions:
- Estimate to discover possible solutions.
- Use benchmark quantities to determine if a solution makes sense.
- Check calculations when solving problems.
- Verify possible solutions by explaining the methods used.
- Evaluate results based on the given context.

**Clarifications:**
Teachers who encourage students to assess the reasonableness of solutions:
- Have students estimate or predict solutions prior to solving.
- Prompt students to continually ask, “Does this solution make sense? How do you know?”
- Reinforce that students check their work as they progress within and after a task.
- Strengthen students' ability to verify solutions through justifications.

### MA.K12.MTR.7.1: Apply mathematics to real-world contexts.

Mathematicians who apply mathematics to real-world contexts:
- Connect mathematical concepts to everyday experiences.
- Use models and methods to understand, represent and solve problems.
- Perform investigations to gather data or determine if a method is appropriate. • Redesign models and methods to improve accuracy or efficiency.

**Clarifications:**
Teachers who encourage students to apply mathematics to real-world contexts:
- Provide opportunities for students to create models, both concrete and abstract, and perform investigations.
### General Course Information and Notes

**GENERAL NOTES**

While the content focus of this course is consistent with the Integrated Science 3 course, students will explore these concepts in greater depth. In general, the academic pace and rigor will be greatly increased for honors level course work.

Laboratory investigations that include the use of scientific inquiry, research, measurement, problem solving, laboratory apparatus and technologies, experimental procedures, and safety procedures are an integral part of this course. The National Science Teachers Association (NSTA) recommends that at the high school level, all students should be in the science lab or field, collecting data every week. School laboratory investigations (labs) are defined by the National Research Council (NRC) as an experience in the laboratory, classroom, or the field that provides students with opportunities to interact directly with natural phenomena or with data collected by others using tools, materials, data collection techniques, and models (NRC, 2006, p. 3). Laboratory investigations in the high school classroom should help all students develop a growing understanding of the complexity and ambiguity of empirical work, as well as the skills to calibrate and troubleshoot equipment used to make observations. Learners should understand measurement error; and have the skills to aggregate, interpret, and present the resulting data (National Research Council, 2006, p.77; NSTA, 2007).

**Special Notes:**

**Instructional Practices**

Teaching from a range of complex text is optimized when teachers in all subject areas implement the following strategies on a routine basis:

1. Ensuring wide reading from complex text that varies in length.
2. Making close reading and rereading of texts central to lessons.
3. Emphasizing text-specific complex questions, and cognitively complex tasks, reinforce focus on the text and cultivate independence.
4. Emphasizing students supporting answers based upon evidence from the text.
5. Providing extensive research and writing opportunities (claims and evidence).


- Asking questions (for science) and defining problems (for engineering).
- Developing and using models.
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- Using mathematics, information and computer technology, and computational thinking.
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Hons and Advanced Level Course Note: Advanced courses require a greater demand on students through increased academic rigor. Academic rigor is obtained through the application, analysis, evaluation, and creation of complex ideas that are often abstract and multi-faceted. Students are challenged to think and collaborate critically on the content they are learning. Honors level rigor will be achieved by increasing text complexity through text selection, focus on high-level qualitative measures, and complexity of task. Instruction will be structured to give students a deeper understanding of conceptual themes and organization within and across disciplines. Academic rigor is more than simply assigning to students a greater quantity of work.

Florida's Benchmarks for Excellent Student Thinking (B.E.S.T.) Standards
This course includes Florida's B.E.S.T. ELA Expectations (EE) and Mathematical Thinking and Reasoning Standards (MTRs) for students. Florida educators should intentionally embed these standards within the content and their instruction as applicable. For guidance on the implementation of the EEts and MTRs, please visit https://www.cpalms.org/Standards/BEST_Standards.aspx and select the appropriate B.E.S.T. Standards package.

English Language Development ELD Standards Special Notes Section:
Teachers are required to provide listening, speaking, reading and writing instruction that allows English language learners (ELL) to communicate information, ideas and concepts for academic success in the content area of Science. For the given level of English language proficiency and with visual, graphic, or interactive support, students will interact with grade level words, expressions, sentences and discourse to process or produce language necessary for academic success. The ELD standard should specify a relevant content area concept or topic of study chosen by curriculum developers and teachers which maximizes an ELL's need for communication and social skills. To access an ELL supporting document which delineates performance definitions and descriptors, please click on the following link: https://cpalmsmediaprod.blob.core.windows.net/uploads/docs/standards/eld/sc.pdf

**GENERAL INFORMATION**

Course Number: 2002450

Course Path: Section: Grades PreK to 12 Education
Education Courses > Grade Group: Grades 9 to 12 and Adult Education Courses > Subject: Science > SubSubject: Integrated Sciences

Abbreviated Title: INTEG SCI 3 HON

Course Length: Year (Y)

Course Attributes:
- Honors
- Class Size Core Required

Course Level: 3

Graduation Requirement: Equally Rigorous Science

**Educator Certifications**

- Earth/Space Science (Grades 6-12)
- Physics (Grades 6-12)
- Science (Secondary Grades 7-12)
- Biology (Grades 6-12)
- Chemistry (Grades 6-12)
Course Standards

<table>
<thead>
<tr>
<th>Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>SC.912.E.5.8</td>
<td>Connect the concepts of radiation and the electromagnetic spectrum to the use of historical and newly-developed observational tools.</td>
</tr>
<tr>
<td>SC.912.L.14.1</td>
<td>Describe the scientific theory of cells (cell theory) and relate the history of its discovery to the process of science.</td>
</tr>
<tr>
<td>SC.912.L.14.2</td>
<td>Relate structure to function for the components of plant and animal cells. Explain the role of cell membranes as a highly selective barrier (passive and active transport).</td>
</tr>
<tr>
<td>SC.912.L.14.4</td>
<td>Compare and contrast structure and function of various types of microscopes.</td>
</tr>
<tr>
<td>SC.912.L.14.6</td>
<td>Explain the significance of genetic factors, environmental factors, and pathogenic agents to health from the perspectives of both individual and public health.</td>
</tr>
<tr>
<td>SC.912.L.14.11</td>
<td>Classify and state the defining characteristics of epithelial tissue, connective tissue, muscle tissue, and nervous tissue.</td>
</tr>
<tr>
<td>SC.912.L.14.12</td>
<td>Describe the anatomy and histology of bone tissue.</td>
</tr>
<tr>
<td>SC.912.L.14.34</td>
<td>Describe the composition and physiology of blood, including that of the plasma and the formed elements.</td>
</tr>
<tr>
<td>SC.912.L.14.35</td>
<td>Describe the steps in hemostasis, including the mechanism of coagulation. Include the basis for blood typing and transfusion reactions.</td>
</tr>
<tr>
<td>SC.912.L.14.51</td>
<td>Describe the function of the vertebrate integumentary system.</td>
</tr>
<tr>
<td>SC.912.L.15.15</td>
<td>Describe how mutation and genetic recombination increase genetic variation.</td>
</tr>
<tr>
<td>SC.912.L.16.2</td>
<td>Discuss observed inheritance patterns caused by various modes of inheritance, including dominant, recessive, codominant, sex-linked, polygenic, and multiple alleles.</td>
</tr>
<tr>
<td>SC.912.L.16.9</td>
<td>Explain how and why the genetic code is universal and is common to almost all organisms.</td>
</tr>
<tr>
<td>SC.912.L.16.10</td>
<td>Evaluate the impact of biotechnology on the individual, society and the environment, including medical and ethical issues.</td>
</tr>
<tr>
<td>SC.912.L.16.11</td>
<td>Discuss the technologies associated with forensic medicine and DNA identification, including restriction fragment length polymorphism (RFLP) analysis.</td>
</tr>
<tr>
<td>SC.912.L.16.12</td>
<td>Describe how basic DNA technology (restriction digestion by endonucleases, gel electrophoresis, polymerase chain reaction, ligation, and transformation) is used to construct recombinant DNA molecules (DNA cloning).</td>
</tr>
<tr>
<td>SC.912.L.17.1</td>
<td>Discuss the characteristics of populations, such as number of individuals, age structure, density, and pattern of distribution.</td>
</tr>
<tr>
<td>SC.912.L.18.1</td>
<td>Describe the basic molecular structures and primary functions of the four major categories of biological macromolecules.</td>
</tr>
</tbody>
</table>

Define a problem based on a specific body of knowledge, for example: biology, chemistry, physics, and earth/space science, and do the following:

1. Pose questions about the natural world. (Articulate the purpose of the investigation and identify the relevant scientific concepts.)
2. Conduct systematic observations. (Write procedures that are clear and replicable. Identify observables and examine relationships between test (independent) variable and outcome (dependent) variable. Employ appropriate methods for accurate and consistent observations; conduct and record measurements at appropriate levels of precision. Follow safety guidelines.)
3. Examine books and other sources of information to see what is already known.
4. Review what is known in light of empirical evidence. (Examine whether available empirical evidence can be interpreted in terms of existing knowledge and models, and if not, modify or develop new models.)
5. Plan investigations. (Design and evaluate a scientific investigation.)
6. Use tools to gather, analyze, and interpret data (this includes the use of measurement in metric and other systems, and also the generation and interpretation of graphical representations of data, including data tables and graphs). (Collect data or evidence in an organized way. Properly use instruments, equipment, and materials (e.g., scales, probeware, meter sticks, microscopes, computers) including set-up, calibration, technique, maintenance, and storage.)
7. Pose answers, explanations, or descriptions of events.
8. Generate explanations that explicate or describe natural phenomena (inferences).
9. Use appropriate evidence and reasoning to justify these explanations to others.
10. Communicate results of scientific investigations, and
11. Evaluate the merits of the explanations produced by others.

SC.912.N.1.1:

SC.912.N.1.2:

SC.912.N.1.3:

SC.912.N.1.4:

SC.912.N.1.6:

SC.912.N.2.1:

SC.912.N.2.4:

SC.912.N.3.1:

SC.912.N.3.2:

SC.912.N.3.5:

SC.912.N.4.1:

SC.912.N.4.2:

SC.912.P.8.1:

SC.912.P.8.2:

SC.912.P.8.7:
Relate acidity and basicity to hydronium and hydroxyl ion concentration and pH.

Describe the properties of the carbon atom that make the diversity of carbon compounds possible.

Differentiate among the various forms of energy and recognize that they can be transformed from one form to others.

Explore the theory of electromagnetism by comparing and contrasting the different parts of the electromagnetic spectrum in terms of wavelength, frequency, and energy, and relate them to phenomena and applications.

Describe the measurable properties of waves and explain the relationships among them and how these properties change when the wave moves from one medium to another.

Qualitatively describe the shift in frequency in sound or electromagnetic waves due to the relative motion of a source or a receiver.

Distinguish between scalar and vector quantities and assess which should be used to describe an event.

Analyze the motion of an object in terms of its position, velocity, and acceleration (with respect to a frame of reference) as functions of time.

Interpret and apply Newton's three laws of motion.

Apply the law of conservation of linear momentum to interactions, such as collisions between objects.

Recognize that nothing travels faster than the speed of light in vacuum which is the same for all observers no matter how they or the light source are moving.

Recognize that time, length, and energy depend on the frame of reference.

Determine the central ideas or conclusions of a text; summarize complex information, including a variety of perspectives and views.

Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks; analyze the specific results based on explanations in the text.

Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 11-12 texts and topics.

Analyze the text structures information or ideas into categories or hierarchies, demonstrating understanding of the information or ideas.

Analyze the author's purpose in providing an explanation, describing a procedure, or discussing an experiment in a text, identifying important issues that remain unresolved.

Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g., quantitative data, video, multimedia) in order to address a question or solve a problem.

Evaluate the hypotheses, data, analysis, and conclusions in a science or technical text, verifying the data when possible and corroborating or challenging conclusions with other sources of information.

Synthesize information from a range of sources (e.g., texts, experiments, simulations) into a coherent understanding of a process, phenomenon, or concept, resolving conflicting information when possible.

By the end of grade 12, read and comprehend science/technical texts in the grades 11–12 text complexity band independently and proficiently.

Initiate and participate effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grades 11–12 topics, texts, and issues, building on others' ideas and expressing their own clearly and persuasively.

Come to discussions prepared, read and have researched material under study; explicitly draw on that preparation by referring to evidence from texts and other research on the topic or issue to stimulate a thoughtful, well-reasoned exchange of ideas.

Work with peers to promote civil, democratic discussions and decision-making, set clear goals and deadlines, and establish individual roles as needed.

Propel conversations by posing and responding to questions that probe reasoning and evidence; ensure a hearing for a full range of positions on a topic or issue; clarify, verify, or challenge ideas and conclusions; and promote divergent and creative perspectives.

Respect thoughtfully to diverse perspectives; synthesize comments, claims, and evidence made on all sides of an issue; resolve contradictions when possible; and determine what additional information or research is required to deepen the investigation or complete the task.

Integrate multiple sources of information presented in diverse formats and media (e.g., visually, qualitatively, orally) in order to make informed decisions and solve problems, evaluating the credibility and accuracy of each source and noting any discrepancies among the data.

Evaluate a speaker's point of view, reasoning, and use of evidence and examples to establish clear and distinct perspective, such that listeners can follow the line of reasoning, alternative or opposing perspectives are addressed, and the organization, development, substance, and style are appropriate to purpose, audience, and a range of formal and informal tasks.

Make strategic use of digital media (e.g., textual, graphical, audio, visual, and interactive elements) in presentations to enhance understanding of findings, reasoning, and evidence and to add interest.
Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.

Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience.

Use technology, including the Internet, to produce, publish, and update individual or shared writing products in response to ongoing feedback, including new arguments or information.

Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation.

Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the strengths and limitations of each source in terms of the specific task, purpose, and audience; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and overreliance on any one source and following a standard format for citation.

Draw evidence from informational texts to support analysis, reflection, and research.

Write routinely over extended time frames (time for reflection and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences.

Cite specific textual evidence to support analysis of science and technical texts, attending to the precise details of explanations or descriptions.

Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks, attending to special cases or exceptions defined in the text.

Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 9–10 texts and topics.

Analyze the structure of the relationships among concepts in a text, including relationships among key terms (e.g., force, friction, reaction force, energy).

Translate quantitative or technical information expressed in words in a text into visual form (e.g., a table or chart) and translate information expressed visually or mathematically (e.g., in an equation) into words.

By the end of grade 10, read and comprehend science/technical texts in the grades 9–10 text complexity band independently and proficiently.

Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes.

a. Introduce a topic and organize ideas, concepts, and information to make important connections and distinctions; include formatting (e.g., headings), graphics (e.g., figures, tables), and multimedia when useful to aiding comprehension.

b. Develop the topic with well-chosen, relevant, and sufficient facts, extended definitions, concrete details, quotations, or other information and examples appropriate to the audience's knowledge of the topic.

c. Use varied transitions and sentence structures to link the major sections of the text, create cohesion, and clarify the relationships among ideas and concepts.

d. Use precise language and domain-specific vocabulary to manage the complexity of the topic and convey a style appropriate to the discipline and context as well as to the likely readers.

e. Establish and maintain a formal style and objective tone while attending to the norms and conventions of the discipline in which they are writing.

f. Provide a concluding statement or section that follows from and supports the information or explanation presented (e.g., articulating implications or the significance of the topic).

Draw evidence from informational texts to support analysis, reflection, and research.

Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases.

a. Graph linear and quadratic functions and show intercepts, maxima, and minima.

b. Graph square root, cube root, and piecewise-defined functions, including step functions and absolute value functions.

c. Graph polynomial functions, identifying zeros when suitable factorizations are available, and showing end behavior.

d. Graph rational functions, identifying zeros and asymptotes when suitable factorizations are available, and showing end behavior.

e. Graph exponential and logarithmic functions, showing intercepts and end behavior, and trigonometric functions, showing period, midline, and amplitude, and using phase shift.

Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays.

Choose a level of accuracy appropriate to limitations on measurement when reporting quantities.

Solve problems involving velocity and other quantities that can be represented by vectors.

Make sense of problems and persevere in solving them.

Mathematically proficient students start by explaining to themselves the meaning of a problem and looking for entry points to its solution. They analyze givens, constraints, relationships, and goals. They make conjectures about the form and meaning of the solution and plan a solution pathway rather than simply jumping into a solution attempt. They consider analogous problems, and try special cases and simpler forms of the original problem in order to gain insight into its solution. They monitor and evaluate their progress and change course if necessary. Older students might, depending on the context of the problem, transform algebraic expressions or change the viewing window on their graphing calculator to get the information they need. Mathematically proficient students can explain correspondences between equations, verbal descriptions, tables, and graphs or draw diagrams of important features and relationships, graph data, and search for regularity or trends. Younger students might rely on using concrete objects or pictures to help conceptualize and solve a problem. Mathematically proficient students check their answers to problems using a different method, and they continually ask themselves, “Does this make sense?” They can understand the approaches of others to solving complex problems and identify correspondences between different approaches.

Standard Relation to Course: Supporting

Reason abstractly and quantitatively.

Mathematically proficient students make sense of quantities and their relationships in problem situations. They bring two complementary abilities to bear on problems involving quantitative relationships: the ability to decontextualize—to abstract a given situation and represent it symbolically...
and manipulate the representing symbols as if they have a life of their own, without necessarily attending to their referents—and the ability to contextualize, to pause as needed during the manipulation process in order to probe into the referents for the symbols involved. Quantitative reasoning entails habits of creating a coherent representation of the problem at hand; considering the units involved; attending to the meaning of quantities, not just how to compute them; and knowing and flexibly using different properties of operations and objects.

**Standard Relation to Course: Supporting**

**MAFS.K12.MP.1:** Construct viable arguments and critique the reasoning of others.

Mathematically proficient students understand and use stated assumptions, definitions, and previously established results in constructing arguments. They make conjectures and build a logical progression of statements to explore the truth of their conjectures. They are able to analyze situations by breaking them into cases, and can recognize and use counterexamples. They justify their conclusions, communicate them to others, and respond to the arguments of others. They reason inductively about data, making plausible arguments that take into account the context from which the data arose. Mathematically proficient students are also able to compare the effectiveness of two plausible arguments, distinguish correct logic or reasoning from one that is flawed, and—if there is a flaw in an argument—explain what it is. Elementary students can construct arguments using concrete referents such as objects, drawings, diagrams, and actions. Such arguments can make sense and be correct, even though they are not generalized or made formal until later grades. Later, students learn to determine domains to which an argument applies. Students at all grades can listen or read the arguments of others, decide whether they make sense, and ask useful questions to clarify or improve the arguments.

**Standard Relation to Course: Supporting**

**Model with mathematics.**

Mathematically proficient students can apply the mathematics they know to solve problems arising in everyday life, society, and the workplace. In early grades, this might be as simple as writing an addition equation to describe a situation. In middle grades, a student might apply proportional reasoning to plan a school event or analyze a problem in the community. By high school, a student might use geometry to solve a design problem or use a function to describe how one quantity of interest depends on another. Mathematically proficient students who can apply what they know are comfortable making assumptions and approximations to simplify a complicated situation, realizing that these may need revision later. They are able to identify important quantities in a practical situation and map their relationships using such tools as diagrams, two-way tables, graphs, flowcharts and formulas. They can analyze those relationships mathematically to draw conclusions. They routinely interpret their mathematical results in the context of the situation and reflect on whether the results make sense, possibly improving the model if it has not served its purpose.

**Standard Relation to Course: Supporting**

**Use appropriate tools strategically.**

Mathematically proficient students consider the available tools when solving a mathematical problem. These tools might include pencil and paper, concrete models, a ruler, a protractor, a calculator, a spreadsheet, a computer algebra system, a statistical package, or dynamic geometry software. Proficient students are sufficiently familiar with tools appropriate for their grade or course to make sound decisions about when each of these tools might be helpful, recognizing both the insight to be gained and their limitations. For example, mathematically proficient high school students analyze graphs of functions and solutions generated using a graphing calculator. They detect possible errors by strategically using estimation and other mathematical knowledge. When making mathematical models, they know that technology can enable them to visualize the results of varying assumptions, explore consequences, and compare predictions with data. Mathematically proficient students at various grade levels are able to identify relevant external mathematical resources, such as digital content located on a website, and use them to pose or solve problems. They are able to use technological tools to explore and deepen their understanding of concepts.

**Standard Relation to Course: Supporting**

**Attend to precision.**

Mathematically proficient students try to communicate precisely to others. They try to use clear definitions in discussion with others and in their own reasoning. They state the meaning of the symbols they choose, including using the equal sign consistently and appropriately. They are careful about specifying units of measure, and labeling axes to clarify the correspondence with quantities in a problem. They calculate accurately and efficiently, express numerical answers with a degree of precision appropriate for the problem context. In the elementary grades, students give carefully formulated explanations to each other. By the time they reach high school they have learned to examine claims and make explicit use of definitions.

**Standard Relation to Course: Supporting**

**Look for and make use of structure.**

Mathematically proficient students look closely to discern a pattern or structure. Young students, for example, might notice that three and seven more is the same amount as three and seven more, or they may sort a collection of shapes according to how many sides the shapes have. Later, students will see 7 + 8 equals the well remembered 9 + 7, in preparation for learning about the distributive property. In the expression x² + 9x + 14, older students can see the 14 as 2 × 7 and recognize the significance of an existing line in a geometric figure and can use the strategy of drawing an auxiliary line for solving problems. They also can step back for an overview and shift perspective. They can see complicated things, such as some algebraic expressions, as single objects or as being composed of several objects. For example, they can see 5 – 3(x – y)² as 5 minus a positive number times a square and use that to realize that its value cannot be more than 5 for any real numbers x and y.

**Standard Relation to Course: Supporting**

**Look for and express regularity in repeated reasoning.**

Mathematically proficient students notice if calculations are repeated, and look both for general methods and for shortcuts. Upper elementary students might notice when dividing 25 by 11 that they are repeating the same calculations over and over again, and conclude they have a repeating decimal. By paying attention to the calculation of slope as they repeatedly check whether points are on the line through (1, 2) with slope 3, middle school students might abstract the equation (y – 2)/(x – 1) = 3. Noticing the regularity in the way terms cancel when expanding (x – 1)(x² + x + 1), (x – 1)(x³ + x² + x + 1) might lead them to the general formula for the sum of a geometric series. As they work to solve a problem, mathematically proficient students maintain oversight of the process, while attending to the details. They continually evaluate the reasonableness of their intermediate results.

**Standard Relation to Course: Supporting**

ELD.K12.ELL.SC.1: English language learners communicate information, ideas and concepts necessary for academic success in the content area of Science.

ELD.K12.ELL.SI.1: English language learners communicate for social and instructional purposes within the school setting.
GENERAL NOTES

Laboratory investigations that include the use of scientific inquiry, research, measurement, problem solving, laboratory apparatus and technologies, experimental procedures, and safety procedures are an integral part of this course. The National Science Teachers Association (NSTA) recommends that at the high school level, all students should be in the science lab or field, collecting data every week. School laboratory investigations (labs) are defined by the National Research Council (NRC) as an experience in the laboratory, classroom, or the field that provides students with opportunities to interact directly with natural phenomena or with data collected by others using tools, materials, data collection techniques, and models (NRC, 2006, p. 3). Laboratory investigations in the high school classroom should help all students develop a growing understanding of the complexity and ambiguity of empirical work, as well as the skills to calibrate and troubleshoot equipment used to make observations. Learners should understand measurement error; and have the skills to aggregate, interpret, and present the resulting data (National Research Council, 2006, p.77; NSTA, 2007).

Special Notes:

Instructional Practices

Teaching from a range of complex text is optimized when teachers in all subject areas implement the following strategies on a routine basis:

1. Ensuring wide reading from complex text that varies in length.
2. Making close reading and rereading of texts central to lessons.
3. Emphasizing text-specific complex questions, and cognitively complex tasks, reinforce focus on the text and cultivate independence.
4. Emphasizing students supporting answers based upon evidence from the text.
5. Providing extensive research and writing opportunities (claims and evidence).


- Asking questions (for science) and defining problems (for engineering).
- Developing and using models.
- Planning and carrying out investigations.
- Analyzing and interpreting data.
- Using mathematics, information and computer technology, and computational thinking.
- Constructing explanations (for science) and designing solutions (for engineering).
- Engaging in argument from evidence.
- Obtaining, evaluating, and communicating information.

Literacy Standards in Science

Secondary science courses include reading standards for literacy in science and technical subjects 6-12 and writing standards for literacy in history/social studies, science, and technical subjects 6-12. The courses also include speaking and listening standards. For a complete list of standards required for this course click on the blue tile labeled course standards. You may also download the complete course including all required standards and notes sections using the export function located at the top of this page.

English Language Development ELD Standards Special Notes Section:

Teaching teachers are required to provide listening, speaking, reading and writing instruction that allows English language learners (ELL) to communicate information, ideas and concepts for academic success in the content area of Science. For the given level of English language proficiency and with visual, graphic, or interactive support, students will interact with grade level words, expressions, sentences and concepts for academic success in the content area of Science. For the given level of English language proficiency and with visual, graphic, or interactive support, students will interact with grade level words, expressions, sentences and concepts for academic success in the content area of Science. Emphasizing students supporting answers based upon evidence from the text. To access an ELL supporting document which delineates performance definitions and descriptors, please click on the following link:

https://cpalmsmediaprod.blob.core.windows.net/uploads/docs/standards/eld/sc.pdf

Additional Instructional Resources:

A.V.E. for Success Collection is provided by the Florida Association of School Administrators: http://www.fasa.net/4DCGI/cms/review.html?Action=CMS_Document&DocID=379. Please be aware that these resources have not been reviewed by CPALMS and there may be a charge for the use of some of them in this collection.

GENERAL INFORMATION

Course Number: 2002480

Course Path: Section: Grades PreK to 12 Education Courses > Grade Group: Grades 9 to 12 and Adult Education Courses > Subject: Science > SubSubject: Integrated Sciences >

Abbreviated Title: FOR SCI 1

Course Length: Year (Y)

Course Status: Course Approved

Grade Level(s): 9,10,11,12

Graduation Requirement: Equally Rigorous Science

Educator Certifications

<table>
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<th>Grade Group</th>
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<tr>
<td>Middle Grades General Science (Middle Grades 5-9)</td>
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<td>Earth/Space Science (Grades 6-12)</td>
<td></td>
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<tr>
<td>Physics (Grades 6-12)</td>
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</tbody>
</table>
Describe how basic DNA technology (restriction digestion by restriction endonucleases, gel electrophoresis, polymerase chain reaction, ligation, and transformation) is used to construct recombinant DNA molecules (DNA cloning).

Explain that scientific knowledge is both durable and robust and open to change. Scientific knowledge can change because it is often examined and re-examined by new investigations drawing together all the current evidence concerning a societal problem by comparing a number of different costs and benefits, evaluated through scientific argumentation, which depends on critical and logical thinking, and the active consideration of alternative scientific explanations to explain the data presented.

SC.912.N.1.1: Pose questions about the natural world, (Articulate the purpose of the investigation and identify the relevant scientific concepts).

SC.912.N.1.2: Conduct systematic observations, (Write procedures that are clear and replicable. Identify observables and examine relationships between test (independent) variable and outcome (dependent) variable. Employ appropriate methods for accurate and consistent observations; conduct and record measurements at appropriate levels of precision. Follow safety guidelines).

SC.912.N.1.3: Examine books and other sources of information to see what is already known.

SC.912.N.1.4: Review what is known in light of empirical evidence, (Examine whether available empirical evidence can be interpreted in terms of existing knowledge and models, and if not, modify or develop new models).

SC.912.N.1.5: Plan investigations, (Design and evaluate a scientific investigation).

SC.912.N.1.6: Use tools to gather, analyze, and interpret data (this includes the use of measurement in metric and other systems, and also the generation and interpretation of graphical representations of data, including data tables and graphs), (Collect data or evidence in an organized way. Properly use instruments, equipment, and materials (e.g., scales, probeware, meter sticks, microscopes, computers) including set-up, calibration, technique, maintenance, and storage).

SC.912.N.1.7: Pose answers, explanations, or descriptions of events,

SC.912.N.1.8: Generate explanations that explicate or describe natural phenomena (inferences),

SC.912.N.1.9: Use appropriate evidence and reasoning to justify these explanations to others,

SC.912.N.1.10: Communicate results of scientific investigations, and

SC.912.N.1.11: Evaluate the merits of the explanations produced by others.

SC.912.N.2.1: Identify what is science, what clearly is not science, and what superficially resembles science (but fails to meet the criteria for science).

SC.912.N.2.2: Explain that scientific knowledge is both durable and robust and open to change. Scientific knowledge can change because it is often examined and re-examined by new investigations and scientific argumentation. Because of these frequent examinations, scientific knowledge becomes more powerful explanation scientists have to offer.

SC.912.N.3.1: Explain that a scientific theory is the culmination of many scientific investigations drawing together all the current evidence concerning a substantial range of phenomena; thus, a scientific theory represents the most powerful explanation scientists have to offer.

SC.912.N.3.2: Describe the role consensus plays in the historical development of a theory in any one of the disciplines of science.

SC.912.N.3.3: Describe the function of models in science, and identify the wide range of models used in science.

SC.912.N.4.1: Explain how scientific knowledge and reasoning provide an empirically-based perspective to inform society's decision making.

SC.912.N.4.2: Weigh the merits of alternative strategies for solving a specific societal problem by comparing a number of different costs and benefits, such as human, economic, and environmental.

SC.912.P.8.1: Differentiate among the four states of matter.

SC.912.P.8.2: Differentiate between physical and chemical properties and physical and chemical changes of matter.

SC.912.P.8.7: Interpret formula representations of molecules and compounds in terms of composition and structure.


<table>
<thead>
<tr>
<th>SC.912.P.8.11:</th>
<th>Relate acidity and basicity to hydronium and hydroxyl ion concentration and pH.</th>
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<tbody>
<tr>
<td>SC.912.P.8.12:</td>
<td>Describe the properties of the carbon atom that make the diversity of carbon compounds possible.</td>
</tr>
<tr>
<td>SC.912.P.10.1:</td>
<td>Differentiate among the various forms of energy and recognize that they can be transformed from one form to others.</td>
</tr>
<tr>
<td>SC.912.P.10.18:</td>
<td>Explore the theory of electromagnetism by comparing and contrasting the different parts of the electromagnetic spectrum in terms of wavelength, frequency, and energy, and relate them to phenomena and applications.</td>
</tr>
<tr>
<td>SC.912.P.10.20:</td>
<td>Describe the measurable properties of waves and explain the relationships among them and how these properties change when the wave moves from one medium to another.</td>
</tr>
<tr>
<td>SC.912.P.10.21:</td>
<td>Qualitatively describe the shift in frequency in sound or electromagnetic waves due to the relative motion of a source or a receiver.</td>
</tr>
<tr>
<td>SC.912.P.12.1:</td>
<td>Distinguish between scalar and vector quantities and assess which should be used to describe an event.</td>
</tr>
<tr>
<td>SC.912.P.12.2:</td>
<td>Analyze the motion of an object in terms of its position, velocity, and acceleration (with respect to a frame of reference) as functions of time.</td>
</tr>
<tr>
<td>SC.912.P.12.3:</td>
<td>Interpret and apply Newton's three laws of motion.</td>
</tr>
<tr>
<td>SC.912.P.12.5:</td>
<td>Apply the law of conservation of linear momentum to interactions, such as collisions between objects.</td>
</tr>
<tr>
<td>SC.912.P.12.7:</td>
<td>Recognize that nothing travels faster than the speed of light in vacuum which is the same for all observers no matter how they or the light source are moving.</td>
</tr>
<tr>
<td>SC.912.P.12.9:</td>
<td>Recognize that time, length, and energy depend on the frame of reference.</td>
</tr>
<tr>
<td>SC.912.P.12.12:</td>
<td>Explain how various factors, such as concentration, temperature, and presence of a catalyst affect the rate of a chemical reaction.</td>
</tr>
</tbody>
</table>

**MA.K12.MTR.1.1:** Mathematicians who participate in effortful learning both individually and with others:

- Analyze the problem in a way that makes sense given the task.
- Ask questions that will help with solving the task.
- Build perseverance by modifying methods as needed while solving a challenging task.
- Stay engaged and maintain a positive mindset when working to solve tasks.
- Help and support each other when attempting a new method or approach.

**MA.K12.MTR.2.1:** Demonstrate understanding by representing problems in multiple ways. Mathematicians who demonstrate understanding by representing problems in multiple ways:

- Build understanding through modeling and using manipulatives.
- Represent solutions to problems in multiple ways using objects, drawings, tables, graphs and equations.
- Progress from modeling problems with objects and drawings to using algorithms and equations.
- Express connections between concepts and representations.
- Choose a representation based on the given context or purpose.

**MA.K12.MTR.3.1:** Complete tasks with mathematical fluency. Mathematicians who complete tasks with mathematical fluency:

- Select efficient and appropriate methods for solving problems within the given context.
- Maintain flexibility and accuracy while performing procedures and mental calculations.
- Complete tasks accurately and with confidence.
- Adapt procedures to apply them to a new context.
- Use feedback to improve efficiency when performing calculations.

**MA.K12.MTR.4.1:** Engage in discussions that reflect on the mathematical thinking of self and others. Mathematicians who engage in discussions that reflect on the mathematical thinking of self and others:

- Communicate mathematical ideas, vocabulary and methods effectively.
- Analyze the mathematical thinking of others.
- Compare the efficiency of a method to those expressed by others.
- Recognize errors and suggest how to correctly solve the task.
- Justify results by explaining methods and processes.
- Construct possible arguments based on evidence.

**Clarifications:**

- Teachers who encourage students to participate actively in effortful learning both individually and with others:
  - Cultivate a community of growth mindset learners.
  - Foster perseverance in students by choosing tasks that are challenging.
  - Develop students' ability to analyze and problem solve.
  - Recognize students' effort when solving challenging problems.

- Teachers who encourage students to demonstrate understanding by representing problems in multiple ways:
  - Help students make connections between concepts and representations.
  - Provide opportunities for students to use manipulatives when investigating concepts.
  - Guide students from concrete to pictorial to abstract representations as understanding progresses.
  - Show students that various representations can have different purposes and can be useful in different situations.

- Teachers who encourage students to complete tasks with mathematical fluency:
  - Provide students with the flexibility to solve problems by selecting a procedure that allows them to solve efficiently and accurately.
  - Offer multiple opportunities for students to practice efficient and generalizable methods.
  - Provide opportunities for students to reflect on the method they used and determine if a more efficient method could have been used.

- Teachers who encourage students to engage in discussions that reflect on the mathematical thinking of self and others:
  - Establish a culture in which students ask questions of the teacher and their peers, and error is an opportunity for learning.
  - Create opportunities for students to discuss their thinking with peers.
  - Select, sequence and present student work to advance and deepen understanding of correct and increasingly efficient methods.
  - Develop students' ability to justify methods and compare their responses to the responses of their peers.
### MA.K12.MTR.5.1:
Use patterns and structure to help understand and connect mathematical concepts.

Mathematicians who use patterns and structure to help understand and connect mathematical concepts:
- Focus on relevant details within a problem.
- Create plans and procedures to logically order events, steps or ideas to solve problems.
- Decompose a complex problem into manageable parts.
- Relate previously learned concepts to new concepts.
- Look for similarities among problems.
- Connect solutions of problems to more complicated large-scale situations.

**Clarifications:**
Teachers who encourage students to use patterns and structure to help understand and connect mathematical concepts:
- Help students recognize the patterns in the world around them and connect these patterns to mathematical concepts.
- Support students to develop generalizations based on the similarities found among problems.
- Provide opportunities for students to create plans and procedures to solve problems.
- Develop students' ability to construct relationships between their current understanding and more sophisticated ways of thinking.

### MA.K12.MTR.6.1:
Assess the reasonableness of solutions.

Mathematicians who assess the reasonableness of solutions:
- Estimate to discover possible solutions.
- Use benchmark quantities to determine if a solution makes sense.
- Check calculations when solving problems.
- Verify possible solutions by explaining the methods used.
- Evaluate results based on the given context.

**Clarifications:**
Teachers who encourage students to assess the reasonableness of solutions:
- Have students estimate or predict solutions prior to solving.
- Prompt students to continually ask, “Does this solution make sense? How do you know?”
- Reinforce that students check their work as they progress within and after a task.
- Strengthen students' ability to verify solutions through justifications.

### MA.K12.MTR.7.1:
Apply mathematics to real-world contexts.

Mathematicians who apply mathematics to real-world contexts:
- Connect mathematical concepts to everyday experiences.
- Use models and methods to understand, represent and solve problems.
- Perform investigations to gather data or determine if a method is appropriate.
- Redesign models and methods to improve accuracy or efficiency.

**Clarifications:**
Teachers who encourage students to apply mathematics to real-world contexts:
- Provide opportunities for students to create models, both concrete and abstract, and perform investigations.
- Challenge students to question the accuracy of their models and methods.
- Support students as they validate conclusions by comparing them to the given situation.
- Indicate how various concepts can be applied to other disciplines.

### ELA.K12.EE.1.1:
Cite evidence to explain and justify reasoning.

**Clarifications:**
K-1 Students include textual evidence in their oral communication with guidance and support from adults. The evidence can consist of details from the text without naming the text. During 1st grade, students learn how to incorporate the evidence in their writing.
2-3 Students include relevant textual evidence in their written and oral communication. Students should name the text when they refer to it. In 3rd grade, students should use a combination of direct and indirect citations.
4-5 Students continue with previous skills and reference comments made by speakers and peers. Students cite texts that they've directly quoted, paraphrased, or used for information. When writing, students will use the form of citation dictated by the instructor or the style guide referenced by the instructor.
6-8 Students continue with previous skills and use a style guide to create a proper citation.
9-12 Students continue with previous skills and should be aware of existing style guides and the ways in which they differ.

### ELA.K12.EE.2.1:
Read and comprehend grade-level complex texts proficiently.

**Clarifications:**
See Text Complexity for grade-level complexity bands and a text complexity rubric.

### ELA.K12.EE.3.1:
Make inferences to support comprehension.

**Clarifications:**
Students will make inferences before the words infer or inference are introduced. Kindergarten students will answer questions like “Why is the girl smiling?” or make predictions about what will happen based on the title page. Students will use the terms and apply them in 2nd grade and beyond.

### ELA.K12.EE.4.1:
Use appropriate collaborative techniques and active listening skills when engaging in discussions in a variety of situations.

**Clarifications:**
In kindergarten, students learn to listen to one another respectfully.
In grades 1-2, students build upon these skills by justifying what they are thinking. For example: “I think ______ because ______.” The collaborative conversations are becoming academic conversations.
In grades 3-12, students engage in academic conversations discussing claims and justifying their reasoning, refining and applying skills. Students build on ideas, propel the conversation, and support claims and counterclaims with evidence.
Use the accepted rules governing a specific format to create quality work.

**ELA.K12.EE.5.1:**
Students will incorporate skills learned into work products to produce quality work. For students to incorporate these skills appropriately, they must receive instruction. A 3rd grade student creating a poster board display must have instruction in how to effectively present information to do quality work.

Use appropriate voice and tone when speaking or writing.

**ELA.K12.EE.6.1:**

**ELD.K12.ELL.SI.1:**
English language learners communicate for social and instructional purposes within the school setting.

**ELD.K12.ELL.SC.1:**
English language learners communicate information, ideas and concepts necessary for academic success in the content area of Science.

**General Course Information and Notes**

**General Notes**

Laboratory investigations that include the use of scientific inquiry, research, measurement, problem solving, laboratory apparatus and technologies, experimental procedures, and safety procedures are an integral part of this course. The National Science Teachers Association (NSTA) recommends that at the high school level, all students should be in the science lab or field, collecting data every week. School laboratory investigations (labs) are defined by the National Research Council (NRC) as an experience in the laboratory, classroom, or the field that provides students with opportunities to interact directly with natural phenomena or with data collected by others using tools, materials, data collection techniques, and models (NRC, 2006, p. 3). Laboratory investigations in the high school classroom should help all students develop a growing understanding of the complexity and ambiguity of empirical work, as well as the skills to calibrate and troubleshoot equipment used to make observations. Learners should understand measurement error; and have the skills to aggregate, interpret, and present the resulting data (National Research Council, 2006, p. 77; NSTA, 2007).

**Special Notes:**

**Instructional Practices**

Teaching from a range of complex text is optimized when teachers in all subject areas implement the following strategies on a routine basis:

1. Ensuring wide reading from complex text that varies in length.
2. Making close reading and rereading of texts central to lessons.
3. Emphasizing text-specific complex questions, and cognitively complex tasks, reinforce focus on the text and cultivate independence.
4. Emphasizing students supporting answers based upon evidence from the text.
5. Providing extensive research and writing opportunities (claims and evidence).

**Science and Engineering Practices** (NRC Framework for K-12 Science Education, 2010)

- Asking questions (for science) and defining problems (for engineering).
- Developing and using models.
- Planning and carrying out investigations.
- Analyzing and interpreting data.
- Using mathematics, information and computer technology, and computational thinking.
- Constructing explanations (for science) and designing solutions (for engineering).
- Engaging in argument from evidence.
- Obtaining, evaluating, and communicating information.

**Florida's Benchmarks for Excellent Student Thinking (B.E.S.T.) Standards**

This course includes Florida's B.E.S.T. ELA Expectations (EE) and Mathematical Thinking and Reasoning Standards (MTRs) for students. Florida educators should intentionally embed these standards within the content and their instruction as applicable. For guidance on the implementation of the EE's and MTRs, please visit https://www.cpalms.org/Standards/BEST_Standards.aspx and select the appropriate B.E.S.T. Standards package.

**English Language Development ELD Standards Special Notes Section:**

Teachers are required to provide listening, speaking, reading and writing instruction that allows English language learners (ELL) to communicate information, ideas and concepts for academic success in the content area of Science. For the given level of English language proficiency and with visual, graphic, or interactive support, students will interact with grade level words, expressions, sentences and discourse to process or produce language necessary for academic success. The ELD standard should specify a relevant content area concept or topic of study chosen by curriculum developers and teachers which maximizes an ELL's need for communication and social skills. To access an ELL supporting document which delineates performance definitions and descriptors, please click on the following link: https://cpalmsmediaprod.blob.core.windows.net/uploads/docs/standards/eld/sc.pdf

**Additional Instructional Resources:**

A.V.E for Success Collection is provided by the Florida Association of School Administrators: http://www.fasa.net/4DCGI/cms/review.html?Action=CMS_Document&DocID=139. Please be aware that these resources have not been reviewed by CPALMS and there may be a charge for the use of some of them in this collection.

**General Information**

**Course Number:** 2002480

**Course Path:**

- **Section:** Grades PreK to 12 Education
- **Courses:**
- **Grade Group:** Grades 9 to 12 and Adult

**Education Courses:**

- **Subject:** Science
- **SubSubject:** Integrated Sciences

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Educator Certifications

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Evaluate the merits of the explanations produced by others.

Communicate results of scientific investigations, and use appropriate evidence and reasoning to justify these explanations to others, generating explanations that explicate or describe natural phenomena (inferences), using the results of scientific investigations as evidence of reality. Make and test hypotheses, using appropriate and replicable procedures that are clear and replicable. Collect and record measurements at appropriate levels of precision. Follow safety guidelines, examine relationships between test (independent) variable and outcome (dependent) variable. Use appropriate methods for accurate and consistent observations; conduct systematic observations, (Write procedures that are clear and replicable. Identify observables and examine relationships between variables using experimental and control trials. Use the scientific method to develop and test hypotheses, generation and interpretation of graphical representations of data, including data tables and graphs). Collect data or evidence in an organized way. Properly use instruments, equipment, and materials (e.g., scales, probeware, meter sticks, microscopes, computers) including set-up, calibration, technique, maintenance, and storage.

Pose questions about the natural world, (Articulate the purpose of the investigation and identify the relevant scientific concepts). Examine knowledge and models, and if not, modify or develop new models. Design and evaluate a scientific investigation. (Collect data or evidence in an organized way. Properly use instruments, equipment, and materials (e.g., scales, probeware, meter sticks, microscopes, computers) including set-up, calibration, technique, maintenance, and storage). Pose answers, explanations, or descriptions of events, and generate explanations that explicate or describe natural phenomena (inferences). Use appropriate evidence and reasoning to justify these explanations to others. Communicate results of scientific investigations, and evaluate the merits of the explanations produced by others.

Describe and explain what characterizes science and its methods.

Recognize that the strength or usefulness of a scientific claim is evaluated through scientific argumentation, which depends on critical and logical thinking, and the active consideration of alternative scientific explanations to explain the data presented.
Identify sources of information and assess their reliability according to the strict standards of scientific investigation.

Describe and provide examples of how similar investigations conducted in many parts of the world result in the same outcome.

Describe how scientific inferences are drawn from scientific observations and provide examples from the content being studied.

Identify sources of information and assess their reliability according to the strict standards of scientific investigation.

Interpret formula representations of molecules and compounds in terms of composition and structure.

Explain how various factors, such as concentration, temperature, and

Explore the theory of electromagnetism by comparing and contrasting the

Describe how scientific inferences are drawn from scientific observations and provide examples from the content being studied.

Make strategic use of digital media (e.g., textual, graphical, audio,

Describe oxidation-reduction reactions in living and non-living systems.

Differentiate among conductors, semiconductors, and insulators.

Integrate multiple sources of information presented in diverse formats

Investigate and explain the relationships among current, voltage, resistance, and power.

Synthesize information from a range of sources (e.g., texts,

Apply the law of conservation of linear momentum to interactions, such as collisions between objects.

Cite specific textual evidence to support analysis of science and

Describe the function of models in science, and identify the wide range of models used in science.

Analyze how the text structures information or ideas into categories or

Characterize types of chemical reactions, for example: redox, acid-base, synthesis, and single and double replacement reactions.

Describe how scientific knowledge and reasoning provide an empirically-based perspective to inform society's decision making.

Analyze the author's purpose in providing an explanation, describing a

Explain how scientific knowledge and reasoning provide an empirically-based perspective to inform society's decision making.

Analyze how the text structures information or ideas into categories or

Identify selected functional groups and relate how they contribute to properties of carbon compounds.

Identify sources of information and assess their reliability according to the strict standards of scientific investigation.
c. Use words, phrases, and clauses as well as varied syntax to link the major sections of the text, create cohesion, and clarify the relationships between claim(s) and reasons, between reasons and evidence, and between claim(s) and counterclaims.
d. Establish and maintain a formal style and objective tone while attending to the norms and conventions of the discipline in which they are writing.
e. Provide a concluding statement or section that follows from or supports the argument presented.

**LAFS.1112.WHST.1.2:**
Write informative/explanatory texts, including the narration of historical events, scientific procedures/experiments, or technical processes.

a. Introduce a topic and organize complex ideas, concepts, and information so that each new element builds on that which precedes it to create a unified whole; include formatting (e.g., headings), graphics (e.g., figures, tables), and multimedia when useful to aiding comprehension.
b. Develop the topic thoroughly by selecting the most significant and relevant facts, extended definitions, concrete details, quotations, or other information and examples appropriate to the audience's knowledge of the topic.
c. Use varied transitions and sentence structures to link the major sections of the text, create cohesion, and clarify the relationships among complex ideas and concepts.
d. Use precise language, domain-specific vocabulary and techniques such as metaphor, simile, and analogy to manage the complexity of the topic; convey a knowledgeable stance in a style that responds to the discipline and context as well as to the expertise of likely readers.
e. Provide a concluding statement or section that follows from and supports the information or explanation provided (e.g., articulating implications or the significance of the topic).

**LAFS.1112.WHST.2.4:**
Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.

**LAFS.1112.WHST.2.5:**
Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience.

**LAFS.1112.WHST.2.6:**
Use technology, including the Internet, to produce, publish, and update individual or shared writing products in response to ongoing feedback, including new arguments or information.

**LAFS.1112.WHST.3.7:**
Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation.

**LAFS.1112.WHST.3.8:**
Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the strengths and limitations of each source in terms of the specific task, purpose, and audience; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and overreliance on any one source and following a standard format for citation.

**LAFS.1112.WHST.3.9:**
Draw evidence from informational texts to support analysis, reflection, and research.

**LAFS.1112.WHST.4.10:**
Write routinely over extended time frames (time for reflection and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences.

**LAFS.910.RST.1.1:**
Cite specific textual evidence to support analysis of science and technical texts, attending to the precise details of explanations or descriptions.

**LAFS.910.RST.1.3:**
Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks, attending to special cases or exceptions defined in the text.

**LAFS.910.RST.2.4:**
Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 9–10 texts and topics.

**LAFS.910.RST.2.5:**
Translate quantitative or technical information expressed in words in a text into visual form (e.g., a table or chart) and translate information expressed visually or mathematically (e.g., in an equation) into words.

**LAFS.910.RST.3.7:**
By the end of grade 10, read and comprehend science/technical texts in the grades 9–10 text complexity band independently and proficiently.

**LAFS.1012.WHST.1.2:**
Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases. ★

a. Graph linear and quadratic functions and show intercepts, maxima, and minima.
b. Graph square root, cube root, and piecewise-defined functions, including step functions and absolute value functions.
c. Graph polynomial functions, identifying zeros when suitable factorizations are available, and showing end behavior.
d. Graph rational functions, identifying zeros and asymptotes when suitable factorizations are available, and showing end behavior.
e. Graph exponential and logarithmic functions, showing intercepts and end behavior, and trigonometric functions, showing period, midline, and amplitude, and using phase shift.

**MAFS.912.F-IF.3.7:**
Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays. ★

**MAFS.912.N-Q.1.1:**
Use a level of accuracy appropriate to limitations on measurement when reporting quantities. ★

**MAFS.912.N-VM.1.3:**
Solve problems involving velocity and other quantities that can be represented by vectors.

**MAFS.912.N-Q.1.3:**
Make sense of problems and persevere in solving them.

Mathematically proficient students start by explaining to themselves the meaning of a problem and looking for entry points to its solution. They analyze givers, constraints, relationships, and goals. They make conjectures about the form and meaning of the solution and plan a solution pathway rather than simply jumping into a solution attempt. They consider analogous problems, and try special cases and simpler forms of the original problem in order to gain insight into its solution. They monitor and evaluate their progress and change course if necessary. Older students
might, depending on the context of the problem, transform algebraic expressions or change the viewing window on their graphing calculator to get the information they need. Mathematically proficient students can explain correspondences between equations, verbal descriptions, tables, and graphs or draw diagrams of important features and relationships, graph data, and search for regularity or trends. Younger students might rely on using concrete objects or pictures to help conceptualize and solve a problem. Mathematically proficient students check their answers to problems using a different method, and they continually ask themselves, “Does this make sense?” They can understand the approaches of others to solving complex problems and identify correspondences between different approaches.

**Standard Relation to Course: Supporting**

**Reason abstractly and quantitatively.**

Mathematically proficient students make sense of quantities and their relationships in problem situations. They bring two complementary abilities to bear on problems involving quantitative relationships: the ability to decontextualize—to abstract a given situation and represent it symbolically and manipulate the representing symbols as if they have a life of their own, without necessarily attending to their referents—and the ability to contextualize, to pause as needed during the manipulation process in order to probe into the referents for the symbols involved. Quantitative reasoning entails habits of creating a coherent representation of the problem at hand; considering the units involved; attending to the meaning of quantities, not just how to compute them; and knowing and flexibly using different properties of operations and objects.

**Standard Relation to Course: Supporting**

**Construct viable arguments and critique the reasoning of others.**

Mathematically proficient students understand and use stated assumptions, definitions, and previously established results in constructing arguments. They make conjectures and build a logical progression of statements to explore the truth of their conjectures. They are able to analyze situations by breaking them into cases, and can recognize and use counterexamples. They justify their conclusions, communicate them to others, and respond to the arguments of others. They reason inductively about data, making plausible arguments that take into account the context from which the data arose. Mathematically proficient students are also able to compare the effectiveness of two plausible arguments, distinguish correct logic or reasoning from that which is flawed, and—if there is a flaw in an argument—explain what it is. Elementary students can construct arguments using concrete referents such as objects, drawings, diagrams, and actions. Such arguments can make sense and be correct, even though they are not generalized or made formal until later grades. Later, students learn to determine domains to which an argument applies. Students at all grades can listen or read the arguments of others, decide whether they make sense, and ask useful questions to clarify or improve the arguments.

**Standard Relation to Course: Supporting**

**Model with mathematics.**

Mathematically proficient students can apply the mathematics they know to solve problems arising in everyday life, society, and the workplace. In early grades, this might be as simple as writing an addition equation to describe a situation. In middle grades, a student might apply proportional reasoning to plan a school event or analyze a problem in the community. By high school, a student might use geometry to solve a design problem or use a function to describe how one quantity of interest depends on another. Mathematically proficient students who can apply what they know are comfortable making assumptions and approximations to simplify a complicated situation, realizing that these may need revision later. They are able to identify important quantities in a practical situation and map their relationships using such tools as diagrams, two-way tables, graphs, flowcharts and formulas. They can analyze those relationships mathematically to draw conclusions. They routinely interpret their mathematical results in the context of the situation and reflect on whether the results make sense, possibly improving the model if it has not served its purpose.

**Standard Relation to Course: Supporting**

**Use appropriate tools strategically.**

Mathematically proficient students consider the available tools when solving a mathematical problem. These tools might include pencil and paper, concrete models, a ruler, a protractor, a calculator, a spreadsheet, a computer algebra system, a statistical package, or dynamic geometry software. Proficient students are sufficiently familiar with tools appropriate for their grade or course to make sound decisions about when each of these tools might be helpful, recognizing both the insight to be gained and their limitations. For example, mathematically proficient high school students analyze graphs of functions and solutions generated using a graphing calculator. They detect possible errors by strategically using estimation and other mathematical knowledge. When making mathematical models, they know that technology can enable them to visualize the results of varying assumptions, explore consequences, and compare predictions with data. Mathematically proficient students at various grade levels are able to identify relevant external mathematical resources, such as digital content located on a website, and use them to pose or solve problems. They are able to use technological tools to explore and deepen their understanding of concepts.

**Standard Relation to Course: Supporting**

**Attend to precision.**

Mathematically proficient students try to communicate precisely to others. They use clear definitions in discussion with others and in their own reasoning. They state the meaning of the symbols they choose, including using the equal sign consistently and appropriately. They are careful about specifying units of measure, and labeling axes to clarify the correspondence with quantities in a problem. They calculate accurately and efficiently, express numerical answers with a degree of precision appropriate for the problem context. In the elementary grades, students give carefully formulated explanations to each other. By the time they reach high school they have learned to examine claims and make explicit use of definitions.

**Standard Relation to Course: Supporting**

**Look for and make use of structure.**

Mathematically proficient students look closely to discern a pattern or structure. Young students, for example, might notice that three and seven more is the same amount as seven and three more, or they may sort a collection of shapes according to how many sides the shapes have. Later, students will see 7 x 8 equals the well remembered 7 x 5 + 7 x 3, in preparation for learning about the distributive property. In the expression x^2 + 9x + 14, older students can see the 14 as 2 × 7 and may sort a collection of shapes according to how many sides the shapes have. Later, they might notice that three and seven more is the same amount as seven and three more, or they may sort a collection of shapes according to how many sides the shapes have.
middle school students might abstract the equation \((y - 2)/(x - 1) = 3\). Noticing the regularity in the way terms cancel when expanding \((x - 1)(x + 1)\), \((x - 1)(x^2 + x + 1)\), and \((x - 1)(x^3 + x^2 + x + 1)\) might lead them to the general formula for the sum of a geometric series. As they work to solve a problem, mathematically proficient students maintain oversight of the process, while attending to the details. They continually evaluate the reasonableness of their intermediate results.

**General Course Information and Notes**

**GENERAL NOTES**

Laboratory investigations that include the use of scientific inquiry, research, measurement, problem solving, laboratory apparatus and technologies, experimental procedures, and safety procedures are an integral part of this course. The National Science Teachers Association (NSTA) recommends that at the high school level, all students should be in the science lab or field, collecting data every week. School laboratory investigations (labs) are defined by the National Research Council (NRC) as an experience in the laboratory, classroom, or the field that provides students with opportunities to interact directly with natural phenomena or with data collected by others using tools, materials, data collection techniques, and models (NRC, 2006, p. 3). Laboratory investigations in the high school classroom should help all students develop a growing understanding of the complexity and ambiguity of empirical work, as well as the skills to calibrate and troubleshoot equipment used to make observations. Learners should understand measurement error; and have the skills to aggregate, interpret, and present the resulting data (National Research Council, 2006, p. 77; NSTA, 2007).

**Special Notes:**

**Instructional Practices**

Teaching from a range of complex text is optimized when teachers in all subject areas implement the following strategies on a routine basis:

1. Ensuring wide reading from complex text that varies in length.
2. Making close reading and rereading of texts central to lessons.
3. Emphasizing text-specific complex questions, and cognitively complex tasks, reinforce focus on the text and cultivate independence.
4. Emphasizing students supporting answers based upon evidence from the text.
5. Providing extensive research and writing opportunities (claims and evidence).

**Science and Engineering Practices** (NRC Framework for K-12 Science Education, 2010)

- Asking questions (for science) and defining problems (for engineering).
- Developing and using models.
- Planning and carrying out investigations.
- Analyzing and interpreting data.
- Using mathematics, information and computer technology, and computational thinking.
- Constructing explanations (for science) and designing solutions (for engineering).
- Engaging in argument from evidence.
- Obtaining, evaluating, and communicating information.

**Literacy Standards in Science**

Secondary science courses include reading standards for literacy in science and technical subjects 6-12 and writing standards for literacy in history/social studies, science, and technical subjects 6-12. The courses also include speaking and listening standards. For a complete list of standards required for this course click on the blue tile labeled course standards. You may also download the complete course including all required standards and notes sections using the export function located at the top of this page.

**English Language Development ELD Standards Special Notes Section:**

Teachers are required to provide listening, speaking, reading and writing instruction that allows English language learners (ELL) to communicate information, ideas and concepts for academic success in the content area of Science. For the given level of English language proficiency and with visual, graphic, or interactive support, students will interact with grade level words, expressions, sentences and discourse to process or produce language necessary for academic success. The ELD standard should specify a relevant content area concept or topic of study chosen by curriculum developers and teachers which maximizes an ELL’s need for communication and social skills.

To access an ELL supporting document which delineates performance definitions and descriptors, please click on the following link: https://cpalmsmediaprod.blob.core.windows.net/uploads/docs/standards/eld/sc.pdf

**GENERAL INFORMATION**

**Course Number:** 2002490

**Course Path:** Section: Grades PreK to 12 Education

Courses > Grade Group: Grades 9 to 12 and Adult Education Courses > Subject: Science > SubSubject: Integrated Sciences

**Abbreviated Title:** FOR SCI 2

**Course Length:** Year (Y)

**Course Level:** 2

**Number of Credits:** One (1) credit

**Course Type:** Core Academic Course

**Course Status:** Course Approved

**Grade Level(s):** 9,10,11,12

**Graduation Requirement:** Equally Rigorous Science
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<td>SC.912.L.18.4:</td>
<td>Describe the structures of proteins and amino acids. Explain the functions of proteins in living organisms. Identify some reactions that amino acids undergo. Relate the structure and function of enzymes.</td>
</tr>
<tr>
<td>SC.912.L.18.10:</td>
<td>Connect the role of adenosine triphosphate (ATP) to energy transfers within a cell.</td>
</tr>
<tr>
<td>SC.912.L.18.11:</td>
<td>Explain the role of enzymes as catalysts that lower the activation energy of biochemical reactions. Identify factors, such as pH and temperature, and their effect on enzyme activity.</td>
</tr>
<tr>
<td>SC.912.L.18.12:</td>
<td>Discuss the special properties of water that contribute to Earth's suitability as an environment for life: cohesive behavior, ability to moderate temperature, expansion upon freezing, and versatility as a solvent.</td>
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Define a problem based on a specific body of knowledge, for example: biology, chemistry, physics, and earth/space science, and do the following:

1. Pose questions about the natural world, (Articulate the purpose of the investigation and identify the relevant scientific concepts).
2. Conduct systematic observations, (Write procedures that are clear and replicable. Identify observables and examine relationships between a test (independent) variable and outcome (dependent) variable. Employ appropriate methods for accurate and consistent observations; conduct and record measurements at appropriate levels of precision. Follow safety guidelines).
3. Examine books and other sources of information to see what is already known,
4. Review what is known in light of empirical evidence, (Examine whether available empirical evidence can be interpreted in terms of existing knowledge and models, and if not, modify or develop new models).
5. Plan investigations, (Design and evaluate a scientific investigation).
6. Use tools to gather, analyze, and interpret data (this includes the use of measurement in metric and other systems, and also the generation and interpretation of graphical representations of data, including data tables and graphs), (Collect data or evidence in an organized way. Properly use instruments, equipment, and materials (e.g., scales, probeware, meter sticks, microscopes, computers) including set-up, calibration, technique, maintenance, and storage).
7. Pose answers, explanations, or descriptions of events,
8. Generate explanations that explicate or describe natural phenomena (inferences),
9. Use appropriate evidence and reasoning to justify these explanations to others,
10. Communicate results of scientific investigations, and
11. Evaluate the merits of the explanations produced by others.

Describe what characterizes science and its methods.

Recognize that the strength or usefulness of a scientific claim is evaluated through scientific argumentation, which depends on critical and logical thinking, and the active consideration of alternative scientific explanations to explain the data presented.
| SC.912.N.1.4: | Identify sources of information and assess their reliability according to the strict standards of scientific investigation. |
| SC.912.N.1.5: | Describe and provide examples of how similar investigations conducted in many parts of the world result in the same outcome. |
| SC.912.N.1.6: | Describe how scientific inferences are drawn from scientific observations and provide examples from the content being studied. |
| SC.912.N.2.4: | Explain that scientific knowledge is both durable and robust and open to change. Scientific knowledge can change because it is often examined and re-examined by new investigations and scientific argumentation. Because of these frequent examinations, scientific knowledge becomes stronger, leading to its durability. |
| SC.912.N.3.5: | Describe the function of models in science, and identify the wide range of models used in science. |
| SC.912.N.4.1: | Explain how scientific knowledge and reasoning provide an empirically-based perspective to inform society's decision making. |
| SC.912.N.4.2: | Weigh the merits of alternative strategies for solving a specific societal problem by comparing a number of different costs and benefits, such as human, economic, and environmental. |
| SC.912.P.8.7: | Interpret formula representations of molecules and compounds in terms of composition and structure. |
| SC.912.P.8.8: | Characterize types of chemical reactions, for example: redox, acid-base, synthesis, and single and double replacement reactions. |
| SC.912.P.8.13: | Identify selected functional groups and relate how they contribute to properties of carbon compounds. |
| SC.912.P.10.4: | Describe heat as the energy transferred by convection, conduction, and radiation, and explain the connection of heat to change in temperature or states of matter. |
| SC.912.P.10.7: | Distinguish between endothermic and exothermic chemical processes. |
| SC.912.P.10.13: | Relate the configuration of static charges to the electric field, electric force, electric potential, and electric potential energy. |
| SC.912.P.10.15: | Investigate and explain the relationships among current, voltage, resistance, and power. |
| SC.912.P.10.18: | Explore the theory of electromagnetism by comparing and contrasting the different parts of the electromagnetic spectrum in terms of wavelength, frequency, and energy, and relate them to phenomena and applications. |
| SC.912.P.12.1: | Distinguish between scalar and vector quantities and assess which should be used to describe an event. |
| SC.912.P.12.2: | Analyze the motion of an object in terms of its position, velocity, and acceleration (with respect to a frame of reference) as functions of time. |
| SC.912.P.12.3: | Interpret and apply Newton's three laws of motion. |
| SC.912.P.12.5: | Apply the law of conservation of linear momentum to interactions, such as collisions between objects. |
| SC.912.P.12.6: | Qualitatively apply the concept of angular momentum. |
| SC.912.P.12.12: | Explain how various factors, such as concentration, temperature, and presence of a catalyst affect the rate of a chemical reaction. |

**Mathematicians who participate in effortful learning both individually and with others:**
- Analyze the problem in a way that makes sense given the task.
- Ask questions that will help with solving the task.
- Build perseverance by modifying methods as needed while solving a challenging task.
- Stay engaged and maintain a positive mindset when working to solve tasks.
- Help and support each other when attempting a new method or approach.

**Clariﬁcations:**
- Teachers who encourage students to participate actively in effortful learning both individually and with others:
  - Cultivate a community of growth mindset learners.
  - Foster perseverance in students by choosing tasks that are challenging.
  - Develop students’ ability to analyze and problem solve.
  - Recognize students’ effort when solving challenging problems.

**Mathematicians who demonstrate understanding by representing problems in multiple ways:**
- Build understanding through modeling and using manipulatives.
- Represent solutions to problems in multiple ways using objects, drawings, tables, graphs and equations.
- Progress from modeling problems with objects and drawings to using algorithms and equations.
- Express connections between concepts and representations.
- Choose a representation based on the given context or purpose.

**Clariﬁcations:**
- Teachers who encourage students to demonstrate understanding by representing problems in multiple ways:
  - Help students make connections between concepts and representations.
  - Provide opportunities for students to use manipulatives when investigating concepts.
  - Guide students from concrete to pictorial to abstract representations as understanding progresses.
  - Show students that various representations can have different purposes and can be useful in different situations.

**Mathematicians who complete tasks with mathematical ﬂuency:**
- Select efficient and appropriate methods for solving problems within the given context.
- Maintain ﬂexibility and accuracy while performing procedures and mental calculations.
- Complete tasks accurately and with conﬁdence.
- Adapt procedures to apply them to a new context.
- Use feedback to improve efﬁciency when performing calculations.

**Clariﬁcations:**
- Teachers who encourage students to complete tasks with mathematical ﬂuency:
  - Provide students with the ﬂexibility to solve problems by selecting a procedure that allows them to solve efﬁciently and accurately.
  - Offer multiple opportunities for students to practice efﬁcient and generalizable methods.
  - Provide opportunities for students to reﬂect on the method they used and determine if a more efﬁcient method could have been used.

**Mathematicians who engage in discussions that reflect on the mathematical thinking of self and others:**
- Engage in discussions that reﬂect on the mathematical thinking of self and others.
Communicate mathematical ideas, vocabulary and methods effectively.
Analyze the mathematical thinking of others.
Compare the efficiency of a method to those expressed by others.
Recognize errors and suggest how to correctly solve the task.
Justify results by explaining methods and processes.
Construct possible arguments based on evidence.

Clarifications:
Teachers who encourage students to engage in discussions that reflect on the mathematical thinking of self and others:
- Establish a culture in which students ask questions of the teacher and their peers, and error is an opportunity for learning.
- Create opportunities for students to discuss their thinking with peers.
- Select, sequence and present student work to advance and deepen understanding of correct and increasingly efficient methods.
- Develop students' ability to justify methods and compare their responses to the responses of their peers.

Use patterns and structure to help understand and connect mathematical concepts.
Mathematicians who use patterns and structure to help understand and connect mathematical concepts:
- Focus on relevant details within a problem.
- Create plans and procedures to logically order events, steps or ideas to solve problems.
- Decompose a complex problem into manageable parts.
- Relate previously learned concepts to new concepts.
- Look for similarities among problems.
- Connect solutions of problems to more complicated large-scale situations.

Clarifications:
Teachers who encourage students to use patterns and structure to help understand and connect mathematical concepts:
- Help students recognize the patterns in the world around them and connect these patterns to mathematical concepts.
- Support students to develop generalizations based on the similarities found among problems.
- Provide opportunities for students to create plans and procedures to solve problems.
- Develop students' ability to construct relationships between their current understanding and more sophisticated ways of thinking.

Assess the reasonableness of solutions.
Mathematicians who assess the reasonableness of solutions:
- Estimate to discover possible solutions.
- Use benchmark quantities to determine if a solution makes sense.
- Check calculations when solving problems.
- Verify possible solutions by explaining the methods used.
- Evaluate results based on the given context.

Clarifications:
Teachers who encourage students to assess the reasonableness of solutions:
- Have students estimate or predict solutions prior to solving.
- Prompt students to continually ask, “Does this solution make sense? How do you know?”
- Reinforce that students check their work as they progress within and after a task.
- Strengthen students' ability to verify solutions through justifications.

Apply mathematics to real-world contexts.
Mathematicians who apply mathematics to real-world contexts:
- Connect mathematical concepts to everyday experiences.
- Use models and methods to understand, represent and solve problems.
- Perform investigations to gather data or determine if a method is appropriate. • Redesign models and methods to improve accuracy or efficiency.

Clarifications:
Teachers who encourage students to apply mathematics to real-world contexts:
- Provide opportunities for students to create models, both concrete and abstract, and perform investigations.
- Challenge students to question the accuracy of their models and methods.
- Support students as they validate conclusions by comparing them to the given situation.
- Indicate how various concepts can be applied to other disciplines.

Cite evidence to explain and justify reasoning.

Clarifications:
K-1 Students include textual evidence in their oral communication with guidance and support from adults. The evidence can consist of details from the text without naming the text. During 1st grade, students learn how to incorporate the evidence in their writing.
2-3 Students include relevant textual evidence in their written and oral communication. Students should name the text when they refer to it. In 3rd grade, students should use a combination of direct and indirect citations.
4-5 Students continue with previous skills and reference comments made by speakers and peers. Students cite texts that they've directly quoted, paraphrased, or used for information. When writing, students will use the form of citation dictated by the instructor or the style guide referenced by the instructor.
6-8 Students continue with previous skills and use a style guide to create a proper citation.
9-12 Students continue with previous skills and should be aware of existing style guides and the ways in which they differ.

Read and comprehend grade-level complex texts proficiently.

Clarifications:
See Text Complexity for grade-level complexity bands and a text complexity rubric.
**GENERAL NOTES**

Laboratory investigations that include the use of scientific inquiry, research, measurement, problem solving, laboratory apparatus and technologies, experimental procedures, and safety procedures are an integral part of this course. The National Science Teachers Association (NSTA) recommends that at the high school level, all students should be in the science lab or field, collecting data every week. School laboratory investigations (labs) are defined by the National Research Council (NRC) as an experience in the laboratory, classroom, or the field that provides students with opportunities to interact directly with natural phenomena or with data collected by others using tools, materials, data collection techniques, and models (NRC, 2006, p. 3). Laboratory investigations in the high school classroom should help all students develop a growing understanding of the complexity and ambiguity of empirical work, as well as the skills to calibrate and troubleshoot equipment used to make observations. Learners should understand measurement error; and have the skills to aggregate, interpret, and present the resulting data (National Research Council, 2006, p. 77; NSTA, 2007).

**Special Notes:**

**Instructional Practices**

Teaching from a range of complex text is optimized when teachers in all subject areas implement the following strategies on a routine basis:

1. Ensuring wide reading from complex text that varies in length.
3. Emphasizing text-specific complex questions, and cognitively complex tasks, reinforce focus on the text and cultivate independence.
4. Emphasizing students supporting answers based upon evidence from the text.
5. Providing extensive research and writing opportunities (claims and evidence).

**Science and Engineering Practices** (NRC Framework for K-12 Science Education, 2010)

- Asking questions (for science) and defining problems (for engineering).
- Developing and using models.
- Planning and carrying out investigations.
- Analyzing and interpreting data.
- Using mathematics, information and computer technology, and computational thinking.
- Constructing explanations (for science) and designing solutions (for engineering).
- Engaging in argument from evidence.
- Obtaining, evaluating, and communicating information.

**Florida's Benchmarks for Excellent Student Thinking (B.E.S.T.) Standards**

This course includes Florida's B.E.S.T. ELA Expectations (EE) and Mathematical Thinking and Reasoning Standards (MTRs) for students. Florida educators should intentionally embed these courses within the content and their instruction as applicable. For guidance on the implementation of the EE and MTR standards, please visit https://www.cpalms.org/Standards/BEST_Standards.aspx and select the appropriate B.E.S.T. Standards package.

**English Language Development ELD Standards Special Notes Section:**

Teachers are required to provide listening, speaking, reading, and writing instruction that allows English language learners (ELL) to communicate information, ideas and concepts for academic success in the content area of Science. For the given level of English language proficiency and with visual, graphic, or interactive support, students will interact with grade level words, expressions, sentences and discourse to process or produce language necessary for academic success. The ELD standard should specify a relevant content area concept or topic of study chosen by curriculum developers and teachers which maximizes an ELL's need for communication and social skills. To access an ELL supporting document which delineates performance definitions and descriptors, please click on the following link: https://cpalmsmediaprod.blob.core.windows.net/uploads/docs/standards/eld/sc.pdf
**Educator Certifications**

<table>
<thead>
<tr>
<th>Certification</th>
<th>Subject</th>
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</thead>
<tbody>
<tr>
<td>Middle Grades General Science (Middle Grades 5-9)</td>
<td>Integrated Sciences</td>
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<tr>
<td>Earth/Space Science (Grades 6-12)</td>
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<tr>
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<tr>
<td>Science (Secondary Grades 7-12)</td>
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Explain the general distribution of life in aquatic systems as a
Explain how scientific knowledge and reasoning provide an empirically-based perspective to inform society's decision making.
Explore the Law of Conservation of Energy by differentiating among
Recognize that the strength or usefulness of a scientific claim is
Discuss the characteristics of populations, such as number of individuals, age structure, density, and pattern of distribution.
Discuss how various oceanic and freshwater processes, such as currents, tides, and waves, affect the abundance of aquatic organisms.
Describe changes in ecosystems resulting from seasonal variations, climate change and succession.
Compare and contrast the relationships among organisms, including predation, parasitism, competition, commensalism, and mutualism.
Characterize the biotic and abiotic components that define freshwater systems, marine systems and terrestrial systems.
Recognize the consequences of the losses of biodiversity due to catastrophic events, climate changes, human activity, and the introduction of invasive, non-native species.
Use a food web to identify and distinguish producers, consumers, and decomposers. Explain the pathway of energy transfer through trophic levels and the reduction of available energy at successive trophic levels.
Diagram and explain the biogeochemical cycles of an ecosystem, including water, carbon, and nitrogen cycle.
Evaluate the costs and benefits of renewable and nonrenewable resources, such as water, energy, fossil fuels, wildlife, and forests.
Discuss the large-scale environmental impacts resulting from human activity, including waste spills, oil spills, runoff, greenhouse gases, ozone depletion, and surface and groundwater pollution.
Discuss the special properties of water that contribute to Earth's suitability as an environment for life: cohesive behavior, ability to moderate temperature, expansion upon freezing, and versatility as a solvent.

**Course Standards**

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<td>Cite evidence that the ocean has had a significant influence on climate change by absorbing, storing, and moving heat, carbon, and water.</td>
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<td>SC.912.L.14.6:</td>
<td>Explain the significance of genetic factors, environmental factors, and pathogenic agents to health from the perspectives of both individual and public health.</td>
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<td>SC.912.L.15.13:</td>
<td>Describe the conditions required for natural selection, including: overproduction of offspring, inherited variation, and the struggle to survive, which result in differential reproductive success.</td>
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<td>SC.912.L.17.2:</td>
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<td>Diagram and explain the biogeochemical cycles of an ecosystem, including water, carbon, and nitrogen cycle.</td>
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<td>Evaluate the costs and benefits of renewable and nonrenewable resources, such as water, energy, fossil fuels, wildlife, and forests.</td>
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<td>SC.912.L.17.16:</td>
<td>Discuss the large-scale environmental impacts resulting from human activity, including waste spills, oil spills, runoff, greenhouse gases, ozone depletion, and surface and groundwater pollution.</td>
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<td>Discuss the special properties of water that contribute to Earth's suitability as an environment for life: cohesive behavior, ability to moderate temperature, expansion upon freezing, and versatility as a solvent.</td>
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Define a problem based on a specific body of knowledge, for example: biology, chemistry, physics, and earth/space science, and do the following:

1. Pose questions about the natural world, (Articulate the purpose of the investigation and identify the relevant scientific concepts).
2. Conduct systematic observations, (Write procedures that are clear and replicable. Identify observables and examine relationships between test (independent) variable and outcome (dependent) variable. Employ appropriate methods for accurate and consistent observations; conduct and record measurements at appropriate levels of precision. Follow safety guidelines).
3. Examine books and other sources of information to see what is already known,
4. Review what is known in light of empirical evidence, (Examine whether available empirical evidence can be interpreted in terms of existing knowledge and models, and if not, modify or develop new models).
5. Plan investigations, (Design and evaluate a scientific investigation).
6. Use tools to gather, analyze, and interpret data (this includes the use of measurement in metric and other systems, and also the generation and interpretation of graphical representations of data, including data tables and graphs), (Collect data or evidence in an organized way. Properly use instruments, equipment, and materials (e.g., scales, probeware, meter sticks, microscopes, computers) including set-up, calibration, technique, maintenance, and storage).
7. Pose answers, explanations, or descriptions of events,
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11. Evaluate the merits of the explanations produced by others.

Describe and explain what characterizes science and its methods.

Recognize that the strength or usefulness of a scientific claim is evaluated through scientific argumentation, which depends on critical and logical thinking, and the active consideration of alternative scientific explanations to explain the data presented.

Identify sources of information and assess their reliability according to the strict standards of scientific investigation.

Describe and provide examples of how similar investigations conducted in many parts of the world result in the same outcome.

Describe how scientific inferences are drawn from scientific observations and provide examples from the content being studied.

Recognize the role of creativity in constructing scientific questions, methods and explanations.

Identify what is science, what clearly is not science, and what superficially resembles science (but fails to meet the criteria for science).

Explain that scientific knowledge is both durable and robust and open to change. Scientific knowledge can change because it is often examined and re-examined by new investigations and scientific argumentation. Because of these frequent examinations, scientific knowledge becomes stronger, leading to its durability.

Describe instances in which scientists' varied backgrounds, talents, interests, and goals influence the inferences and thus the explanations that they make about observations of natural phenomena and describe that competing interpretations (explanations) of scientists are a strength of science as they are a source of new, testable ideas that have the potential to add new evidence to support one or another of the explanations.

Explain that a scientific theory is the culmination of many scientific investigations drawing together all the current evidence concerning a substantial range of phenomena; thus, a scientific theory represents the most powerful explanation scientists have to offer.

Describe the function of models in science, and identify the wide range of models used in science.

Describe how scientific knowledge and reasoning provide an empirically-based perspective to inform society's decision making.

Weigh the merits of alternative strategies for solving a specific societal problem by comparing a number of different costs and benefits, such as human, economic, and environmental.

Explore the Law of Conservation of Energy by differentiating among open, closed, and isolated systems and explain that the total energy in an isolated system is a conserved quantity.
SC.912.P.10.20: Describe the measurable properties of waves and explain the relationships among them and how these properties change when the wave moves from one medium to another.

LAFS.1112.RST.1.1: Cite specific textual evidence to support analysis of science and technical texts, attending to important distinctions the author makes and to any gaps or inconsistencies in the account.

LAFS.1112.RST.1.2: Determine the central ideas or conclusions of a text; summarize complex concepts, processes, or information presented in a text by paraphrasing them in simpler but still accurate terms.

LAFS.1112.RST.1.3: Follow precisely a complex multiphase procedure when carrying out experiments, taking measurements, or performing technical tasks; analyze the specific results based on explanations in the text.

LAFS.1112.RST.2.4: Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 11-12 texts and topics.

LAFS.1112.RST.2.5: Analyze how the text structures information or ideas into categories or hierarchies, demonstrating understanding of the information or ideas.

LAFS.1112.RST.2.6: Analyze the author's purpose in providing an explanation, describing a procedure, or discussing an experiment in a text, identifying important issues that remain unresolved.

LAFS.1112.RST.3.7: Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g., quantitative data, video, multimedia) in order to address a question or solve a problem.

LAFS.1112.RST.3.8: Evaluate the hypotheses, data, analysis, and conclusions in a science or technical text, verifying the data when possible and corroborating or challenging conclusions with other sources of information.

LAFS.1112.RST.3.9: Synthesize information from a range of sources (e.g., texts, experiments, simulations) into a coherent understanding of a process, phenomenon, or concept, resolving conflicting information when possible.

LAFS.1112.RST.4.10: By the end of grade 12, read and comprehend science/technical texts in the grades 11–12 text complexity band independently and proficiently.

Initiate and participate effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grades 11–12 topics, texts, and issues, building on others' ideas and expressing their own clearly and persuasively.

• a. Come to discussions prepared, having read and researched material under study; explicitly draw on that preparation by referring to evidence from texts and other research on the topic or issue to initiate a thoughtful, well-reasoned exchange of ideas.

• b. Work with peers to promote civil, democratic discussions and decision-making, set clear goals and deadlines, and establish individual roles as needed.

• c. Propose conversations by posing and responding to questions that probe reasoning and evidence; ensure a hearing for a full range of positions on a topic or issue; clarify, verify, or challenge ideas and conclusions; and promote divergent and creative perspectives.

• d. Respond thoughtfully to diverse perspectives; synthesize comments, claims, and evidence made on all sides of an issue; resolve contradictions and meanings when possible; and determine what additional information or research is required to deepen the investigation or complete the task.

Integrate multiple sources of information presented in diverse formats and media (e.g., visually, quantitatively, orally) in order to make informed decisions and solve problems, evaluating the credibility and accuracy of each source and noting any discrepancies among the data.

Evaluate a speaker's point of view, reasoning, and use of evidence and rhetoric, assessing the stance, premises, links among ideas, word choice, points of emphasis, and tone used.

Present information, findings, and supporting evidence, conveying a clear and distinct perspective, such that listeners can follow the line of reasoning, alternative or opposing perspectives are addressed, and the organization, development, substance, and style are appropriate to purpose, audience, and a range of formal and informal tasks.

Make strategic use of digital media (e.g., textual, graphical, audio, visual, and interactive elements) in presentations to enhance understanding of findings, reasoning, and evidence and to add interest.

Write arguments focused on discipline-specific content.

• a. Introduce precise, knowledgeable claim(s), establish the significance of the claim(s), distinguish the claim(s) from alternate or opposing claims, and create an organization that logically sequences the claim(s), counterclaims, reasons, and evidence.

• b. Develop claim(s) and counterarguments fairly and thoroughly, supplying the most relevant data and evidence for each while pointing out the strengths and limitations of both claim(s) and counterarguments in a discipline-appropriate form that anticipates the audience's knowledge level, concerns, values, and possible biases.

• c. Use words, phrases, and clauses as well as varied syntax to link the major sections of the text, create cohesion, and clarify the relationships between claim(s) and reasons, between reasons and evidence, and between claim(s) and counterarguments.

• d. Establish and maintain a formal style and objective tone while attending to the norms and conventions of the discipline in which they are writing.

• e. Provide a concluding statement or section that follows from or supports the argument presented.

Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes.

• a. Introduce a topic and organize complex ideas, concepts, and information so that each new element builds on that which preceded it to create a unified whole; include formatting (e.g., headings), graphics (e.g., figures, tables), and multimedia when useful to aiding comprehension.

• b. Develop the topic thoroughly by selecting the most significant and relevant facts, extended definitions, concrete details, quotations, or other information and examples appropriate to the audience's knowledge of the topic.

• c. Use varied transitions and sentence structures to link the major sections of the text, create cohesion, and clarify the relationships among complex ideas and concepts.

• d. Use precise language, domain-specific vocabulary and techniques such as metaphor, simile, and analogy to manage the complexity of the topic; convey a knowledgeable stance in a style that responds to the discipline and context as well as to the expertise of likely readers.

• e. Provide a concluding statement or section that follows from and supports the information or explanation provided (e.g., articulating implications or the significance of the topic).

Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.

Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience.

Use technology, including the Internet, to produce, publish, and update individual or shared writing products in response to ongoing feedback, including new arguments or information.

Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation.

Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the strengths and limitations of each source in terms of the specific task, purpose, and audience; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and overreliance on any one source and following a standard format for citation.
Draw evidence from informational texts to support analysis, reflection, and research.

Write routinely over extended time frames (time for reflection and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences.

For a function that models a relationship between two quantities, interpret key features of graphs and tables in terms of the quantities, and sketch graphs showing key features given a verbal description of the relationship. Key features include: intercepts; intervals where the function is increasing, decreasing, positive, or negative; relative maximums and minimums; symmetries, end behavior, and periodicity.

Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases.

- Graph linear and quadratic functions and show intercepts, maxima, and minima.
- Graph square root, cube root, and piecewise-defined functions, including step functions and absolute value functions.
- Graph polynomial functions, identifying zeros when suitable factorizations are available, and showing end behavior.
- Graph rational functions, identifying zeros and asymptotes when suitable factorizations are available, and showing end behavior.
- Graph exponential and logarithmic functions, showing intercepts and end behavior, and trigonometric functions, showing period, midline, and amplitude, and using phase shift.

Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays.

Use statistics appropriate to the shape of the data distribution to compare center (median, mean) and spread (interquartile range, standard deviation) of two or more different data sets.

Use statistics appropriate to the shape of the data distribution to compare center (median, mean) and spread (interquartile range, standard deviation) of two or more different data sets.

Interpret differences in shape, center, and spread in the context of the data sets, accounting for possible effects of extreme data points (outliers).

Make sense of problems and persevere in solving them.

Mathematically proficient students start by explaining to themselves the meaning of a problem and looking for entry points to its solution. They analyze givens, constraints, relationships, and goals. They make conjectures about the form and meaning of the solution and plan a solution pathway rather than simply jumping into a solution attempt. They consider analogous problems, and try special cases and simpler forms of the original problem in order to gain insight into its solution. They monitor and evaluate their progress and change course if necessary. Older students might, depending on the context of the problem, transform algebraic expressions or change the viewing window on their graphing calculator to get the information they need. Mathematically proficient students can explain correspondences between equations, verbal descriptions, tables, and graphs or draw diagrams of important features and relationships, graph data, and search for regularity or trends. Younger students might rely on using concrete objects or pictures to help conceptualize and solve a problem. Mathematically proficient students check their answers to problems using a different method, and they continually ask themselves, "Does this make sense?" They can understand the approaches of others to solving complex problems and identify correspondences between different approaches.

Reason abstractly and quantitatively.

Mathematically proficient students make sense of quantities and their relationships in problem situations. They bring two complementary abilities to bear on problems involving quantitative relationships: the ability to decontextualize—to abstract a given situation and represent it symbolically and manipulate the representing symbols as if they have a life of their own, without necessarily attending to their referents—and the ability to contextualize, to pause as needed during the manipulation process in order to probe into the referents for the symbols involved. Quantitative reasoning entails habits of creating a coherent representation of the problem at hand; considering the units involved; attending to the meaning of quantities, not just how to compute them; and knowing and flexibly using different properties of operations and objects.

Construct viable arguments and critique the reasoning of others.

Mathematically proficient students understand and use stated assumptions, definitions, and previously established results in constructing arguments. They make conjectures and build a logical progression of statements to explore the truth of their conjectures. They are able to analyze situations by breaking them into cases, and can recognize and use counterexamples. They justify their conclusions, communicate them to others, and respond to the arguments of others. They reason inductively about data, making plausible arguments that take into account the context from which the data arose. Mathematically proficient students are also able to compare the effectiveness of two plausible arguments, distinguish correct logic or reasoning from that which is flawed, and—if there is a flaw in an argument—explain what it is. Elementary students can construct arguments using concrete referents such as objects, drawings, diagrams, and actions. Such arguments can make sense and be correct, even though they are not generalized or made formal until later grades. Later, students learn to determine domains to which an argument applies. Students at all grades can listen or read the arguments of others, decide whether they make sense, and ask useful questions to clarify or improve the arguments.

Model with mathematics.

Mathematically proficient students can apply the mathematics they know to solve problems arising in everyday life, society, and the workplace. In early grades, this might be as simple as writing an addition equation to describe a situation. In middle grades, a student might apply proportional reasoning to plan a school event or analyze a problem in the community. By high school, a student might use geometry to solve a design problem or use a function to describe how one quantity of interest depends on another. Mathematically proficient students who can apply what they know are comfortable making assumptions and approximations to simplify a complicated situation, realizing that these may need revision later. They are
Mathematically proficient students consider the available tools when solving a mathematical problem. These tools might include pencil and paper, concrete models, a ruler, a protractor, a calculator, a spreadsheet, a computer algebra system, a statistical package, or dynamic geometry software. Proficient students are sufficiently familiar with tools appropriate for their grade or course to make sound decisions about when each of these tools might be helpful, recognizing both the insight to be gained and their limitations. For example, mathematically proficient high school students analyze graphs of functions and solutions generated using a graphing calculator. They detect possible errors by strategically using estimation and other mathematical knowledge. When making mathematical models, they know that technology can enable them to visualize the results of varying assumptions, explore consequences, and compare predictions with data. Mathematically proficient students at various grade levels are able to identify relevant external mathematical resources, such as digital content located on a website, and use them to pose or solve problems. They are able to use technological tools to explore and deepen their understanding of concepts.

General Course Information and Notes

**GENERAL NOTES**

Laboratory investigations that include the use of scientific inquiry, research, measurement, problem solving, laboratory apparatus and technologies, experimental procedures, and safety procedures are an integral part of this course. The National Science Teachers Association (NSTA) recommends that at the high school level, all students should be in the science lab or field, collecting data every week. School laboratory investigations (labs) are defined by the National Research Council (NRC) as an experience in the laboratory, classroom, or the field that provides students with opportunities to interact directly with natural phenomena or with data collected by others using tools, materials, data collection techniques, and models (NRC, 2006, p. 3). Laboratory investigations in the high school classroom should help all students develop a growing understanding of the complexity and ambiguity of empirical work, as well as the skills to calibrate and troubleshoot equipment used to make observations. Learners should understand measurement error; and have the skills to aggregate, interpret, and present the resulting data (National Research Council, 2006, p.77; NSTA, 2007).

**Special Notes:**

**Instructional Practices**

Teaching from a range of complex text is optimized when teachers in all subject areas implement the following strategies on a routine basis:

1. Ensuring wide reading from complex text that varies in length.
2. Making close reading and rereading of texts central to lessons.
3. Emphasizing text-specific complex questions, and cognitively complex tasks, reinforce focus on the text and cultivate independence.
4. Emphasizing students supporting answers based upon evidence from the text.
5. Providing extensive research and writing opportunities (claims and evidence).

**Science and Engineering Practices** (NRC Framework for K-12 Science Education, 2010)
• Asking questions (for science) and defining problems (for engineering).
• Developing and using models.
• Planning and carrying out investigations.
• Analyzing and interpreting data.
• Using mathematics, information and computer technology, and computational thinking.
• Constructing explanations (for science) and designing solutions (for engineering).
• Engaging in argument from evidence.
• Obtaining, evaluating, and communicating information.

**Literacy Standards in Science**
Secondary science courses include reading standards for literacy in science and technical subjects 6-12 and writing standards for literacy in history/social studies, science, and technical subjects 6-12. The courses also include speaking and listening standards. For a complete list of standards required for this course click on the blue tile labeled course standards. You may also download the complete course including all required standards and notes sections using the export function located at the top of this page.

**English Language Development ELD Standards Special Notes Section:**
Teachers are required to provide listening, speaking, reading and writing instruction that allows English language learners (ELL) to communicate information, ideas and concepts for academic success in the content area of Science. For the given level of English language proficiency and with visual, graphic, or interactive support, students will interact with grade level words, expressions, sentences and discourse to process or produce language necessary for academic success. The ELD standard should specify a relevant content area concept or topic of study chosen by curriculum developers and teachers which maximizes an ELL's need for communication and social skills. To access an ELL supporting document which delineates performance definitions and descriptors, please click on the following link: https://cpalmsmediaprod.blob.core.windows.net/uploads/docs/standards/eld/sc.pdf

**Additional Instructional Resources:**
A.V.E. for Success Collection is provided by the Florida Association of School Administrators: http://www.fasa.net/4DCGI/cms/review.html?Action=CMS_Document&DocID=139. Please be aware that these resources have not been reviewed by CPALMS and there may be a charge for the use of some of them in this collection.

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**GENERAL INFORMATION**

**Course Number:** 2002500

**Course Path:** Section: Grades PreK to 12 Education Courses > Grade Group: Grades 9 to 12 and Adult Education Courses > Subject: Science > SubSubject: Marine Sciences >

**Abbreviated Title:** MARINE SCI 1

**Number of Credits:** One (1) credit

**Course Type:** Core Academic Course

**Course Status:** Course Approved

**Grade Level(s):** 9,10,11,12

**Graduation Requirement:** Equally Rigorous Science

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**Educator Certifications**

<table>
<thead>
<tr>
<th>Biology (Grades 6-12)</th>
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<tr>
<td>Chemistry (Grades 6-12)</td>
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<tr>
<td>Physics (Grades 6-12)</td>
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<tr>
<td>Earth/Space Science (Grades 6-12)</td>
</tr>
<tr>
<td>Science (Secondary Grades 7-12)</td>
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</tbody>
</table>
Describe changes in ecosystems resulting from seasonal variations, climate change and succession.

Characterize the biotic and abiotic components that define freshwater systems, marine systems and terrestrial systems.

Discuss how various oceanic and freshwater processes, such as currents, tides, and waves, affect the abundance of aquatic organisms.

Describe changes in ecosystems resulting from seasonal variations, climate change and succession.

Compare and contrast the relationships among organisms, including predation, parasitism, competition, commensalism, and mutualism.

Characterize the biotic and abiotic components that define freshwater systems, marine systems and terrestrial systems.

Recognize the consequences of the losses of biodiversity due to catastrophic events, climate changes, human activity, and the introduction of invasive, non-native species.

Use a food web to identify and distinguish producers, consumers, and decomposers. Explain the pathway of energy transfer through trophic levels and the reduction of available energy at successive trophic levels.

Diagram and explain the biogeochemical cycles of an ecosystem, including water, carbon, and nitrogen cycle.

Evaluate the costs and benefits of renewable and nonrenewable resources, such as water, energy, fossil fuels, wildlife, and forests.

Discuss the large-scale environmental impacts resulting from human activity, including waste spills, oil spills, runoff, greenhouse gases, ozone depletion, and surface and groundwater pollution.

Discuss the special properties of water that contribute to Earth's suitability as an environment for life: cohesive behavior, ability to moderate temperature, expansion upon freezing, and versatility as a solvent.

Define a problem based on a specific body of knowledge, for example: biology, chemistry, physics, and earth/space science, and do the following:

1. Pose questions about the natural world, (Articulate the purpose of the investigation and identify the relevant scientific concepts).
2. Conduct systematic observations, (Write procedures that are clear and replicable. Identify observables and examine relationships between test (independent) variable and outcome (dependent) variable. Employ appropriate methods for accurate and consistent observations; conduct and record measurements at appropriate levels of precision. Follow safety guidelines).
3. Examine books and other sources of information to see what is already known,
4. Review what is known in light of empirical evidence, (Examine whether available empirical evidence can be interpreted in terms of existing knowledge and models, and if not, modify or develop new models).
5. Plan investigations, (Design and evaluate a scientific investigation).
6. Use tools to gather, analyze, and interpret data (this includes the use of measurement in metric and other systems, and also the generation and interpretation of graphical representations of data, including data tables and graphs), (Collect data or evidence in an organized way. Properly use instruments, equipment, and materials (e.g., scales, probeware, meter sticks, microscopes, computers) including set-up, calibration, technique, maintenance, and storage).
7. Pose answers, explanations, or descriptions of events,
8. Generate explanations that explicate or describe natural phenomena (inferences),
9. Use appropriate evidence and reasoning to justify these explanations to others,
10. Communicate results of scientific investigations, and
11. Evaluate the merits of the explanations produced by others.

Describe instances in which scientists’ varied backgrounds, talents, interests, and goals influence the inferences and thus the explanations that they make about observations of natural phenomena and describe that competing interpretations (explanations) of scientists are a strength of science as they are a source of new, testable ideas that have the potential to add new evidence to support one or another of the explanations.

Explain that a scientific theory is the culmination of many scientific investigations drawing together all the current evidence concerning a substantial range of phenomena; thus, a scientific theory represents the most powerful explanation scientists have to offer.

Describe the function of models in science, and identify the wide range of models used in science.

Explain how scientific knowledge and reasoning provide an empirically-based perspective to inform society’s decision making.

Weigh the merits of alternative strategies for solving a specific societal problem by comparing a number of different costs and benefits, such as human, economic, and environmental.

Explore the Law of Conservation of Energy by differentiating among open, closed, and isolated systems and explain that the total energy in an isolated system is a conserved quantity.
Describe the measurable properties of waves and explain the relationships among them and how these properties change when the wave moves from one medium to another.

Mathematicians who participate in effortful learning both individually and with others:
- Analyze the problem in a way that makes sense given the task.
- Ask questions that will help with solving the task.
- Build perseverance by modifying methods as needed while solving a challenging task.
- Stay engaged and maintain a positive mindset when working to solve tasks.
- Help and support each other when attempting a new method or approach.

**Clarifications:**
Teachnrs who encourage students to participate actively in effortful learning both individually and with others:
- Cultivate a community of growth mindset learners.
- Foster perseverance in students by choosing tasks that are challenging.
- Develop students' ability to analyze and problem solve.
- Recognize students' effort when solving challenging problems.

Demonstrate understanding by representing problems in multiple ways.
Mathematicians who demonstrate understanding by representing problems in multiple ways:
- Build understanding through modeling and using manipulatives.
- Represent solutions to problems in multiple ways using objects, drawings, tables, graphs and equations.
- Progress from modeling problems with objects and drawings to using algorithms and equations.
- Express connections between concepts and representations.
- Choose a representation based on the given context or purpose.

**Clarifications:**
Teachers who encourage students to demonstrate understanding by representing problems in multiple ways:
- Help students make connections between concepts and representations.
- Provide opportunities for students to use manipulatives when investigating concepts.
- Guide students from concrete to pictorial to abstract representations as understanding progresses.
- Show students that various representations can have different purposes and can be useful in different situations.

Complete tasks with mathematical fluency.
Mathematicians who complete tasks with mathematical fluency:
- Select efficient and appropriate methods for solving problems within the given context.
- Maintain flexibility and accuracy while performing procedures and mental calculations.
- Complete tasks accurately and with confidence.
- Adapt procedures to apply them to a new context.
- Use feedback to improve efficiency when performing calculations.

**Clarifications:**
Teachers who encourage students to complete tasks with mathematical fluency:
- Provide students with the flexibility to solve problems by selecting a procedure that allows them to solve efficiently and accurately.
- Offer multiple opportunities for students to practice efficient and generalizable methods.
- Provide opportunities for students to reflect on the method they used and determine if a more efficient method could have been used.

Engage in discussions that reflect on the mathematical thinking of self and others.
Mathematicians who engage in discussions that reflect on the mathematical thinking of self and others:
- Communicate mathematical ideas, vocabulary and methods effectively.
- Analyze the mathematical thinking of others.
- Compare the efficiency of a method to those expressed by others.
- Recognize errors and suggest how to correctly solve the task.
- Justify results by explaining methods and processes.
- Construct possible arguments based on evidence.

**Clarifications:**
Teachers who encourage students to engage in discussions that reflect on the mathematical thinking of self and others:
- Establish a culture in which students ask questions of the teacher and their peers, and error is an opportunity for learning.
- Create opportunities for students to discuss their thinking with peers.
- Select, sequence and present student work to advance and deepen understanding of correct and increasingly efficient methods.
- Develop students' ability to justify methods and compare their responses to the responses of their peers.

Use patterns and structure to help understand and connect mathematical concepts.
Mathematicians who use patterns and structure to help understand and connect mathematical concepts:
- Focus on relevant details within a problem.
- Create plans and procedures to logically order events, steps or ideas to solve problems.
- Decompose a complex problem into manageable parts.
- Relate previously learned concepts to new concepts.
- Look for similarities among problems.
- Connect solutions of problems to more complicated large-scale situations.

**Clarifications:**
Teachers who encourage students to use patterns and structure to help understand and connect mathematical concepts:
- Help students recognize the patterns in the world around them and connect these patterns to mathematical concepts.
- Support students to develop generalizations based on the similarities found among problems.
- Provide opportunities for students to create plans and procedures to solve problems.
### MA.K12.MTR.6.1:

**Clarifications:**
- Teachers who encourage students to assess the reasonableness of solutions:
  - Have students estimate or predict solutions prior to solving.
  - Prompt students to continually ask, “Does this solution make sense? How do you know?”
  - Reinforce that students check their work as they progress within and after a task.
  - Strengthen students’ ability to verify solutions through justifications.

### MA.K12.MTR.7.1:

**Clarifications:**
- Teachers who encourage students to apply mathematics to real-world contexts:
  - Provide opportunities for students to create models, both concrete and abstract, and perform investigations.
  - Challenge students to question the accuracy of their models and methods.
  - Support students as they validate conclusions by comparing them to the given situation.
  - Indicate how various concepts can be applied to other disciplines.

### ELA.K12.EE.1.1:

**Clarifications:**
- K-1 Students include textual evidence in their oral communication with guidance and support from adults. The evidence can consist of details from the text without naming the text. During 1st grade, students learn how to incorporate the evidence in their writing.
- 2-3 Students include relevant textual evidence in their written and oral communication. Students should name the text when they refer to it. In 3rd grade, students should use a combination of direct and indirect citations.
- 4-5 Students continue with previous skills and reference comments made by speakers and peers. Students cite texts that they’ve directly quoted, paraphrased, or used for information. When writing, students will use the form of citation dictated by the instructor or the style guide referenced by the instructor.
- 6-8 Students continue with previous skills and use a style guide to create a proper citation.
- 9-12 Students continue with previous skills and should be aware of existing style guides and the ways in which they differ.

### ELA.K12.EE.2.1:

**Clarifications:**
- See Text Complexity for grade-level complexity bands and a text complexity rubric.

### ELA.K12.EE.3.1:

**Clarifications:**
- Students will make inferences before the words infer or inference are introduced. Kindergarten students will answer questions like “Why is the girl smiling?” or make predictions about what will happen based on the title page. Students will use the terms and apply them in 2nd grade and beyond.

### ELA.K12.EE.4.1:

**Clarifications:**
- In kindergarten, students learn to listen to one another respectfully.
- In grades 1-2, students build upon these skills by justifying what they are thinking. For example: “I think _____ because _____.” The collaborative conversations are becoming academic conversations.
- In grades 3-12, students engage in academic conversations discussing claims and justifying their reasoning, refining and applying skills. Students build on ideas, propel the conversation, and support claims and counterclaims with evidence.

### ELA.K12.EE.5.1:

**Clarifications:**
- Students will incorporate skills learned into work products to produce quality work. For students to incorporate these skills appropriately, they must receive instruction. A 3rd grade student creating a poster board display must have instruction in how to effectively present information to do quality work.

### ELA.K12.EE.6.1:

**Clarifications:**
- In kindergarten and 1st grade, students learn the difference between formal and informal language. For example, the way we talk to our friends differs from the way we speak to adults. In 2nd grade and beyond, students practice appropriate social and academic language to discuss texts.

### ELD.K12.ELL.5C.1:

- English language learners communicate information, ideas and concepts necessary for academic success in the content area of Science.

### ELD.K12.ELL.SI.1:

- English language learners communicate for social and instructional purposes within the school setting.
General Course Information and Notes

GENERAL INFORMATION

Course Length: 
Course Level: 

Course Number: 2002500

Number of Credits: One (1) credit
Course Type: Core Academic Course
Course Status: State Board Approved
Grade Level(s): 9, 10, 11, 12
Graduation Requirement: Equally Rigorous Science

Course Path: Section: Grades PreK to 12 Education
Courses > Grade Group: Grades 9 to 12 and Adult
Education Courses > Subject: Science > SubSubject:
Marine Sciences >

Abbreviated Title: MARINE SCI 1
Course Length: Year (Y)
Course Level: 2

Educator Certifications

Biology (Grades 6-12)
Chemistry (Grades 6-12)
Course Standards

<table>
<thead>
<tr>
<th>Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>SC.912.E.7.6:</td>
<td>Relate the formation of severe weather to the various physical factors.</td>
</tr>
<tr>
<td>SC.912.E.7.9:</td>
<td>Cite evidence that the ocean has had a significant influence on climate change by absorbing, storing, and moving heat, carbon, and water.</td>
</tr>
<tr>
<td>SC.912.L.14.6:</td>
<td>Explain the significance of genetic factors, environmental factors, and pathogenic agents to health from the perspectives of both individual and public health.</td>
</tr>
<tr>
<td>SC.912.L.15.13:</td>
<td>Describe the conditions required for natural selection, including overproduction of offspring, inherited variation, and the struggle to survive, which result in differential reproductive success.</td>
</tr>
<tr>
<td>SC.912.L.16.10:</td>
<td>Evaluate the impact of biotechnology on the individual, society and the environment, including medical and ethical issues.</td>
</tr>
<tr>
<td>SC.912.L.17.1:</td>
<td>Discuss the characteristics of populations, such as number of individuals, age structure, density, and pattern of distribution.</td>
</tr>
<tr>
<td>SC.912.L.17.2:</td>
<td>Explain the general distribution of life in aquatic systems as a function of chemistry, geography, light, depth, salinity, and temperature.</td>
</tr>
<tr>
<td>SC.912.L.17.3:</td>
<td>Discuss how various oceanic and freshwater processes, such as currents, tides, and waves, affect the abundance of aquatic organisms.</td>
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<tr>
<td>SC.912.L.17.4:</td>
<td>Describe changes in ecosystems resulting from seasonal variations, climate change and succession.</td>
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<td>SC.912.L.17.6:</td>
<td>Compare and contrast the relationships among organisms, including predation, parasitism, competition, commensalism, and mutualism.</td>
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<td>SC.912.L.17.7:</td>
<td>Characterize the biotic and abiotic components that define freshwater systems, marine systems and terrestrial systems.</td>
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<td>SC.912.L.17.8:</td>
<td>Recognize the consequences of the losses of biodiversity due to catastrophic events, climate changes, human activity, and the introduction of invasive, non-native species.</td>
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<td>SC.912.L.17.9:</td>
<td>Use a food web to identify and distinguish producers, consumers, and decomposers. Explain the pathway of energy transfer through trophic levels and the reduction of available energy at successive trophic levels.</td>
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<td>SC.912.L.17.10:</td>
<td>Diagram and explain the biogeochemical cycles of an ecosystem, including water, carbon, and nitrogen cycle.</td>
</tr>
<tr>
<td>SC.912.L.17.11:</td>
<td>Evaluate the costs and benefits of renewable and nonrenewable resources, such as water, energy, fossil fuels, wildlife, and forests.</td>
</tr>
<tr>
<td>SC.912.L.17.16:</td>
<td>Discuss the large-scale environmental impacts resulting from human activity, including waste spills, oil spills, runoff, greenhouse gases, ozone depletion, and surface and groundwater pollution.</td>
</tr>
<tr>
<td>SC.912.L.17.17:</td>
<td>Assess the effectiveness of innovative methods of protecting the environment.</td>
</tr>
<tr>
<td>SC.912.L.17.18:</td>
<td>Describe how human population size and resource use relate to environmental quality.</td>
</tr>
<tr>
<td>SC.912.L.18.12:</td>
<td>Discuss the special properties of water that contribute to Earth’s suitability as an environment for life: cohesive behavior, ability to moderate temperature, expansion upon freezing, and versatility as a solvent.</td>
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</table>
| SC.912.N.1.1: | 1. Pose questions about the natural world, (Articulate the purpose of the investigation and identify the relevant scientific concepts).  
2. Conduct systematic observations, (Write procedures that are clear and replicable. Identify observables and examine relationships between test (independent) variable and outcome (dependent) variable. Employ appropriate methods for accurate and consistent observations; conduct and record measurements at appropriate levels of precision. Follow safety guidelines).  
3. Examine books and other sources of information to see what is already known,  
4. Review what is known in light of empirical evidence, (Examine whether available empirical evidence can be interpreted in terms of existing knowledge and models, and if not, modify or develop new models).  
5. Plan investigations, (Design and evaluate a scientific investigation).  
6. Use tools to gather, analyze, and interpret data (this includes the use of measurement in metric and other systems, and also the generation and interpretation of graphical representations of data, including data tables and graphs), (Collect data or evidence in an organized way. Properly use instruments, equipment, and materials (e.g., scales, probeware, meter sticks, microscopes, computers) including set-up, calibration, technique, maintenance, and storage).  
7. Pose answers, explanations, or descriptions of events,  
8. Generate explanations that explicate or describe natural phenomena (inferences),  
9. Use appropriate evidence and reasoning to justify these explanations to others,  
10. Communicate results of scientific investigations, and  
11. Evaluate the merits of the explanations produced by others. |
| SC.912.N.1.2: | Describe and explain what characterizes science and its methods. |
| SC.912.N.1.3: | Recognize that the strength or usefulness of a scientific claim is evaluated through scientific argumentation, which depends on critical and logical thinking, and the active consideration of alternative scientific explanations to explain the data presented. |
| SC.912.N.1.4: | Identify sources of information and assess their reliability according to the strict standards of scientific investigation. |
| SC.912.N.1.5: | Describe and provide examples of how similar investigations conducted in many parts of the world result in the same outcome. |
| SC.912.N.1.6: | Describe how scientific inferences are drawn from scientific observations and provide examples from the content being studied. |
| SC.912.N.1.7: | Recognize the role of creativity in constructing scientific questions, methods and explanations. |
| SC.912.N.2.1: | Identify what is science, what clearly is not science, and what superficially resembles science (but fails to meet the criteria for science). |
| SC.912.N.2.4: | Explain that scientific knowledge is both durable and robust and open to change. Scientific knowledge can change because it is often examined and re-examined by new investigations and scientific argumentation. Because of these frequent examinations, scientific knowledge becomes stronger, leading to its durability. |
| SC.912.N.2.5: | Describe instances in which scientists’ varied backgrounds, talents, interests, and goals influence the inferences and thus the explanations that they make about observations of natural phenomena and describe that competing interpretations (explanations) of scientists are a strength of science as they are a source of new, testable ideas that have the potential to add new evidence to support one or another of the explanations. |
| SC.912.N.3.1: | Explain that a scientific theory is the culmination of many scientific investigations drawing together all the current evidence concerning a substantial range of phenomena; thus, a scientific theory represents the most powerful explanation scientists have to offer. |
| SC.912.N.3.5: | Describe the function of models in science, and identify the wide range of models used in science. |
Explain how scientific knowledge and reasoning provide an empirically-based perspective to inform society's decision making.

Weigh the merits of alternative strategies for solving a specific societal problem by comparing a number of different costs and benefits, such as human, economic, and environmental.

Explore the Law of Conservation of Energy by differentiating among open, closed, and isolated systems and explain that the total energy in an isolated system is a conserved quantity.

Describe the measurable properties of waves and explain the characteristics of the data distribution, such as the shape of the distribution or the existence of extreme data points.

For a function that models a relationship between two quantities, interpret key features of graphs and tables in terms of the quantities, and sketch graphs showing key features given a verbal description of the relationship. Key features include: intercepts; intervals where the function is increasing, decreasing, positive, or negative; relative maximums and minimums; symmetries; end behavior; and periodicity.

Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases.

- a. Graph linear and quadratic functions and show intercepts, maxima, and minima.
- b. Graph square root, cube root, and piecewise-defined functions, including step functions and absolute value functions.
- c. Graph polynomial functions, identifying zeros when suitable factorizations are available, and showing end behavior.
- d. Graph rational functions, identifying zeros and asymptotes when suitable factorizations are available, and showing end behavior.
- e. Graph exponential and logarithmic functions, showing intercepts and end behavior, and trigonometric functions, showing period, midline, and amplitude, and using phase shift.

Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases.

- a. Graph linear and quadratic functions and show intercepts, maxima, and minima.
- b. Graph square root, cube root, and piecewise-defined functions, including step functions and absolute value functions.
- c. Graph polynomial functions, identifying zeros when suitable factorizations are available, and showing end behavior.
- d. Graph rational functions, identifying zeros and asymptotes when suitable factorizations are available, and showing end behavior.
- e. Graph exponential and logarithmic functions, showing intercepts and end behavior, and trigonometric functions, showing period, midline, and amplitude, and using phase shift.


data sets for which such a procedure is not appropriate. Use statistics appropriate to the shape of the data distribution to compare center (median, mean) and spread (interquartile range, standard deviation) of two or more different data sets.

- a. Use statistics appropriate to the shape of the data distribution to compare center (median, mean) and spread (interquartile range, standard deviation) of two or more different data sets.
- b. Use the mean and standard deviation of a data set to fit it to a normal distribution and to estimate population percentages. Recognize that there are data sets for which such a procedure is not appropriate. Use calculators, spreadsheets, and tables to estimate areas under the normal curve.
- c. Summarize categorical data for two categories in two-way frequency tables. Interpret relative frequencies in the context of the data (including joint, marginal, and conditional relative frequencies). Recognize possible associations and trends in the data.

- a. Represent data on two quantitative variables on a scatter plot, and describe how the variables are related.
- b. Informally assess the fit of a function by plotting and analyzing residuals.
- c. Fit a linear function for a scatter plot that suggests a linear association.

- a. Make sense of problems and persevere in solving them.
- b. Reason abstractly and quantitatively.

- a. Mathematically proficient students start by explaining to themselves the meaning of a problem and looking for entry points to its solution. They analyze givens, constraints, relationships, and goals. They make conjectures about the form and meaning of the solution and plan a solution pathway rather than simply jumping into a solution attempt. They consider analogous problems, and try special cases and simpler forms of the original problem in order to gain insight into its solution. They monitor and evaluate their progress and change course if necessary. Older students might, depending on the context of the problem, transform algebraic expressions or change the viewing window on their graphing calculator to get a new look at the information they need. Mathematically proficient students can explain correspondences between equations, verbal descriptions, tables, and graphs or draw diagrams of important features and relationships, graph data, and search for regularity or trends. Younger students might rely on using concrete objects or pictures to help conceptualize and solve a problem. Mathematically proficient students check their answers to problems using a different method, and they continually ask themselves, "Does this make sense?" They can understand the approaches of others to solving complex problems and identify correspondences between different approaches.
- b. Reason abstractly and quantitatively.

- a. Mathematically proficient students make sense of quantities and their relationships in problem situations. They bring two complementary abilities to bear on problems involving quantitative relationships: the ability to decontextualize—to abstract a given situation and represent it symbolically and manipulate the representing symbols as if they have a life of their own, without necessarily attending to their referents—and the ability to contextualize, to pause as needed during the manipulation process in order to probe into the referents for the symbols involved. Quantitative reasoning entails habits of creating a coherent representation of the problem at hand; considering the units involved; attending to the meaning of...
Mathematically proficient students understand and use stated assumptions, definitions, and previously established results in constructing arguments. They make conjectures and build a logical progression of statements to explore the truth of their conjectures. They are able to analyze situations by breaking them into cases, and can recognize and use counterexamples. They justify their conclusions, communicate them to others, and respond to the arguments of others. They reason inductively about data, making plausible arguments that take into account the context from which the data arose. Mathematically proficient students are also able to compare the effectiveness of two plausible arguments, distinguish correct logic or reasoning from that which is flawed, and—if there is a flaw in an argument—explain what it is. Elementary students can construct arguments using concrete referents such as objects, drawings, diagrams, and actions. Such arguments can make sense and be correct, even though they are not generalized or made formal until later grades. Later, students learn to determine domains to which an argument applies. Students at all grades can listen or read the arguments of others, decide whether they make sense, and ask useful questions to clarify or improve the arguments.

Standard Relation to Course: Supporting

Construct viable arguments and critique the reasoning of others.

MAFS.K12.MP.3.1: Understand the significance of the symbols used in a mathematical expression. Mathematically proficient students can apply the mathematics they know to solve problems arising in everyday life, society, and the workplace. In early grades, this might be as simple as writing an addition equation to describe a situation. In middle grades, a student might apply proportional reasoning to plan a school event or analyze a problem in the community. By high school, a student might use geometry, graphing calculators, or spreadsheet applications to analyze the geometric relationships and make predictions about the results. Mathematically proficient students can explain the reasoning and can justify their conclusions by communicating them to others. They can analyze the arguments of others and proffer counterexamples or suggestions for improvement. They are also able to identify important quantities in a practical situation and map their relationships using such tools as diagrams, two-way tables, graphs, flowcharts and formulas. They can analyze those relationships mathematically to draw conclusions. They routinely interpret their mathematical results in the context of the situation and reflect on whether the results make sense, possibly improving the model if it has not served its purpose.

Standard Relation to Course: Supporting

Model with mathematics.

MAFS.K12.MP.4.1: Use appropriate tools strategically. Mathematically proficient students consider the available tools when solving a mathematical problem. These tools might include pencil and paper, concrete models, a ruler, a protractor, a calculator, a spreadsheet, a computer algebra system, a statistical package, or dynamic geometry software. Proficient students are sufficiently familiar with tools appropriate for their grade or course to make sound decisions about when each of these tools might be helpful, recognizing both the insight to be gained and their limitations. For example, mathematically proficient high school students analyze graphs of functions and solutions generated using a graphing calculator. They detect possible errors by strategically using estimation and other mathematical knowledge. When making mathematical models, they know that technology can enable them to visualize the results of varying assumptions, explore consequences, and compare predictions with data. Mathematically proficient students at various grade levels are able to identify relevant external mathematical resources, such as digital content located on a website, and use them to pose or solve problems. They are able to use technological tools to explore and deepen their understanding of concepts.

Standard Relation to Course: Supporting

Attend to precision.

MAFS.K12.MP.6.1: Look for and make use of structure. Mathematically proficient students look closely to discern a pattern or structure. Mathematics is a precise language and its students notice the sense of the symbols they use, including using the equal symbol consistently and appropriately. They are careful about specifying units of measure, and labeling axes to clarify the correspondence with quantities in a problem. They calculate accurately and efficiently, express numerical answers with a degree of precision appropriate for the problem context. In the elementary grades, students give carefully formulated explanations to each other. By the time they reach high school they have learned to examine claims and make explicit use of definitions.

Standard Relation to Course: Supporting

Look for and express regularity in repeated reasoning.

MAFS.K12.MP.8.1: Look for and express regularity in repeated reasoning. Mathematically proficient students notice if calculations are repeated, and look both for general methods and for shortcuts. Upper elementary students might notice when dividing 25 by 11 that they are repeating the same calculations over and over again, and conclude they have a repeating decimal. By paying attention to the calculation of slope as they repeatedly check whether points are on the line through (1, 2) with slope 3, middle school students might abstract the equation (y – 2)/(x – 1) = 3. Noticing the regularity in the way terms cancel when expanding (x – 1)(x + 1), (x – 1)(x^2 + x + 1), and (x – 1)(x^3 + x^2 + x + 1) might lead them to the general formula for the sum of a geometric series. As they work to solve a problem, mathematically proficient students maintain oversight of the process, while attending to the details. They continually evaluate the reasonableness of their intermediate results.

Standard Relation to Course: Supporting

Cite specific textual evidence to support analysis of science and technical texts, attending to important distinctions the author makes and to any gaps or inconsistencies in the account.

LAFS.1112.RST.1.1: Determine the central ideas or conclusions of a text; summarize complex concepts, processes, or information presented in a text by paraphrasing them in simpler but still accurate terms.

LAFS.1112.RST.1.2: Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks; analyze the specific results based on explanations in the text.

LAFS.1112.RST.1.3: Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 11–12 texts and topics.

LAFS.1112.RST.2.4: Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 11–12 texts and topics.
Analyze how the text structures information or ideas into categories or hierarchies, demonstrating understanding of the information or ideas.

Initiate and participate effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grades 11-12 topics, texts, and issues, building on others' ideas and expressing their own clearly and persuasively.

- a. Come to discussions prepared, having read and researched material under study; explicitly draw on that preparation by referring to evidence from texts and other research on the topic or issue to stimulate a thoughtful, well-reasoned exchange of ideas.
- b. Work with peers to promote civil, democratic discussions and decision-making, set clear goals and deadlines, and establish individual roles as needed.
- c. Propose conversations by posing and responding to questions that probe reasoning and evidence; ensure a hearing for a full range of positions on a topic or issue; clarify, verify, or challenge ideas and conclusions; and promote divergent and creative perspectives.
- d. Respond thoughtfully to diverse perspectives; synthesize comments, claims, and evidence made on all sides of an issue; resolve contradictions when possible; and determine what additional information or research is required to deepen the investigation or complete the task.

Integrate multiple sources of information presented in diverse formats and media (e.g., visually, quantitatively, orally) in order to make informed decisions and solve problems, evaluating the credibility and accuracy of each source and noting any discrepancies among the data.

Evaluate a speaker's point of view, reasoning, and use of evidence and rhetoric, assessing the stance, premises, links among ideas, word choice, points of emphasis, and tone used.

Present information, findings, and supporting evidence, conveying a clear and distinct perspective, such that listeners can follow the line of reasoning, alternative or opposing perspectives are addressed, and the organization, development, substance, and style are appropriate to purpose, audience, and a range of formal and informal tasks.

Make strategic use of digital media (e.g., textual, graphical, audio, visual, and interactive elements) in presentations to enhance understanding of findings, reasoning, and evidence and to add interest.

Write arguments focused on discipline-specific content.

- a. Introduce precise, knowledgeable claim(s), establish the significance of the claim(s), distinguish the claim(s) from alternate or opposing claims, and create an organization that logically sequences the claim(s), counterclaims, reasons, and evidence.
- b. Develop claim(s) and counterclaims fairly and thoroughly, supplying the most relevant data and evidence for each while pointing out the strengths and limitations of both claim(s) and counterclaims in a discipline-appropriate form that anticipates the audience's knowledge level, concerns, values, and possible biases.
- c. Use words, phrases, and clauses as well as varied syntax to link the major sections of the text, create cohesion, and clarify the relationships between claim(s) and reasons, between reasons and evidence, and between claim(s) and counter-claims.
- d. Establish and maintain a formal style and objective tone while attending to the norms and conventions of the discipline in which they are writing.
- e. Provide a concluding statement or section that follows from or supports the argument presented.

Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes.

- a. Introduce a topic and organize complex ideas, concepts, and information so that each new element builds on that which precedes it to create a unified whole; include matamorphosis (e.g., headings), graphics (e.g., figures, tables), and multimedia when useful to aiding comprehension.
- b. Develop the topic thoroughly by selecting the most significant and relevant facts, extended definitions, concrete details, quotations, or other information and examples appropriate to the audience's knowledge of the topic.
- c. Use varied transitions and sentence structures to link the major sections of the text, create cohesion, and clarify the relationships among complex ideas and concepts.
- d. Use precise language, domain-specific vocabulary and techniques such as metaphor, simile, and analogy to manage the complexity of the topic; convey a knowledgeable stance in a style that responds to the discipline and context as well as to the expertise of likely readers.
- e. Provide a concluding statement or section that follows from and supports the information or explanation provided (e.g., articulating implications or the significance of the topic).

Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.

Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience.

Use technology, including the Internet, to produce, publish, and update individual or shared writing products in response to ongoing feedback, including new arguments or information.

Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation.

Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the strengths and limitations of each source in terms of the specific task, purpose, and audience; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and overreliance on any one source and following a standard format for citation.

Draw evidence from informational texts to support analysis, reflection, and research.

Write routinely over extended time frames (time for reflection and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences.

English language learners communicate information, ideas and concepts necessary for academic success in the content area of Science.

English language learners communicate for social and instructional purposes within the school setting.

General Course Information and Notes

GENERAL NOTES

While the content focus of this course is consistent with the Marine Science I course, students will explore these concepts in greater depth. In general, the academic pace and rigor will be greatly increased for honors level course work. Laboratory investigations that include the use of scientific inquiry, research, measurement, problem solving, laboratory apparatus and technologies, experimental procedures, and safety procedures are an integral part of this course. The National Science Teachers Association (NSTA) recommends that at the high school level, all students should be in the science lab or field, collecting data every week. School laboratory investigations (labs) are defined by the National Research Council (NRC) as an experience in the laboratory, classroom, or the field that provides students with opportunities to interact directly with natural phenomena or with data collected by others using tools, materials, data collection techniques, and models (NRC, 2006, p. 3). Laboratory investigations in the high
school classroom should help all students develop a growing understanding of the complexity and ambiguity of empirical work, as well as the skills to calibrate and troubleshoot equipment used to make observations. Learners should understand measurement error; and have the skills to aggregate, interpret, and present the resulting data (National Research Council, 2006, p.77; NSTA, 2007).

Special Notes:

Instructional Practices
Teaching from a range of complex text is optimized when teachers in all subject areas implement the following strategies on a routine basis:

1. Ensuring wide reading from complex text that varies in length.
2. Making close reading and rereading of texts central to lessons.
3. Emphasizing text-specific complex questions, and cognitively complex tasks, reinforce focus on the text and cultivate independence.
4. Emphasizing students supporting answers based upon evidence from the text.
5. Providing extensive research and writing opportunities (claims and evidence).


- Asking questions (for science) and defining problems (for engineering).
- Developing and using models.
- Planning and carrying out investigations.
- Analyzing and interpreting data.
- Using mathematics, information and computer technology, and computational thinking.
- Constructing explanations (for science) and designing solutions (for engineering).
- Engaging in argument from evidence.
- Obtaining, evaluating, and communicating information.

Honors and Advanced Level Course Note: Advanced courses require a greater demand on students through increased academic rigor. Academic rigor is obtained through the application, analysis, evaluation, and creation of complex ideas that are often abstract and multi-faceted. Students are challenged to think and collaborate critically on the content they are learning. Honors level rigor will be achieved by increasing text complexity through text selection, focus on high-level qualitative measures, and complexity of task. Instruction will be structured to give students a deeper understanding of conceptual themes and organization within and across disciplines. Academic rigor is more than simply assigning to students a greater quantity of work.

Literacy Standards in Science
Secondary science courses include reading standards for literacy in science and technical subjects 6-12 and writing standards for literacy in history/social studies, science, and technical subjects 6-12. The courses also include speaking and listening standards. For a complete list of standards required for this course click on the blue tile labeled course standards. You may also download the complete course including all required standards and notes sections using the export function located at the top of this page.

English Language Development ELD Standards Special Notes Section:
Teachers are required to provide listening, speaking, reading and writing instruction that allows English language learners (ELL) to communicate information, ideas and concepts for academic success in the content area of Science. For the given level of English language proficiency and with visual, graphic, or interactive support, students will interact with grade level words, expressions, sentences and discourse to process or produce language necessary for academic success. The ELD standard should specify a relevant content area concept or topic of study chosen by curriculum developers and teachers which maximizes an ELL's need for communication and social skills. To access an ELL supporting document which delineates performance definitions and descriptors, please click on the following link: https://cpalmsmediaprod.blob.core.windows.net/uploads/docs/standards/eld/sc.pdf

Additional Instructional Resources:
A.V.E. for Success Collection is provided by the Florida Association of School Administrators: http://www.fasa.net/4DCGI/cms/review.html?Action=CMS_Document&DocID=139. Please be aware that these resources have not been reviewed by CPALMS and there may be a charge for the use of some of them in this collection.

GENERAL INFORMATION

Course Number: 2002510
Course Attributes:
- Honors

Number of Credits: One (1) credit
Course Type: Core Academic Course
Course Status: Course Approved
Grade Level(s): 9,10,11,12
Graduation Requirement: Equally Rigorous Science

Educator Certifications

<table>
<thead>
<tr>
<th>Biology (Grades 6-12)</th>
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<tbody>
<tr>
<td>Chemistry (Grades 6-12)</td>
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<td>Physics (Grades 6-12)</td>
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<td>Earth/Space Science (Grades 6-12)</td>
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<td>Science (Secondary Grades 7-12)</td>
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### Course Standards

<table>
<thead>
<tr>
<th>Name</th>
<th>Description</th>
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<tbody>
<tr>
<td>SC.912.E.7.6</td>
<td>Relate the formation of severe weather to the various physical factors.</td>
</tr>
<tr>
<td>SC.912.E.7.9</td>
<td>Cite evidence that the ocean has had a significant influence on climate change by absorbing, storing, and moving heat, carbon, and water.</td>
</tr>
<tr>
<td>SC.912.L.14.6</td>
<td>Explain the significance of genetic factors, environmental factors, and pathogenic agents to health from the perspectives of both individual and public health.</td>
</tr>
<tr>
<td>SC.912.L.15.13</td>
<td>Describe the conditions required for natural selection, including overproduction of offspring, inherited variation, and the struggle to survive, which result in differential reproductive success.</td>
</tr>
<tr>
<td>SC.912.L.16.10</td>
<td>Evaluate the impact of biotechnology on the individual, society and the environment, including medical and ethical issues.</td>
</tr>
<tr>
<td>SC.912.L.17.1</td>
<td>Discuss the characteristics of populations, such as number of individuals, age structure, density, and pattern of distribution.</td>
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<tr>
<td>SC.912.L.17.2</td>
<td>Explain the general distribution of life in aquatic systems as a function of chemistry, geography, light, depth, salinity, and temperature.</td>
</tr>
<tr>
<td>SC.912.L.17.3</td>
<td>Discuss how various oceanic and freshwater processes, such as currents, tides, and waves, affect the abundance of aquatic organisms.</td>
</tr>
<tr>
<td>SC.912.L.17.4</td>
<td>Describe changes in ecosystems resulting from seasonal variations, climate change and succession.</td>
</tr>
<tr>
<td>SC.912.L.17.6</td>
<td>Compare and contrast the relationships among organisms, including predation, parasitism, competition, commensalism, and mutualism.</td>
</tr>
<tr>
<td>SC.912.L.17.7</td>
<td>Characterize the biotic and abiotic components that define freshwater systems, marine systems and terrestrial systems.</td>
</tr>
<tr>
<td>SC.912.L.17.8</td>
<td>Recognize the consequences of the losses of biodiversity due to catastrophic events, climate changes, human activity, and the introduction of invasive, non-native species.</td>
</tr>
<tr>
<td>SC.912.L.17.9</td>
<td>Use a food web to identify and distinguish producers, consumers, and decomposers. Explain the pathway of energy transfer through trophic levels and the reduction of available energy at successive trophic levels.</td>
</tr>
<tr>
<td>SC.912.L.17.10</td>
<td>Diagram and explain the biogeochemical cycles of an ecosystem, including water, carbon, and nitrogen cycle.</td>
</tr>
<tr>
<td>SC.912.L.17.11</td>
<td>Evaluate the costs and benefits of renewable and nonrenewable resources, such as water, energy, fossil fuels, wildlife, and forests.</td>
</tr>
<tr>
<td>SC.912.L.17.16</td>
<td>Discuss the large-scale environmental impacts resulting from human activity, including waste spills, oil spills, runoff, greenhouse gases, ozone depletion, and surface and groundwater pollution.</td>
</tr>
<tr>
<td>SC.912.L.17.17</td>
<td>Assess the effectiveness of innovative methods of protecting the environment.</td>
</tr>
<tr>
<td>SC.912.L.17.18</td>
<td>Describe how human population size and resource use relate to environmental quality.</td>
</tr>
<tr>
<td>SC.912.L.18.12</td>
<td>Discuss the special properties of water that contribute to Earth's suitability as an environment for life: cohesive behavior, ability to moderate temperature, expansion upon freezing, and versatility as a solvent.</td>
</tr>
</tbody>
</table>
| SC.912.N.1.1 | Define a problem based on a specific body of knowledge, for example: biology, chemistry, physics, and earth/space science, and do the following:  
1. Pose questions about the natural world, (Articulate the purpose of the investigation and identify the relevant scientific concepts).  
2. Conduct systematic observations, (Write procedures that are clear and replicable. Identify observables and examine relationships between test (independent) variable and outcome (dependent) variable. Employ appropriate methods for accurate and consistent observations; conduct and record measurements at appropriate levels of precision. Follow safety guidelines). |
| SC.912.N.1.11 | Evaluate the merits of the explanations produced by others. |
| SC.912.N.1.12 | Use tools to gather, analyze, and interpret data (this includes the use of measurement in metric and other systems, and also the generation and interpretation of graphical representations of data, including data tables and graphs), (Collect data or evidence in an organized way. Properly use instruments, equipment, and materials (e.g., scales, probeware, meter sticks, microscopes, computers) including set-up, calibration, technique, maintenance, and storage). |
| SC.912.N.1.13 | Pose answers, explanations, or descriptions of events,  
8. Generate explanations that explicate or describe natural phenomena (inferences),  
9. Use appropriate evidence and reasoning to justify these explanations to others,  
10. Communicate results of scientific investigations, and  
11. Evaluate the merits of the explanations produced by others. |
| SC.912.N.1.14 | Plan investigations, (Design and evaluate a scientific investigation). |
| SC.912.N.1.15 | Recognize the role of creativity in constructing scientific questions, methods and explanations. |
| SC.912.N.1.16 | Identify what is science, what clearly is not science, and what superficially resembles science (but fails to meet the criteria for science). |
| SC.912.N.1.17 | Identify sources of information and assess their reliability according to the strict standards of scientific investigation. |
| SC.912.N.1.18 | Describe and provide examples of how similar investigations conducted in many parts of the world result in the same outcome. |
| SC.912.N.1.19 | Describe and provide examples of how similar investigations conducted in many parts of the world result in the same outcome. |
| SC.912.N.1.2 | Describe how scientific inferences are drawn from scientific observations and provide examples from the content being studied. |
| SC.912.N.1.3 | Explain that scientific knowledge is both durable and robust and open to change. Scientific knowledge can change because it is often examined and re-examined by new investigations and scientific argumentation. Because of these frequent examinations, scientific knowledge becomes more secure and its reliability increases. |
| SC.912.N.1.4 | Explain that scientific knowledge is both durable and robust and open to change. Scientific knowledge can change because it is often examined and re-examined by new investigations and scientific argumentation. Because of these frequent examinations, scientific knowledge becomes more secure and its reliability increases. |
| SC.912.N.1.5 | Examine books and other sources of information to see what is already known, and critically judge the value and validity of the information. |
| SC.912.N.1.6 | Determine more than one way to conduct an investigation, (Design and evaluate a scientific investigation). |
| SC.912.N.1.7 | Examine and interpret data, (Analyze the quality and quantity of data, whether obtained from experiments, observations, surveys, or secondary sources). |
| SC.912.N.1.8 | Generate explanations that explicate or describe natural phenomena (inferences),  
8. Use appropriate evidence and reasoning to justify these explanations to others,  
9. Use appropriate evidence and reasoning to justify these explanations to others,  
10. Communicate results of scientific investigations, and  
11. Evaluate the merits of the explanations produced by others. |
| SC.912.N.1.9 | Examine and interpret data, (Analyze the quality and quantity of data, whether obtained from experiments, observations, surveys, or secondary sources). |
| SC.912.N.1.10 | Examine and interpret data, (Analyze the quality and quantity of data, whether obtained from experiments, observations, surveys, or secondary sources). |
| SC.912.N.1.11 | Examine and interpret data, (Analyze the quality and quantity of data, whether obtained from experiments, observations, surveys, or secondary sources). |
| SC.912.N.1.12 | Use tools to gather, analyze, and interpret data (this includes the use of measurement in metric and other systems, and also the generation and interpretation of graphical representations of data, including data tables and graphs), (Collect data or evidence in an organized way. Properly use instruments, equipment, and materials (e.g., scales, probeware, meter sticks, microscopes, computers) including set-up, calibration, technique, maintenance, and storage). |
| SC.912.N.1.13 | Use tools to gather, analyze, and interpret data (this includes the use of measurement in metric and other systems, and also the generation and interpretation of graphical representations of data, including data tables and graphs), (Collect data or evidence in an organized way. Properly use instruments, equipment, and materials (e.g., scales, probeware, meter sticks, microscopes, computers) including set-up, calibration, technique, maintenance, and storage). |
| SC.912.N.1.14 | Use tools to gather, analyze, and interpret data (this includes the use of measurement in metric and other systems, and also the generation and interpretation of graphical representations of data, including data tables and graphs), (Collect data or evidence in an organized way. Properly use instruments, equipment, and materials (e.g., scales, probeware, meter sticks, microscopes, computers) including set-up, calibration, technique, maintenance, and storage). |
| SC.912.N.1.15 | Use tools to gather, analyze, and interpret data (this includes the use of measurement in metric and other systems, and also the generation and interpretation of graphical representations of data, including data tables and graphs), (Collect data or evidence in an organized way. Properly use instruments, equipment, and materials (e.g., scales, probeware, meter sticks, microscopes, computers) including set-up, calibration, technique, maintenance, and storage). |
| SC.912.N.2.1 | Examine and interpret data, (Analyze the quality and quantity of data, whether obtained from experiments, observations, surveys, or secondary sources). |
| SC.912.N.2.2 | Examine and interpret data, (Analyze the quality and quantity of data, whether obtained from experiments, observations, surveys, or secondary sources). |
| SC.912.N.2.3 | Examine and interpret data, (Analyze the quality and quantity of data, whether obtained from experiments, observations, surveys, or secondary sources). |
| SC.912.N.2.4 | Examine and interpret data, (Analyze the quality and quantity of data, whether obtained from experiments, observations, surveys, or secondary sources). |
| SC.912.N.2.5 | Examine and interpret data, (Analyze the quality and quantity of data, whether obtained from experiments, observations, surveys, or secondary sources). |
| SC.912.N.3.1 | Explain that a scientific theory is the culmination of many scientific investigations drawing together all the current evidence concerning a substantial range of phenomena; thus, a scientific theory represents the most powerful explanation scientists have to offer. |
| SC.912.N.3.5 | Describe the function of models in science, and identify the wide range of models used in science. |
Explain how scientific knowledge and reasoning provide an empirically-based perspective to inform society's decision making.

Weigh the merits of alternative strategies for solving a specific societal problem by comparing a number of different costs and benefits, such as human, economic, and environmental.

Explore the Law of Conservation of Energy by differentiating among open, closed, and isolated systems and explain that the total energy in an isolated system is a conserved quantity.

Describe the measurable properties of waves and explain the relationships among them and how these properties change when the wave moves from one medium to another.

Mathematicians who participate in effortful learning both individually and with others:
- Analyze the problem in a way that makes sense given the task.
- Ask questions that will help with solving the task.
- Build perseverance by modifying methods as needed while solving a challenging task.
- Stay engaged and maintain a positive mindset when working to solve tasks.
- Help and support each other when attempting a new method or approach.

Mathematicians who demonstrate understanding by representing problems in multiple ways:
- Build understanding through modeling and using manipulatives.
- Represent solutions to problems in multiple ways using objects, drawings, tables, graphs and equations.
- Progress from modeling problems with objects and drawings to using algorithms and equations.
- Express connections between concepts and representations.
- Choose a representation based on the given context or purpose.

Mathematicians who complete tasks with mathematical fluency:
- Select efficient and appropriate methods for solving problems within the given context.
- Maintain flexibility and accuracy while performing procedures and mental calculations.
- Complete tasks accurately and with confidence.
- Adapt procedures to apply them to a new context.
- Use feedback to improve efficiency when performing calculations.

Engage in discussions that reflect on the mathematical thinking of self and others.

Mathematicians who use patterns and structure to help understand and connect mathematical concepts:
- Focus on relevant details within a problem.
- Create plans and procedures to logically order events, steps or ideas to solve problems.
- Decompose a complex problem into manageable parts.
- Relate previously learned concepts to new concepts.
- Look for similarities among problems.
- Connect solutions of problems to more complicated large-scale situations.
### Clarifications:

**Teachers who encourage students to use patterns and structure to help understand and connect mathematical concepts:**
- Help students recognize the patterns in the world around them and connect these patterns to mathematical concepts.
- Support students to develop generalizations based on the similarities found among problems.
- Provide opportunities for students to create plans and procedures to solve problems.
- Develop students' ability to construct relationships between their current understanding and more sophisticated ways of thinking.

**Mathematicians who assess the reasonableness of solutions:**
- Estimate to discover possible solutions.
- Use benchmark quantities to determine if a solution makes sense.
- Check calculations when solving problems.
- Verify possible solutions by explaining the methods used.
- Evaluate results based on the given context.

**Mathematicians who apply mathematics to real-world contexts:**
- Connect mathematical concepts to everyday experiences.
- Use models and methods to understand, represent and solve problems.
- Perform investigations to gather data or determine if a method is appropriate.
- Redesign models and methods to improve accuracy or efficiency.

**Mathematicians who assess the reasonableness of solutions:**
- Have students estimate or predict solutions prior to solving.
- Prompt students to continually ask, “Does this solution make sense? How do you know?”
- Reinforce that students check their work as they progress within and after a task.
- Strengthen students’ ability to verify solutions through justifications.

**Teachers who encourage students to apply mathematics to real-world contexts:**
- Provide opportunities for students to create models, both concrete and abstract, and perform investigations.
- Challenge students to question the accuracy of their models and methods.
- Support students as they validate conclusions by comparing them to the given situation.
- Indicate how various concepts can be applied to other disciplines.

**K-1 Students include textual evidence in their oral communication with guidance and support from adults. The evidence can consist of details from the text without naming the text. During 1st grade, students learn how to incorporate the evidence in their writing.**

**2-3 Students include relevant textual evidence in their written and oral communication. Students should name the text when they refer to it. In 3rd grade, students should use a combination of direct and indirect citations.**

**4-5 Students continue with previous skills and reference comments made by speakers and peers. Students cite texts that they've directly quoted, paraphrased, or used for information. When writing, students will use the form of citation dictated by the instructor or the style guide referenced by the instructor.**

**5-8 Students continue with previous skills and use a style guide to create a proper citation.**

**9-12 Students continue with previous skills and should be aware of existing style guides and the ways in which they differ.**

**Read and comprehend grade-level complex texts proficiently.**

**See Text Complexity for grade-level complexity bands and a text complexity rubric.**

**Make inferences to support comprehension.**

**Students will make inferences before the words infer or inference are introduced. Kindergarten students will answer questions like "Why is the girl smiling?" or make predictions about what will happen based on the title page. Students will use the terms and apply them in 2nd grade and beyond.**

**Use appropriate collaborative techniques and active listening skills when engaging in discussions in a variety of situations.**

**In kindergarten, students learn to listen to one another respectfully. In grades 1-2, students build upon these skills by justifying what they are thinking. For example: “I think _____ because _____.” The collaborative conversations are becoming academic conversations.**

**In grades 3-12, students engage in academic conversations discussing claims and justifying their reasoning, refining and applying skills. Students build on ideas, propel the conversation, and support claims and counterclaims with evidence.**

**Use the accepted rules governing a specific format to create quality work.**

**Students will incorporate skills learned into work products to produce quality work. For students to incorporate these skills appropriately, they must receive instruction. A 3rd grade student creating a poster board display must have instruction in how to effectively present information to do quality work.**

**Use appropriate voice and tone when speaking or writing.**
General Course Information and Notes

GENERAL NOTES

While the content focus of this course is consistent with the Marine Science I course, students will explore these concepts in greater depth. In general, the academic pace and rigor will be greatly increased for honors level course work. Laboratory investigations that include the use of scientific inquiry, research, measurement, problem solving, laboratory apparatus and technologies, experimental procedures, and safety procedures are an integral part of this course. The National Science Teachers Association (NSTA) recommends that at the high school level, all students should be in the science lab or field, collecting data every week. School laboratory investigations (labs) are defined by the National Research Council (NRC) as an experience in the laboratory, classroom, or the field that provides students with opportunities to interact directly with natural phenomena or with data collected by others using tools, materials, data collection techniques, and models (NRC, 2006, p. 3). Laboratory investigations in the high school classroom should help all students develop a growing understanding of the complexity and ambiguity of empirical work, as well as the skills to calibrate and troubleshoot equipment used to make observations. Learners should understand measurement error; and have the skills to aggregate, interpret, and present the resulting data (National Research Council, 2006, p. 77; NSTA, 2007).

Special Notes:
Instructional Practices
Teaching from a range of complex text is optimized when teachers in all subject areas implement the following strategies on a routine basis:

1. Ensuring wide reading from complex text that varies in length.
2. Making close reading and rereading of texts central to lessons.
3. Emphasizing text-specific complex questions, and cognitively complex tasks, reinforce focus on the text and cultivate independence.
4. Emphasizing students supporting answers based upon evidence from the text.
5. Providing extensive research and writing opportunities (claims and evidence).


- Asking questions (for science) and defining problems (for engineering).
- Developing and using models.
- Planning and carrying out investigations.
- Analyzing and interpreting data.
- Using mathematics, information and computer technology, and computational thinking.
- Constructing explanations (for science) and designing solutions (for engineering).
- Engaging in argument from evidence.
- Obtaining, evaluating, and communicating information.

Honors and Advanced Level Course Note: Advanced courses require a greater demand on students through increased academic rigor. Academic rigor is obtained through the application, analysis, evaluation, and creation of complex ideas that are often abstract and multi-faceted. Students are challenged to think and collaborate critically on the content they are learning. Honors level rigor will be achieved by increasing text complexity through text selection, focus on high-level qualitative measures, and complexity of task. Instruction will be structured to give students a deeper understanding of conceptual themes and organization within and across disciplines. Academic rigor is more than simply assigning to students a greater quantity of work.

Florida's Benchmarks for Excellent Student Thinking (B.E.S.T.) Standards
This course includes Florida's B.E.S.T. ELA Expectations (EE) and Mathematical Thinking and Reasoning Standards (MTRs) for students. Florida educators should intentionally embed these standards within the content and their instruction as applicable. For guidance on the implementation of the EEs and MTRs, please visit https://www.cpalms.org/Standards/BEST_Standards.aspx and select the appropriate B.E.S.T. Standards package.

English Language Development ELD Standards Special Notes Section:
Teachers are required to provide listening, speaking, reading and writing instruction that allows English language learners (ELL) to communicate information, ideas and concepts for academic success in the content area of Science. For the given level of English language proficiency and with visual, graphic, or interactive support, students will interact with grade level words, expressions, sentences and discourse to process or produce language necessary for academic success. The ELD standard should specify a relevant content area concept or topic of study chosen by curriculum developers and teachers which maximizes an ELL's need for communication and social skills. To access an ELL supporting document which delineates performance definitions and descriptors, please click on the following link: https://cpalmsmediaprod.blob.core.windows.net/uploads/docs/standards/eld/sc.pdf

Additional Instructional Resources:
A.V.E. for Success Collection is provided by the Florida Association of School Administrators: http://www.fasa.net/4DCGI/cms/review.html?Action=CMS_Document&DocID=139. Please be aware that these resources have not been reviewed by CPALMS and there may be a charge for the use of some of them in this collection.

GENERAL INFORMATION

Course Number: 2002510
Course Path: Section: Grades PreK to 12 Education
Courses > Grade Group: Grades 9 to 12 and Adult Education Courses > Subject: Science > SubSubject: Marine Sciences
Abbreviated Title: MARINE SCI 1 HON
Number of Credits: One (1) credit
Course Length: Year (Y)
Course Attributes:

- Honors

Course Type: Core Academic Course
Course Status: State Board Approved
Course Level: 3
Grade Level(s): 9,10,11,12
Graduation Requirement: Equally Rigorous Science

Educator Certifications

<table>
<thead>
<tr>
<th>Subject</th>
<th>Grade</th>
</tr>
</thead>
<tbody>
<tr>
<td>Biology</td>
<td>Grades 6-12</td>
</tr>
<tr>
<td>Chemistry</td>
<td>Grades 6-12</td>
</tr>
<tr>
<td>Physics</td>
<td>Grades 6-12</td>
</tr>
<tr>
<td>Earth/Space Science</td>
<td>Grades 6-12</td>
</tr>
<tr>
<td>Science (Secondary Grades 7-12)</td>
<td></td>
</tr>
</tbody>
</table>
General Course Information and Notes

GENERAL NOTES

For more information about this Cambridge course, visit http://www.cie.org.uk/programmes-and-qualifications/cambridge-advanced/cambridge-international-as-and-a-levels/curriculum/.

GENERAL INFORMATION

Course Number: 2002515

Course Path: Grades PreK to 12 Education Courses > Grade Group: Grades 9 to 12 and Adult Education Courses > Subject: Science > SubSubject: Marine Sciences

Abbreviated Title: AICE MARINE SCI 1 AS

Course Length: Year (Y)

Course Attributes:
- Advanced International Certificate of Education (AICE)

Course Level: 3

Number of Credits: One (1) credit

Grade Level(s): 9,10,11,12

Graduation Requirement: Equally Rigorous Science

Educator Certifications

Chemistry (Grades 6-12)
Biology (Grades 6-12)
Earth/Space Science (Grades 6-12)
Science (Secondary Grades 7-12)
Physics (Grades 6-12)
<table>
<thead>
<tr>
<th>Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>SC.912.E.7.4</td>
<td>Summarize the conditions that contribute to the climate of a geographic area, including the relationships to lakes and oceans.</td>
</tr>
<tr>
<td>SC.912.E.7.8</td>
<td>Explain how various atmospheric, oceanic, and hydrologic conditions in Florida have influenced and can influence human behavior, both individually and collectively.</td>
</tr>
<tr>
<td>SC.912.E.7.9</td>
<td>Cite evidence that the ocean has had a significant influence on climate change by absorbing, storing, and moving heat, carbon, and water.</td>
</tr>
<tr>
<td>SC.912.L.17.4</td>
<td>Describe changes in ecosystems resulting from seasonal variations, climate change and succession.</td>
</tr>
<tr>
<td>SC.912.L.17.5</td>
<td>Analyze how population size is determined by births, deaths, immigration, emigration, and limiting factors (biotic and abiotic) that determine carrying capacity.</td>
</tr>
<tr>
<td>SC.912.L.17.7</td>
<td>Characterize the biotic and abiotic components that define freshwater systems, marine systems and terrestrial systems.</td>
</tr>
<tr>
<td>SC.912.L.17.10</td>
<td>Diagram and explain the biogeochemical cycles of an ecosystem, including water, carbon, and nitrogen cycle.</td>
</tr>
<tr>
<td>SC.912.L.17.11</td>
<td>Evaluate the costs and benefits of renewable and nonrenewable resources, such as water, energy, fossil fuels, wildlife, and forests.</td>
</tr>
<tr>
<td>SC.912.L.17.13</td>
<td>Discuss the need for adequate monitoring of environmental parameters when making policy decisions.</td>
</tr>
<tr>
<td>SC.912.L.17.16</td>
<td>Discuss the large-scale environmental impacts resulting from human activity, including waste spills, oil spills, runoff, greenhouse gases, ozone depletion, and surface and groundwater pollution.</td>
</tr>
<tr>
<td>SC.912.L.18.2</td>
<td>Describe the important structural characteristics of monosaccharides, disaccharides, and polysaccharides and explain the functions of carbohydrates in living things.</td>
</tr>
<tr>
<td>SC.912.N.1.1:</td>
<td>Define a problem based on a specific body of knowledge, for example: biology, chemistry, physics, and earth/space science, and do the following:</td>
</tr>
<tr>
<td>1. Pose questions about the natural world, (Articulate the purpose of the investigation and identify the relevant scientific concepts).</td>
<td></td>
</tr>
<tr>
<td>2. Conduct systematic observations, (Write procedures that are clear and replicable. Identify observables and examine relationships between test (independent) variable and outcome (dependent) variable. Employ appropriate methods for accurate and consistent observations; conduct and record measurements at appropriate levels of precision. Follow safety guidelines).</td>
<td></td>
</tr>
<tr>
<td>3. Examine books and other sources of information to see what is already known,</td>
<td></td>
</tr>
<tr>
<td>4. Review what is known in light of empirical evidence, (Examine whether available empirical evidence can be interpreted in terms of existing knowledge and models, and if not, modify or develop new models).</td>
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</tr>
<tr>
<td>5. Plan investigations, (Design and evaluate a scientific investigation).</td>
<td></td>
</tr>
<tr>
<td>6. Use tools to gather, analyze, and interpret data (this includes the use of measurement in metric and other systems, and also the generation and interpretation of graphical representations of data, including data tables and graphs), (Collect data or evidence in an organized way. Properly use instruments, equipment, and materials (e.g., scales, probeware, meter sticks, microscopes, computers) including set-up, calibration, technique, maintenance, and storage).</td>
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<tr>
<td>7. Pose answers, explanations, or descriptions of events,</td>
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<tr>
<td>8. Generate explanations that explicate or describe natural phenomena (inferences),</td>
<td></td>
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<tr>
<td>9. Use appropriate evidence and reasoning to justify these explanations to others,</td>
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<tr>
<td>10. Communicate results of scientific investigations, and</td>
<td></td>
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<tr>
<td>11. Evaluate the merits of the explanations produced by others.</td>
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</tr>
<tr>
<td>SC.912.N.1.2:</td>
<td>Describe and explain what characterizes science and its methods.</td>
</tr>
<tr>
<td>SC.912.N.1.3:</td>
<td>Recognize that the strength or usefulness of a scientific claim is evaluated through scientific argumentation, which depends on critical and logical thinking, and the active consideration of alternative scientific explanations to explain the data presented.</td>
</tr>
<tr>
<td>SC.912.N.1.4:</td>
<td>Identify sources of information and assess their reliability according to the strict standards of scientific investigation.</td>
</tr>
<tr>
<td>SC.912.N.1.5:</td>
<td>Describe and provide examples of how similar investigations conducted in many parts of the world result in the same outcome.</td>
</tr>
<tr>
<td>SC.912.N.1.6:</td>
<td>Describe how scientific inferences are drawn from scientific observations and provide examples from the content being studied.</td>
</tr>
<tr>
<td>SC.912.N.1.7:</td>
<td>Recognize the role of creativity in constructing scientific questions, methods and explanations.</td>
</tr>
<tr>
<td>SC.912.N.2.1:</td>
<td>Identify what is science, what clearly is not science, and what superficially resembles science (but fails to meet the criteria for science).</td>
</tr>
<tr>
<td>SC.912.N.2.4:</td>
<td>Explain that scientific knowledge is both durable and robust and open to change. Scientific knowledge can change because it is often examined and re-examined by new investigations and scientific argumentation. Because of these frequent examinations, scientific knowledge becomes stronger, leading to its durability.</td>
</tr>
<tr>
<td>SC.912.N.2.5:</td>
<td>Describe instances in which scientists' varied backgrounds, talents, interests, and goals influence the inferences and thus the explanations that they make about observations of natural phenomena and describe that competing interpretations (explanations) of scientists are a strength of science as they are a source of new, testable ideas that have the potential to add new evidence to support one or another of the explanations.</td>
</tr>
<tr>
<td>SC.912.N.3.1:</td>
<td>Explain that a scientific theory is the culmination of many scientific investigations drawing together all the current evidence concerning a substantial range of phenomena; thus, a scientific theory represents the most powerful explanation scientists have to offer.</td>
</tr>
<tr>
<td>SC.912.N.3.5:</td>
<td>Describe the function of models in science, and identify the wide range of models used in science.</td>
</tr>
<tr>
<td>SC.912.N.4.1:</td>
<td>Explain how scientific knowledge and reasoning provide an empirically-based perspective to inform society's decision making.</td>
</tr>
<tr>
<td>SC.912.N.4.2:</td>
<td>Weigh the merits of alternative strategies for solving a specific societal problem by comparing a number of different costs and benefits, such as human, economic, and environmental.</td>
</tr>
<tr>
<td>SC.912.P.10.2:</td>
<td>Explore the Law of Conservation of Energy by differentiating among open, closed, and isolated systems and explain that the total energy in an isolated system is a conserved quantity.</td>
</tr>
<tr>
<td>SC.912.P.10.20:</td>
<td>Describe the measurable properties of waves and explain the relationships among them and how these properties change when the wave moves from one medium to another.</td>
</tr>
<tr>
<td>LAFS.1112.RST.1.1:</td>
<td>Cite specific textual evidence to support analysis of science and technical texts, attending to important distinctions the author makes and to any gaps or inconsistencies in the account.</td>
</tr>
<tr>
<td>LAFS.1112.RST.1.2:</td>
<td>Determine the central ideas or conclusions of a text; summarize complex concepts, processes, or information presented in a text by paraphrasing them in simpler but still accurate terms.</td>
</tr>
<tr>
<td>Standard</td>
<td>Description</td>
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</tr>
<tr>
<td>LAFS.1112.RST.1.3</td>
<td>Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks; analyze the specific results based on explanations in the text.</td>
</tr>
<tr>
<td>LAFS.1112.RST.2.4</td>
<td>Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 11–12 text topics and contexts.</td>
</tr>
<tr>
<td>LAFS.1112.RST.2.5</td>
<td>Analyze how the text structures information or ideas into categories or hierarchies, demonstrating understanding of the information or ideas.</td>
</tr>
<tr>
<td>LAFS.1112.RST.2.6</td>
<td>Analyze the author's purpose in providing an explanation, describing a procedure, or discussing an experiment in a text, identifying important issues that remain unresolved.</td>
</tr>
<tr>
<td>LAFS.1112.RST.3.7</td>
<td>Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g., quantitative data, video, multimedia) in order to address a question or solve a problem.</td>
</tr>
<tr>
<td>LAFS.1112.RST.3.8</td>
<td>Evaluate the hypotheses, data, analysis, and conclusions in a science or technical text, verifying the data when possible and corroborating or challenging conclusions with other sources of information.</td>
</tr>
<tr>
<td>LAFS.1112.RST.3.9</td>
<td>Synthesize information from a range of sources (e.g., texts, experiments, simulations) into a coherent understanding of a process, phenomenon, or concept, resolving conflicting information when possible.</td>
</tr>
<tr>
<td>LAFS.1112.RT.4.10</td>
<td>By the end of grade 12, read and comprehend science/technical texts in the grades 11–12 text complexity band independently and proficiently.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Standard</th>
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</tr>
</thead>
<tbody>
<tr>
<td>LAFS.1112 SL.1.1</td>
<td>Initiate and participate effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grades 11–12 topics, texts, and issues, building on others’ ideas and expressing their own clearly and persuasively. a. Come to discussions prepared, having read and researched material under study; explicitly draw on that preparation by referring to evidence from the texts and other research on the topic to stimulate a thoughtful, well-reasoned exchange of ideas. b. Work with peers to promote civil, democratic discussions and decision-making, set clear goals and deadlines, and establish individual roles as needed. c. Propose conversations by posing and responding to questions that probe reasoning and evidence; ensure a hearing for a full range of positions on a topic or issue; clarify, verify, or challenge ideas and conclusions; and promote divergent and creative perspectives. d. Respond thoughtfully to diverse perspectives; synthesize comments, claims, and evidence made on all sides of an issue; resolve contradictions when possible; and determine what additional information or research is required to deepen the investigation or complete the task.</td>
</tr>
<tr>
<td>LAFS.1112 SL.1.2</td>
<td>Integrate multiple sources of information presented in diverse formats and media (e.g., visually, quantitatively, orally) in order to make informed decisions and solve problems, evaluating the credibility and accuracy of each source and noting any discrepancies among the data.</td>
</tr>
<tr>
<td>LAFS.1112 SL.1.3</td>
<td>Evaluate a speaker's point of view, reasoning, and use of evidence and rhetoric, assessing the stance, premises, links among ideas, word choice, points of emphasis, and tone used.</td>
</tr>
<tr>
<td>LAFS.1112 SL.2.4</td>
<td>Present information, findings, and supporting evidence, conveying a clear and distinct perspective, such that listeners can follow the line of reasoning, alternative or opposing perspectives are addressed, and the organization, development, substance, and style are appropriate to purpose, audience, and a range of formal and informal tasks.</td>
</tr>
<tr>
<td>LAFS.1112 SL.2.5</td>
<td>Make strategic use of digital media (e.g., textual, graphical, audio, visual, and interactive elements) in presentations to enhance understanding of findings, reasoning, and evidence and to add interest.</td>
</tr>
<tr>
<td>LAFS.1112 WHST.1.1</td>
<td>Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes. a. Introduce a topic and organize complex ideas, concepts, and information so that each new element builds on that which precedes it to create a unified whole; include formatting (e.g., headings), graphics (e.g., figures, tables), and multimedia when useful to aiding comprehension. b. Develop the topic thoroughly by selecting the most significant and relevant facts, extended definitions, concrete details, quotations, or other information and examples appropriate to the audience's knowledge of the topic. c. Use varied transitions and sentence structures to link the major sections of the text, create cohesion, and clarify the relationships among complex ideas and concepts. d. Use precise language, domain-specific vocabulary and techniques such as metaphor, simile, and analogy to manage the complexity of the topic; convey a knowledgeable stance in a style that responds to the discipline and context as well as to the expertise of likely readers. e. Provide a concluding statement or section that follows from and supports the information or explanation provided (e.g., articulating implications or the significance of the topic).</td>
</tr>
<tr>
<td>LAFS.1112 WHST.1.2</td>
<td>Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes. a. Introduce a topic and organize complex ideas, concepts, and information so that each new element builds on that which precedes it to create a unified whole; include formatting (e.g., headings), graphics (e.g., figures, tables), and multimedia when useful to aiding comprehension. b. Develop the topic thoroughly by selecting the most significant and relevant facts, extended definitions, concrete details, quotations, or other information and examples appropriate to the audience's knowledge of the topic. c. Use varied transitions and sentence structures to link the major sections of the text, create cohesion, and clarify the relationships among complex ideas and concepts. d. Use precise language, domain-specific vocabulary and techniques such as metaphor, simile, and analogy to manage the complexity of the topic; convey a knowledgeable stance in a style that responds to the discipline and context as well as to the expertise of likely readers. e. Provide a concluding statement or section that follows from and supports the information or explanation provided (e.g., articulating implications or the significance of the topic).</td>
</tr>
<tr>
<td>LAFS.1112 WHST.2.4</td>
<td>Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.</td>
</tr>
<tr>
<td>LAFS.1112 WHST.2.5</td>
<td>Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience.</td>
</tr>
<tr>
<td>LAFS.1112 WHST.2.6</td>
<td>Use technology, including the Internet, to produce, publish, and share individual or shared writing products in response to ongoing feedback, including new research or information.</td>
</tr>
<tr>
<td>LAFS.1112 WHST.3.7</td>
<td>Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation.</td>
</tr>
<tr>
<td>LAFS.1112 WHST.3.8</td>
<td>Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the strengths and limitations of each source in terms of the specific task, purpose, and audience; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and over-reliance on any one source and following a standard format for citation.</td>
</tr>
</tbody>
</table>
| LAFS.912.MF-IF.2.4 | For a function that models a relationship between two quantities, interpret key features of graphs and tables in terms of the quantities, and sketch graphs showing key features given a verbal description of the relationship. Key features include: intercepts; intervals where the function is increasing, decreasing, positive, or negative; relative maximums and minimums; symmetries; end behavior; and periodicity. ★
Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases.

MAFS.912.F-IF.3.7:

- Graph linear and quadratic functions and show intercepts, maxima, and minima.
- Graph square root, cube root, and piecewise-defined functions, including step functions and absolute value functions.
- Graph polynomial functions, identifying zeros when suitable factorizations are available, and showing end behavior.
- Graph rational functions, identifying zeros and asymptotes when suitable factorizations are available, and showing end behavior.
- Graph exponential and logarithmic functions, showing intercepts and end behavior, and trigonometric functions, showing period, midline, and amplitude, and using phase shift.

MAFS.912.G-MG.1.2: Apply concepts of density based on area and volume in modeling situations (e.g., persons per square mile, BTUs per cubic foot).

MAFS.912.N-Q.1.1: Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays.

MAFS.912.N-Q.1.3: Choose a level of accuracy appropriate to limitations on measurement when reporting quantities.

MAFS.912.S-ID.2.6: Evaluate reports based on data.

MAFS.912.S-ID.1.1: Represent data with plots on the real number line (dot plots, histograms, and box plots).

Clarifications:
- In grades 6 – 8, students describe center and spread in a data distribution. Here they choose a summary statistic appropriate to the characteristics of the data distribution, such as the shape of the distribution or the existence of extreme data points.

MAFS.912.S-ID.1.2: Interpreting differences in shape, center, and spread in the context of the data sets, accounting for possible effects of extreme data points (outliers).

Clarifications:
- In grades 6 – 8, students describe center and spread in a data distribution. Here they choose a summary statistic appropriate to the characteristics of the data distribution, such as the shape of the distribution or the existence of extreme data points.

MAFS.912.S-ID.1.3: Interpreting categorical data for two categories in two-way frequency tables. Interpret relative frequencies in the context of the data (including joint, marginal, and conditional relative frequencies). Recognize possible associations and trends in the data.

Clarifications:
- Represent data on two quantitative variables on a scatter plot, and describe how the variables are related.
  - Fit a function to the data; use functions fitted to data to solve problems in the context of the data. Use given functions or choose a function suggested by the context. Emphasize linear, and exponential models.
  - Informally assess the fit of a function by plotting and analyzing residuals.
  - Fit a linear function for a scatter plot that suggests a linear association.

MAFS.912.S-ID.1.4: Use the mean and standard deviation of a data set to fit it to a normal distribution and to estimate population percentages. Recognize that there are data sets for which such a procedure is not appropriate. Use calculators, spreadsheets, and tables to estimate areas under the normal curve.

MAFS.912.S-ID.2.5: Summarize categorical data for two categories in two-way frequency tables. Interpret relative frequencies in the context of the data (including joint, marginal, and conditional relative frequencies). Recognize possible associations and trends in the data.

Clarifications:
- Students take a more sophisticated look at using a linear function to model the relationship between two numerical variables. In addition to fitting a line to data, students assess how well the model fits by analyzing residuals.

Mathematically proficient students start by explaining to themselves the meaning of a problem and looking for entry points to its solution. They analyze givens, constraints, relationships, and goals. They make conjectures about the form and meaning of the solution and plan a solution pathway rather than simply jumping into a solution attempt. They consider analogous problems, and try special cases and simpler forms of the original problem in order to gain insight into its solution. They monitor and evaluate their progress and change course if necessary. Older students might, depending on the context of the problem, transform algebraic expressions or change the viewing window on their graphing calculator to get a better look at a point or a graph. Mathematically proficient students check their answers to problems using a different method, and they continually ask themselves, “Does this make sense?” They can understand the approaches of others to solving analogous problems and identify correspondences between different approaches.

Standard Relation to Course: Supporting

Mathematically proficient students make sense of problems and persevere in solving them.

Clarifications:
- Students take a more sophisticated look at using a linear function to model the relationship between two numerical variables. In addition to fitting a line to data, students assess how well the model fits by analyzing residuals.

Using the mean and standard deviation of a data set to fit it to a normal distribution and to estimate population percentages. Recognize that there are data sets for which such a procedure is not appropriate. Use calculators, spreadsheets, and tables to estimate areas under the normal curve.

Mathematically proficient students make sense of quantities and their relationships in problem situations. They bring two complementary abilities to bear on problems involving quantitative relationships: the ability to decontextualize—to abstract a given situation and represent it symbolically and manipulatively the representing symbols as if they have a life of their own, without necessarily attending to their referents—and the ability to contextualize, to pause as needed during the manipulation process in order to probe into the referents for the symbols involved. Quantitative reasoning entails habits of creating a coherent representation of the problem at hand; considering the units involved; attending to the meaning of quantities, not just how to compute them; and knowing and ﬂexibly using different properties of operations and objects.

Standard Relation to Course: Supporting

Construct viable arguments and critique the reasoning of others.

Mathematically proficient students understand and use stated assumptions, deﬁnitions, and previously established results in constructing arguments. They make conjectures and build a logical progression of statements to explore the truth of their conjectures. They are able to analyze situations by breaking them into cases, and can recognize and use counterexamples. They justify their conclusions, communicate them to others, and respond to the arguments of others. They reason inductively about data, making plausible arguments that take into account the context from which the data arose. Mathematically proficient students are able to compare the effectiveness of two plausible arguments, distinguish correct logic or reasoning from that which is flawed, and—if there is a flaw in an argument—explain what it is. Elementary students can construct
arguments using concrete referents such as objects, drawings, diagrams, and actions. Such arguments can make sense and be correct, even though they are not generalized or made formal until later grades. Later, students learn to determine domains to which an argument applies. Students at all grades can listen or read the arguments of others, decide whether they make sense, and ask useful questions to clarify or improve the arguments.

**Standard Relation to Course: Supporting**

### Model with mathematics.

Mathematically proficient students can apply the mathematics they know to solve problems arising in everyday life, society, and the workplace. In early grades, this might be as simple as writing an addition equation to describe a situation. In middle grades, a student might apply proportional reasoning to plan a school event or analyze a problem in the community. By high school, a student might use geometry to solve a design problem or use a function to describe how one quantity of interest depends on another. Mathematically proficient students who can apply what they know are comfortable making assumptions and approximations to simplify a complicated situation, realizing that these may need revision later. They are able to identify important quantities in a practical situation and map their relationships using such tools as diagrams, two-way tables, graphs, flowcharts and formulas. They can analyze those relationships mathematically to draw conclusions. They routinely interpret their mathematical results in the context of the situation and reflect on whether the results make sense, possibly improving the model if it has not served its purpose.

**Standard Relation to Course: Supporting**

### Use appropriate tools strategically.

Mathematically proficient students consider the available tools when solving a mathematical problem. These tools might include pencil and paper, concrete models, a ruler, a protractor, a calculator, a spreadsheet, a computer algebra system, a statistical package, or dynamic geometry software. Proficient students are sufficiently familiar with tools appropriate for their grade or course to make sound decisions about when each of these tools might be helpful, recognizing both the insight to be gained and their limitations. For example, mathematically proficient high school students analyze graphs of functions and solutions generated using a graphing calculator. They detect possible errors by strategically using estimation and other mathematical knowledge. When making mathematical models, they know that technology can enable them to visualize the results of varying assumptions, explore consequences, and compare predictions with data. Mathematically proficient students at various grade levels are able to identify relevant external mathematical resources, such as digital content located on a website, and use them to pose or solve problems. They are able to use technological tools to explore and deepen their understanding of concepts.

**Standard Relation to Course: Supporting**

### Attend to precision.

Mathematically proficient students try to communicate precisely to others. They try to use clear definitions in discussion with others and in their own reasoning. They state the meaning of the symbols they choose, including using the equal sign consistently and appropriately. They are careful about specifying units of measure, and labeling axes to clarify the correspondence with quantities in a problem. They calculate accurately and efficiently, express numerical answers with a degree of precision appropriate for the problem context. In the elementary grades, students give carefully formulated explanations to each other. By the time they reach high school they have learned to examine claims and make explicit use of definitions.

**Standard Relation to Course: Supporting**

### Look for and make use of structure.

Mathematically proficient students look closely to discern a pattern or structure. Young students, for example, might notice that three and seven more is the same amount as seven and three more, or they may sort a collection of shapes according to how many sides the shapes have. Later, students will see 7 × 8 equals the well remembered 7 × 5 + 7 × 3, in preparation for learning about the distributive property. In the expression x² + 9x + 14, older students can see the 14 as 2 × 7 and 3(x – y)² as 5 minus a positive number times a square and use that to realize that its value cannot be more than 5 for any real numbers x and y.

**Standard Relation to Course: Supporting**

### Look for and express regularity in repeated reasoning.

Mathematically proficient students notice if calculations are repeated, and look both for general methods and for shortcuts. Upper elementary students might notice when dividing 25 by 11 that they are repeating the same calculations over and over again, and conclude they have a repeating decimal. By paying attention to the calculation of slope as they repeatedly check whether points are on the line through (1, 2) with slope 3, middle school students might abstract the equation (y – 2) = 3(x – 1), noticing the regularity in the way terms cancel when expanding (x – 1)(x + 1), (x – 1)(x² + x + 1), and (x – 1)(x² + x + 1). They might lead them to the general formula for the sum of a geometric series. As they work to solve a problem, mathematically proficient students maintain oversight of the process, while attending to the details. They continually evaluate the reasonableness of their intermediate results.

**Standard Relation to Course: Supporting**

### General Course Information and Notes

**GENERAL NOTES**

Laboratory investigations that include the use of scientific inquiry, research, measurement, problem solving, laboratory apparatus and technologies, experimental procedures, and safety procedures are an integral part of this course. The National Science Teachers Association (NSTA) recommends that at the high school level, all students should be in the science lab or field, collecting data every week. School laboratory investigations (labs) are defined by the National Research Council (NRC) as an experience in the laboratory, classroom, or the field that provides students with opportunities to interact directly with natural phenomena or with data collected by others using tools, materials, data collection techniques, and models (NRC, 2006, p. 3). Laboratory investigations in the high school classroom should help all students develop a growing understanding of the complexity and ambiguity of empirical work, as well as the skills to calibrate and troubleshoot equipment used to make observations. Learners should understand measurement error, and have the skills to aggregate, interpret, and present the resulting data (National Research Council, 2006, p.77; NSTA, 2007).
Special Notes:

**Instructional Practices**
Teaching from a range of complex text is optimized when teachers in all subject areas implement the following strategies on a routine basis:

1. Ensuring wide reading from complex text that varies in length.
2. Making close reading and rereading of texts central to lessons.
3. Emphasizing text-specific complex questions, and cognitively complex tasks, reinforce focus on the text and cultivate independence.
4. Emphasizing students supporting answers based upon evidence from the text.
5. Providing extensive research and writing opportunities (claims and evidence).

**Science and Engineering Practices** (NRC Framework for K-12 Science Education, 2010)
- Asking questions (for science) and defining problems (for engineering).
- Developing and using models.
- Planning and carrying out investigations.
- Analyzing and interpreting data.
- Using mathematics, information and computer technology, and computational thinking.
- Constructing explanations (for science) and designing solutions (for engineering).
- Engaging in argument from evidence.
- Obtaining, evaluating, and communicating information.

**Literacy Standards in Science**
Secondary science courses include reading standards for literacy in science and technical subjects 6-12 and writing standards for literacy in history/social studies, science, and technical subjects 6-12. The courses also include speaking and listening standards. For a complete list of standards required for this course click on the blue tile labeled course standards. You may also download the complete course including all required standards and notes sections using the export function located at the top of this page.

**English Language Development ELD Standards Special Notes Section:**
Teachers are required to provide listening, speaking, reading and writing instruction that allows English language learners (ELL) to communicate information, ideas and concepts for academic success in the content area of Science. For the given level of English language proficiency and with visual, graphic, or interactive support, students will interact with grade level words, expressions, sentences and discourse to process or produce language necessary for academic success. The ELD standard should specify a relevant content area concept or topic of study chosen by curriculum developers and teachers which maximizes an ELL's need for communication and social skills. To access an ELL supporting document which delineates performance definitions and descriptors, please click on the following link:

https://cpalmsmediaprod.blob.core.windows.net/uploads/docs/standards/eld/sc.pdf

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**GENERAL INFORMATION**

**Course Number:** 2002520

**Course Length:** Year (Y)

**Course Type:** Core Academic Course

**Course Status:** Course Approved

**Grade Level(s):** 9,10,11,12

**Graduation Requirement:** Equally Rigorous Science

**Course Path:** Section: Grades PreK to 12 Education Courses > Grade Group: Grades 9 to 12 and Adult Education Courses > Subject: Science > SubSubject: Marine Sciences

**Abbreviated Title:** MARINE SCI 2

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**Educator Certifications**

<table>
<thead>
<tr>
<th>Biology (Grades 6-12)</th>
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<tr>
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<td>Science (Secondary Grades 7-12)</td>
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**Course Standards**

<table>
<thead>
<tr>
<th>Name</th>
<th>Description</th>
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<tbody>
<tr>
<td>SC.912.E.7.4:</td>
<td>Summarize the conditions that contribute to the climate of a geographic area, including the relationships to lakes and oceans.</td>
</tr>
<tr>
<td>SC.912.E.7.8:</td>
<td>Explain how various atmospheric, oceanic, and hydrologic conditions in Florida have influenced and can influence human behavior, both individually and collectively.</td>
</tr>
<tr>
<td>SC.912.E.7.9:</td>
<td>Cite evidence that the ocean has had a significant influence on climate change by absorbing, storing, and moving heat, carbon, and water.</td>
</tr>
<tr>
<td>SC.912.L.17.4:</td>
<td>Describe changes in ecosystems resulting from seasonal variations, climate change and succession.</td>
</tr>
<tr>
<td>SC.912.L.17.5:</td>
<td>Analyze how population size is determined by births, deaths, immigration, emigration, and limiting factors (biotic and abiotic) that determine carrying capacity.</td>
</tr>
<tr>
<td>SC.912.L.17.7:</td>
<td>Characterize the biotic and abiotic components that define freshwater systems, marine systems and terrestrial systems.</td>
</tr>
<tr>
<td>SC.912.L.17.10:</td>
<td>Diagram and explain the biogeochemical cycles of an ecosystem, including water, carbon, and nitrogen cycle.</td>
</tr>
<tr>
<td>SC.912.L.17.11:</td>
<td>Evaluate the costs and benefits of renewable and nonrenewable resources, such as water, energy, fossil fuels, wildlife, and forests.</td>
</tr>
<tr>
<td>SC.912.L.17.13:</td>
<td>Discuss the need for adequate monitoring of environmental parameters when making policy decisions.</td>
</tr>
<tr>
<td>SC.912.L.17.16:</td>
<td>Discuss the large-scale environmental impacts resulting from human activity, including waste spills, oil spills, runoff, greenhouse gases, ozone depletion, and surface and groundwater pollution.</td>
</tr>
<tr>
<td>SC.912.L.18.2:</td>
<td>Describe the important structural characteristics of monosaccharides, disaccharides, and polysaccharides and explain the functions of carbohydrates in living things.</td>
</tr>
</tbody>
</table>

**SC.912.N.1.1:**

- Define a problem based on a specific body of knowledge, for example: biology, chemistry, physics, and earth/space science, and do the following:
  - 1. Pose questions about the natural world, (Articulate the purpose of the investigation and identify the relevant scientific concepts).
  - 2. Conduct systematic observations, (Write procedures that are clear and replicable. Identify observables and examine relationships between test (independent) variable and outcome (dependent) variable. Employ appropriate methods for accurate and consistent observations; conduct and record measurements at appropriate levels of precision. Follow safety guidelines).
  - 3. Examine books and other sources of information to see what is already known,
  - 4. Review what is known in light of empirical evidence, (Examine whether available empirical evidence can be interpreted in terms of existing knowledge and models, and if not, modify or develop new models).
  - 5. Plan investigations, (Design and evaluate a scientific investigation).
  - 6. Use tools to gather, analyze, and interpret data (this includes the use of measurement in metric and other systems, and also the generation and interpretation of graphical representations of data, including data tables and graphs). (Collect data or evidence in an organized way. Properly use instruments, equipment, and materials (e.g., scales, probeware, meter sticks, microscopes, computers) including set-up, calibration, technique, maintenance, and storage).
  - 7. Pose answers, explanations, or descriptions of events,
  - 8. Generate explanations that explicate or describe natural phenomena (inferences),
  - 9. Use appropriate evidence and reasoning to justify these explanations to others,
  - 10. Communicate results of scientific investigations, and
  - 11. Evaluate the merits of the explanations produced by others.

**SC.912.N.1.2:**

- Describe and explain what characterizes science and its methods.

**SC.912.N.1.3:**

- Recognize that the strength or usefulness of a scientific claim is evaluated through scientific argumentation, which depends on critical and logical thinking, and the active consideration of alternative scientific explanations to explain the data presented.

**SC.912.N.1.4:**

- Identify sources of information and assess their reliability according to the strict standards of scientific investigation.

**SC.912.N.1.5:**

- Describe and provide examples of how similar investigations conducted in many parts of the world result in the same outcome.

**SC.912.N.1.6:**

- Describe how scientific inferences are drawn from scientific observations and provide examples from the content being studied.

**SC.912.N.1.7:**

- Recognize the role of creativity in constructing scientific questions, methods and explanations.

**SC.912.N.2.1:**

- Identify what is science, what clearly is not science, and what superficially resembles science (but fails to meet the criteria for science).

**SC.912.N.2.4:**

- Explain that scientific knowledge is both durable and robust and open to change. Scientific knowledge can change because it is often examined and re-examined by new investigations and scientific argumentation. Because of these frequent examinations, scientific knowledge becomes stronger, leading to its durability.

**SC.912.N.2.5:**

- Describe instances in which scientists' varied backgrounds, talents, interests, and goals influence the inferences and thus the explanations that they make about observations of natural phenomena and describe that competing interpretations (explanations) of scientists are a strength of science as they are a source of new, testable ideas that have the potential to add new evidence to support one or another of the explanations.

**SC.912.N.3.1:**

- Explain that a scientific theory is the culmination of many scientific investigations drawing together all the current evidence concerning a substantial range of phenomena; thus, a scientific theory represents the most powerful explanation scientists have to offer.

**SC.912.N.3.5:**

- Describe the function of models in science, and identify the wide range of models used in science.

**SC.912.N.4.1:**

- Explain how scientific knowledge and reasoning provide an empirically-based perspective to inform society's decision making.

**SC.912.N.4.2:**

- Weigh the merits of alternative strategies for solving a specific societal problem by comparing a number of different costs and benefits, such as human, economic, and environmental.

**SC.912.P.10.2:**

- Explore the Law of Conservation of Energy by differentiating among open, closed, and isolated systems and explain that the total energy in an isolated system is a conserved quantity.

**SC.912.P.10.20:**

- Describe the measurable properties of waves and explain the relationships among them and how these properties change when the wave moves from one medium to another.

Mathematicians who participate in effortful learning both individually and with others:
- Analyze the problem in a way that makes sense given the task.
- Ask questions that will help with solving the task.
### MA.K12.MTR.1.1: Build perseverance by modifying methods as needed while solving a challenging task.

- Stay engaged and maintain a positive mindset when working to solve tasks.
- Help and support each other when attempting a new method or approach.

**Clarifications:**
- Teachers who encourage students to participate actively in effortful learning both individually and with others:
  - Cultivate a community of growth mindset learners.
  - Foster perseverance in students by choosing tasks that are challenging.
  - Develop students' ability to analyze and problem solve.
  - Recognize students' effort when solving challenging problems.

### MA.K12.MTR.2.1: Demonstrate understanding by representing problems in multiple ways.

**Mathematicians who demonstrate understanding by representing problems in multiple ways:**

- Build understanding through modeling and using manipulatives.
- Represent solutions to problems in multiple ways using objects, drawings, tables, graphs and equations.
- Progress from modeling problems with objects and drawings to using algorithms and equations.
- Express connections between concepts and representations.
- Choose a representation based on the given context or purpose.

**Clarifications:**
- Teachers who encourage students to demonstrate understanding by representing problems in multiple ways:
  - Help students make connections between concepts and representations.
  - Provide opportunities for students to use manipulatives when investigating concepts.
  - Guide students from concrete to pictorial to abstract representations as understanding progresses.
  - Show students that various representations can have different purposes and can be useful in different situations.

### MA.K12.MTR.3.1: Complete tasks with mathematical fluency.

**Mathematicians who complete tasks with mathematical fluency:**

- Select efficient and appropriate methods for solving problems within the given context.
- Maintain flexibility and accuracy while performing procedures and mental calculations.
- Complete tasks accurately and with confidence.
- Adapt procedures to apply them to a new context.
- Use feedback to improve efficiency when performing calculations.

**Clarifications:**
- Teachers who encourage students to complete tasks with mathematical fluency:
  - Provide students with the flexibility to solve problems by selecting a procedure that allows them to solve efficiently and accurately.
  - Offer multiple opportunities for students to practice efficient and generalizable methods.
  - Provide opportunities for students to reflect on the method they used and determine if a more efficient method could have been used.

### MA.K12.MTR.4.1: Engage in discussions that reflect on the mathematical thinking of self and others.

**Mathematicians who engage in discussions that reflect on the mathematical thinking of self and others:**

- Communicate mathematical ideas, vocabulary and methods effectively.
- Analyze the mathematical thinking of others.
- Compare the efficiency of a method to those expressed by others.
- Recognize errors and suggest how to correctly solve the task.
- Justify results by explaining methods and processes.
- Construct possible arguments based on evidence.

**Clarifications:**
- Teachers who encourage students to engage in discussions that reflect on the mathematical thinking of self and others:
  - Establish a culture in which students ask questions of the teacher and their peers, and error is an opportunity for learning.
  - Create opportunities for students to discuss their thinking with peers.
  - Select, sequence and present student work to advance and deepen understanding of correct and increasingly efficient methods.
  - Develop students' ability to justify methods and compare their responses to the responses of their peers.

### MA.K12.MTR.5.1: Use patterns and structure to help understand and connect mathematical concepts.

**Mathematicians who use patterns and structure to help understand and connect mathematical concepts:**

- Focus on relevant details within a problem.
- Create plans and procedures to logically order events, steps or ideas to solve problems.
- Decompose a complex problem into manageable parts.
- Relate previously learned concepts to new concepts.
- Look for similarities among problems.
- Connect solutions of problems to more complicated large-scale situations.

**Clarifications:**
- Teachers who encourage students to use patterns and structure to help understand and connect mathematical concepts:
  - Help students recognize the patterns in the world around them and connect these patterns to mathematical concepts.
  - Support students to develop generalizations based on the similarities found among problems.
  - Provide opportunities for students to create plans and procedures to solve problems.
  - Develop students' ability to construct relationships between their current understanding and more sophisticated ways of thinking.

**Assess the reasonableness of solutions.**

**Mathematicians who assess the reasonableness of solutions:**

- Estimate to discover possible solutions.
English language learners communicate information, ideas and concepts for social and instructional purposes within the school setting.

**MA.K12.MTR.6.1:**
Use benchmark quantities to determine if a solution makes sense. Check calculations when solving problems. Verify possible solutions by explaining the methods used. Evaluate results based on the given context.

**Clarifications:**
Teachers who encourage students to assess the reasonableness of solutions:
- Have students estimate or predict solutions prior to solving.
- Prompt students to continually ask, "Does this solution make sense? How do you know?"
- Reinforce that students check their work as they progress within and after a task.
- Strengthen students' ability to verify solutions through justifications.

Apply mathematics to real-world contexts.
Mathematicians who apply mathematics to real-world contexts:
- Provide opportunities for students to create models, both concrete and abstract, and perform investigations.
- Challenge students to question the accuracy of their models and methods.
- Support students as they validate conclusions by comparing them to the given situation.
- Indicate how various concepts can be applied to other disciplines.

**MA.K12.MTR.7.1:**
Cite evidence to explain and justify reasoning.

**ELA.K12.EE.1.1:**
Use appropriate voice and tone when speaking or writing.

**ELA.K12.EE.2.1:**
Use the accepted rules governing a specific format to create quality work.

**ELA.K12.EE.3.1:**
Use appropriate collaborative techniques and active listening skills when engaging in discussions in a variety of situations.

**ELA.K12.EE.4.1:**
Use appropriate voice and tone when speaking or writing.

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Use the accepted rules governing a specific format to create quality work.

**ELD.K12.ELL.SC.1:**
English language learners communicate information, ideas and concepts necessary for academic success in the content area of Science.

**ELD.K12.ELL.SI.1:**
English language learners communicate for social and instructional purposes within the school setting.

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**General Course Information and Notes**

**GENERAL NOTES**

**Conclusion:**

**Text Complexity**

- In kindergarten, students learn to listen to one another respectfully.
- In grades 1-2, students build upon these skills by justifying what they are thinking. For example: "I think _______ because _______" The collaborative conversations are becoming academic conversations.
- In grades 3-12, students engage in academic conversations discussing claims and justifying their reasoning, refining and applying skills. Students build on ideas, propel the conversation, and support claims and counterclaims with evidence.
- Students will incorporate skills learned into work products to produce quality work. For students to incorporate these skills appropriately, they must receive instruction. A 3rd grade student creating a poster board display must have instruction in how to effectively present information to do quality work.
- Students will build on ideas, propel the conversation, and support claims and counterclaims with evidence.
- Teachers who encourage students to apply mathematics to real-world contexts:
- Provide opportunities for students to create models, both concrete and abstract, and perform investigations.
- Challenge students to question the accuracy of their models and methods.
- Support students as they validate conclusions by comparing them to the given situation.
- Indicate how various concepts can be applied to other disciplines.

**Mathematics who apply mathematics to real-world contexts:**
- Connect mathematical concepts to everyday experiences.
- Use models and methods to understand, represent and solve problems.
- Perform investigations to gather data or determine if a method is appropriate. • Redesign models and methods to improve accuracy or efficiency.

**Cite evidence to explain and justify reasoning.**

**K-1 Students include textual evidence in their oral communication with guidance and support from adults. The evidence can consist of details from the text without naming the text. During 1st grade, students learn how to incorporate the evidence in their writing. 2-3 Students include relevant textual evidence in their written and oral communication. Students should name the text when they refer to it. In 3rd grade, students should use a combination of direct and indirect citations.**

**4-5 Students continue with previous skills and reference comments made by speakers and peers. Students cite texts that they've directly quoted, paraphrased, or used for information. When writing, students will use the form of citation dictated by the instructor or the style guide referenced by the instructor. 6-8 Students continue with previous skills and use a style guide to create a proper citation. 9-12 Students continue with previous skills and should be aware of existing style guides and the ways in which they differ.**

**Read and comprehend grade-level complex texts proficiently.**

**See Text Complexity for grade-level complexity bands and a text complexity rubric.**

**Make inferences to support comprehension.**

**Students will make inferences before the words infer or inference are introduced. Kindergarten students will answer questions like "Why is the girl smiling?" or make predictions about what will happen based on the title page. Students will use the terms and apply them in 2nd grade and beyond.**

**Use appropriate collaborative techniques and active listening skills when engaging in discussions in a variety of situations.**

**In kindergarten, students learn to listen to one another respectfully. In grades 1-2, students build upon these skills by justifying what they are thinking. For example: "I think _______ because _______" The collaborative conversations are becoming academic conversations. In grades 3-12, students engage in academic conversations discussing claims and justifying their reasoning, refining and applying skills. Students build on ideas, propel the conversation, and support claims and counterclaims with evidence.**

**Use the accepted rules governing a specific format to create quality work.**

**Students will incorporate skills learned into work products to produce quality work. For students to incorporate these skills appropriately, they must receive instruction. A 3rd grade student creating a poster board display must have instruction in how to effectively present information to do quality work.**

**Use appropriate voice and tone when speaking or writing.**

**In kindergarten and 1st grade, students learn the difference between formal and informal language. For example, the way we talk to our friends differs from the way we speak to adults. In 2nd grade and beyond, students practice appropriate social and academic language to discuss texts.**

**English language learners communicate information, ideas and concepts necessary for academic success in the content area of Science. English language learners communicate for social and instructional purposes within the school setting.**
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- Asking questions (for science) and defining problems (for engineering).
- Developing and using models.
- Planning and carrying out investigations.
- Analyzing and interpreting data.
- Using mathematics, information and computer technology, and computational thinking.
- Constructing explanations (for science) and designing solutions (for engineering).
- Engaging in argument from evidence.
- Obtaining, evaluating, and communicating information.

**Florida's Benchmarks for Excellent Student Thinking (B.E.S.T.) Standards**

This course includes Florida's B.E.S.T. ELA Expectations (EE) and Mathematical Thinking and Reasoning Standards (MTRs) for students. Florida educators should intentionally embed these standards within the content and their instruction as applicable. For guidance on the implementation of the EEs and MTRs, please visit https://www.cpalms.org/Standards/BEST_Standards.aspx and select the appropriate B.E.S.T. Standards package.

**English Language Development ELD Standards Special Notes Section:**

Teachers are required to provide listening, speaking, reading and writing instruction that allows English language learners (ELL) to communicate information, ideas and concepts for academic success in the content area of Science. For the given level of English language proficiency and with visual, graphic, or interactive support, students will interact with grade level words, expressions, sentences and discourse to process or produce language necessary for academic success. The ELD standard should specify a relevant content area concept or topic of study chosen by curriculum developers and teachers which maximizes an ELL's need for communication and social skills. To access an ELL supporting document which delineates performance definitions and descriptors, please click on the following link: https://cpalmsmediaprod.blob.core.windows.net/uploads/docs/standards/eld/sc.pdf
## Course Standards

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<td>SC.912.E.7.3:</td>
<td>Differentiate and describe the various interactions among Earth systems, including: atmosphere, hydrosphere, cryosphere, geosphere, and biosphere.</td>
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<td>SC.912.E.7.5:</td>
<td>Predict future weather conditions based on present observations and conceptual models and recognize limitations and uncertainties of such predictions.</td>
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<td>Discuss the large-scale environmental impacts resulting from human activity, including waste spills, oil spills, runoff, greenhouse gases, ozone depletion, and surface and groundwater pollution.</td>
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<td>SC.912.L.18.12:</td>
<td>Discuss the special properties of water that contribute to Earth's suitability as an environment for life: cohesive behavior, ability to moderate temperature, expansion upon freezing, and versatility as a solvent.</td>
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<td>SC.912.L.18.12:</td>
<td>Define a problem based on a specific body of knowledge, for example: biology, chemistry, physics, and earth/space science, and do the following:</td>
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<td>1. Pose questions about the natural world, (Articulate the purpose of the investigation and identify the relevant scientific concepts).</td>
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<td>2. Conduct systematic observations, (Write procedures that are clear and replicable. Identify observables and examine relationships between test (independent) variable and outcome (dependent) variable. Employ appropriate methods for accurate and consistent observations; conduct and record measurements at appropriate levels of precision. Follow safety guidelines).</td>
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<td>SC.912.N.1.1:</td>
<td>Examine books and other sources of information to see what is already known, (Examine whether available empirical evidence can be interpreted in terms of existing knowledge and models, and if not, modify or develop new models).</td>
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<td>1. Plan investigations, (Design and evaluate a scientific investigation).</td>
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<td>2. Use tools to gather, analyze, and interpret data (this includes the use of measurement in metric and other systems, and also the generation and interpretation of graphical representations of data, including data tables and graphs), (Collect data or evidence in an organized way. Properly use instruments, equipment, and materials (e.g., scales, probeware, meter sticks, microscopes, computers) including set-up, calibration, technique, maintenance, and storage).</td>
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<td>3. Pose answers, explanations, or descriptions of events,</td>
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<td>4. Generate explanations that explicate or describe natural phenomena (inferences), (Use appropriate evidence and reasoning to justify these explanations to others, communicate results of scientific investigations, and evaluate the merits of the explanations produced by others).</td>
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<td>Describe and explain what characterizes science and its methods.</td>
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<td>Recognize that the strength or usefulness of a scientific claim is evaluated through scientific argumentation, which depends on critical and logical thinking, and the active consideration of alternative scientific explanations to explain the data presented.</td>
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<td>Identify sources of information and assess their reliability according to the strict standards of scientific investigation.</td>
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<td>Describe and provide examples of how similar investigations conducted in many parts of the world result in the same outcome.</td>
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<td>SC.912.N.1.6:</td>
<td>Describe how scientific inferences are drawn from scientific observations and provide examples from the content being studied.</td>
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<td>Recognize the role of creativity in constructing scientific questions, methods and explanations.</td>
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<td>SC.912.N.2.1:</td>
<td>Identify what is science, what clearly is not science, and what superficially resembles science (but fails to meet the criteria for science).</td>
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<td>SC.912.N.2.4:</td>
<td>Explain that scientific knowledge is both durable and robust and open to change. Scientific knowledge can change because it is often examined and re-examined by new investigations and scientific argumentation. Because of these frequent examinations, scientific knowledge becomes stronger, leading to its durability.</td>
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<td>SC.912.N.2.5:</td>
<td>Describe instances in which scientists' varied backgrounds, talents, interests, and goals influence the inferences and thus the explanations that they make about observations of natural phenomena and describe that competing interpretations (explanations) of scientists are a strength of science as they are a source of new, testable ideas that have the potential to add new evidence to support one or another of the explanations.</td>
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<td>SC.912.N.3.1:</td>
<td>Explain that a scientific theory is the culmination of many scientific investigations drawing together all the current evidence concerning a substantial range of phenomena; thus, a scientific theory represents the most powerful explanation scientists have to offer.</td>
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<td>Describe the function of models in science, and identify the wide range of models used in science.</td>
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<td>SC.912.N.4.1:</td>
<td>Explain how scientific knowledge and reasoning provide an empirically-based perspective to inform society's decision making.</td>
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<td>Weigh the merits of alternative strategies for solving a specific societal problem by comparing a number of different costs and benefits, such as human, economic, and environmental.</td>
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Explore the Law of Conservation of Energy by differentiating among open, closed, and isolated systems and explain that the total energy in an isolated system is a conserved quantity.

Describe the measurable properties of waves and explain the relationships among them and how these properties change when the wave moves from one medium to another.

Cite specific textual evidence to support analysis of science and technical texts, attending to important distinctions the author makes and to any gaps or inconsistencies in the account.

Determine the central ideas or conclusions of a text; summarize complex concepts, processes, or information presented in a text by paraphrasing them in simpler but still accurate terms.

Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks; analyze the specific results based on explanations in the text.

Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 11–12 texts and topics.

Analyze how the text structures information or ideas into categories or hierarchies, demonstrating understanding of the information or ideas.

Analyze the author's purpose in providing an explanation, describing a procedure, or discussing an experiment in a text, identifying important issues that remain unresolved.

Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g., quantitative data, video, multimedia) in order to address a question or solve a problem.

Evaluate the hypotheses, data, analysis, and conclusions in a science or technical text, verifying the data when possible and corroborating or challenging conclusions with other sources of information.

Synthesize information from a range of sources (e.g., texts, experiments, simulations) into a coherent understanding of a process, phenomenon, or concept, resolving conflicting information when possible.

By the end of grade 12, read and comprehend science/technical texts in the grades 11–12 text complexity band independently and proficiently, initiating and participate effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grades 11–12 topics, texts, and issues, building on others' ideas and expressing their own clearly and persuasively.

a. Come to discussions prepared, having read and researched material under study; explicitly draw on that preparation by referring to evidence from texts and other research on the topic or issue to stimulate a thoughtful, well-reasoned exchange of ideas.

b. Work with peers to promote civil, democratic discussions and decision-making, set clear goals and deadlines, and establish individual roles as needed.

c. Propel conversations by posing and responding to questions that probe reasoning and evidence; ensure a hearing for a full range of positions on a topic or issue; clarify, verify, or challenge ideas and conclusions; and promote divergent and creative perspectives.

d. Respond thoughtfully to diverse perspectives; synthesize comments, claims, and evidence made on all sides of an issue; resolve contradictions when possible; and determine what additional information or research is required to deepen the investigation or complete the task.

Integrate multiple sources of information presented in diverse formats and media (e.g., visually, quantitatively, orally) in order to make informed decisions and solve problems, evaluating the credibility and accuracy of each source and noting any discrepancies among the data.

Evaluate a speaker's point of view, reasoning, and use of evidence and rhetoric, assessing the stance, premises, links among ideas, word choice, points of emphasis, and tone used.

Present information, findings, and supporting evidence, conveying a clear and distinct perspective, such that listeners can follow the line of reasoning, alternative or opposing perspectives are addressed, and the organization, development, substance, and style are appropriate to purpose, audience, and a range of formal and informal tasks.

Make strategic use of digital media (e.g., textual, graphical, audio, visual, and interactive elements) in presentations to enhance understanding of findings, reasoning, and evidence to add interest.

Write arguments focused on discipline-specific content.

a. Introduce precise, knowledgeable claim(s), establish the significance of the claim(s), distinguish the claim(s) from alternate or opposing claims, and create an organization that logically sequences the claim(s), counterclaims, reasons, and evidence.

b. Develop claim(s) and counterclaims fairly and thoroughly, supplying the most relevant data and evidence for each while pointing out the strengths and limitations of both claim(s) and counterclaims in a discipline-appropriate form that anticipates the audience's knowledge level, concerns, values, and possible biases.

c. Use words, phrases, and clauses as well as varied syntax to link the major sections of the text, create cohesion, and clarify the relationships between claim(s) and reasons, between reasons and evidence, and between claim(s) and counterclaims.

d. Establish and maintain a formal style and objective tone while attending to the norms and conventions of the discipline in which they are writing.

e. Provide a concluding statement or section that follows from or supports the argument presented.

Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes.

a. Introduce a topic and organize complex ideas, concepts, and information so that each new element builds on that which preceded it to create a unified whole; include formatting (e.g., headings), graphics (e.g., figures, tables), and multimedia when useful to aiding comprehension.

b. Develop the topic thoroughly by selecting the most significant and relevant facts, extended definitions, concrete details, quotations, or other information and examples appropriate to the audience's knowledge of the topic.

c. Use varied transitions and sentence structures to link the major sections of the text, create cohesion, and clarify the relationships among complex ideas and concepts.

d. Use precise language, domain-specific vocabulary and techniques such as metaphor, simile, and analogy to manage the complexity of the topic; convey a knowledgeable stance in a style that responds to the discipline and context as well as to the expertise of likely readers.

e. Provide a concluding statement or section that follows from and supports the information or explanation provided (e.g., articulating implications or the significance of the topic).

Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.

Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience.

Use technology, including the Internet, to produce, publish, and update individual or shared writing products in response to ongoing feedback, including new arguments or information.

Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation.

Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the strengths and
Limitations of each source in terms of the specific task, purpose, and audience; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and overreliance on any one source and following a standard format for citation.

Draw evidence from informational texts to support analysis, reflection, and research.

Write routinely over extended time frames (time for reflection and knowing and flexibly using different properties of operations and objects).

Apply concepts of density based on area and volume in modeling situations (e.g., persons per square mile, BTUs per cubic foot).

Choose a level of accuracy appropriate to limitations on measurement when reporting quantities.

Draw evidence from informational texts to support analysis, reflection, and research.

Summarize categorical data for two categories in two-way frequency tables. Interpret relative frequencies in the context of the data (including joint, marginal, and conditional relative frequencies).

Evaluate reports based on data.

Represent data with plots on the real number line (dot plots, histograms, and box plots).

Use statistics appropriate to the shape of the data distribution to compare center (median, mean) and spread (interquartile range, standard deviation) of two or more different data sets.

Interpret differences in shape, center, and spread in the context of the data sets, accounting for possible effects of extreme data points.

Represent data on two categorical variables using bar graphs, or categorical variables using segmented bar graphs, or two quantitative variables using scatter plots.

Make sense of problems and persevere in solving them.

Mathematically proficient students start by explaining to themselves the meaning of a problem and looking for entry points to its solution. They analyze givens, constraints, relationships, and goals. They make conjectures about the form and meaning of the solution and plan a solution pathway rather than simply jumping into a solution attempt. They consider analogous problems, and try special cases and simpler forms of the original problem in order to gain insight into its solution. They monitor and evaluate their progress and change course if necessary. Older students might rely on the ability to decontextualize—to abstract a given situation and represent it symbolically—by pulling variables out of context. Younger students might rely on the ability to contextualize; to pause as needed during the manipulation process in order to probe into the referents for the symbols involved.

Mathematically proficient students check their answers to problems using a different method, and if they continually ask themselves, “Does this make sense?” They can understand the approaches of others to solving complex problems and identify correspondences between different approaches.

Mathematically proficient students make sense of quantities and their relationships in problem situations. They bring two complementary abilities to bear on problems involving quantitative relationships: the ability to decontextualize—to abstract a given situation and represent it symbolically and manipulate the representing symbols as if they have a life of their own, without necessarily attending to their referents—and the ability to contextualize, to pause as needed during the manipulation process in order to probe into the referents for the symbols involved. Quantitative reasoning entails habits of creating a coherent representation of the problem at hand; considering the units involved; attending to the meaning of quantities, not just how to compute them; and knowing and flexibly using different properties of operations and objects.
Construct viable arguments and critique the reasoning of others.

Mathematically proficient students understand and use stated assumptions, definitions, and previously established results in constructing arguments. They make conjectures and build a logical progression of statements to explore the truth of their conjectures. They are able to analyze situations by breaking them into cases, and can recognize and use counterexamples. They justify their conclusions, communicate them to others, and respond to the arguments of others. They reason inductively about data, making plausible arguments that take into account the context from which the data arose. Mathematically proficient students are also able to compare the effectiveness of two plausible arguments, distinguish correct logic or reasoning from that which is flawed, and—if there is a flaw in an argument—explain what it is. Elementary students can construct arguments using concrete referents such as objects, drawings, diagrams, and actions. Such arguments can make sense and be correct, even though they are not generalized or made formal until later grades. Later, students learn to determine domains to which an argument applies. Students at all grades can listen or read the arguments of others, decide whether they make sense, and ask useful questions to clarify or improve the arguments.

**Standard Relation to Course: Supporting**

Model with mathematics.

Mathematically proficient students can apply the mathematics they know to solve problems arising in everyday life, society, and the workplace. In early grades, this might be as simple as writing an addition equation to describe a situation. In middle grades, a student might apply proportional reasoning to plan a school event or analyze a problem in the community. By high school, a student might use geometry to solve a design problem or use a function to describe how one quantity of interest depends on another. Mathematically proficient students who can apply what they know are comfortable making assumptions and approximations to simplify a complicated situation, realizing that these may need revision later. They are able to identify important quantities in a practical situation and map their relationships using such tools as diagrams, two-way tables, graphs, flowcharts and formulas. They can analyze those relationships mathematically to draw conclusions. They routinely interpret their mathematical results in the context of the situation and reflect on whether the results make sense, possibly improving the model if it has not served its purpose.

**Standard Relation to Course: Supporting**

Use appropriate tools strategically.

Mathematically proficient students consider the available tools when solving a mathematical problem. These tools might include pencil and paper, concrete models, a ruler, a protractor, a calculator, a spreadsheet, a computer algebra system, a statistical package, or dynamic geometry software. Proficient students are sufficiently familiar with tools appropriate for their grade or course to make sound decisions about when each of these tools might be helpful, recognizing both the insight to be gained and their limitations. For example, mathematically proficient high school students analyze graphs of functions and solutions generated using a graphing calculator. They detect possible errors by strategically using estimation and other mathematical knowledge. When making mathematical models, they know that technology can enable them to visualize the results of varying assumptions, explore consequences, and compare predictions with data. Mathematically proficient students at various grade levels are able to identify relevant external mathematical resources, such as digital content located on a website, and use them to pose or solve problems. They are able to use technological tools to explore and deepen their understanding of concepts.

**Standard Relation to Course: Supporting**

Attend to precision.

Mathematically proficient students try to communicate precisely to others. They try to use clear definitions in discussion with others and in their own reasoning. They state the meaning of the symbols they choose, including using the equal sign consistently and appropriately. They are careful about specifying units of measure, and labeling axes to clarify the correspondence with quantities in a problem. They calculate accurately and efficiently, express numerical answers with a degree of precision appropriate for the problem context. In the elementary grades, students give carefully formulated explanations to each other. By the time they reach high school they have learned to examine claims and make explicit use of definitions.

**Standard Relation to Course: Supporting**

Look for and make use of structure.

Mathematically proficient students look closely to discern a pattern or structure. Young students, for example, might notice that three and seven more is the same amount as seven and three more, or they may sort a collection of shapes according to how many sides the shapes have. Later, students will see 7 × 8 equals the well remembered 7 × 5 + 7, in preparation for learning about the distributive property. In the expression x² + 9x + 14, older students can see the 14 as 2 × 7 and 2 + 7. They recognize the significance of an existing line in a geometric figure and can use the strategy of drawing an auxiliary line to solve a problem. They also can step back for an overview and shift perspective. They can see complicated things, such as some algebraic expressions, as single objects or as being composed of several objects. For example, they can see 5 – (x – 1)²/2 as 5 minus a positive number times a square and use that to realize that its value cannot be more than 5 for any real numbers x and y.

**Standard Relation to Course: Supporting**

Look for and express regularity in repeated reasoning.

Mathematically proficient students notice if calculations are repeatable, and look both for general methods and for shortcuts. Upper elementary students might notice when dividing 25 by 11 that they are repeating the same calculations over and over again, and conclude they have a repeating decimal. By paying attention to the calculation of slope as they repeatedly check whether points are on the line through (1, 2) with slope 3, middle school students might abstract the equation (y – 2)/(x – 1) = 3. Noticing the regularity in the way terms cancel when expanding (x – 1)(x + 1), (x – 1)(x² + x + 1), and (x – 1)(x² + x + 1) might lead them to the general formula for the sum of a geometric series. As they work to solve a problem, mathematically proficient students maintain oversight of the process, while attending to the details. They continually evaluate the reasonableness of their intermediate results.

**Standard Relation to Course: Supporting**

**ELD.K12.ELL.SC.1:** English language learners communicate information, ideas and concepts necessary for academic success in the content area of Science.

**ELD.K12.ELL.SL.1:** English language learners communicate for social and instructional purposes within the school setting.

**GENERAL NOTES**
While the content focus of this course is consistent with the Marine Science 2 course, students will explore these concepts in greater depth. In general, the academic pace and rigor will be greatly increased for honors level course work. Laboratory investigations that include the use of scientific inquiry, research, measurement, problem solving, laboratory apparatus and technologies, experimental procedures, and safety procedures are an integral part of this course. The National Science Teachers Association (NSTA) recommends that at the high school level, all students should be in the science lab or field, collecting data every week. School laboratory investigations (labs) are defined by the National Research Council (NRC) as an experience in the laboratory classroom, or the field that provides students with opportunities to interact directly with natural phenomena or with data collected by others using tools, materials, data collection techniques, and models (NRC, 2006, p. 3). Laboratory investigations in the high school classroom should help all students develop a growing understanding of the complexity and ambiguity of empirical work, as well as the skills to calibrate and troubleshoot equipment used to make observations. Learners should understand measurement error; and have the skills to aggregate, interpret, and present the resulting data (National Research Council, 2006, p.77; NSTA, 2007).

Special Notes:

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Instructional Practices
Teaching from a range of complex text is optimized when teachers in all subject areas implement the following strategies on a routine basis:

1. Ensuring wide reading from complex text that varies in length.
2. Making close reading and rereading of texts central to lessons.
3. Emphasizing text-specific complex questions, and cognitively complex tasks, reinforce focus on the text and cultivate independence.
4. Emphasizing students supporting answers based upon evidence from the text.
5. Providing extensive research and writing opportunities (claims and evidence).


- Asking questions (for science) and defining problems (for engineering).
- Developing and using models.
- Planning and carrying out investigations.
- Analyzing and interpreting data.
- Using mathematics, information and computer technology, and computational thinking.
- Constructing explanations (for science) and designing solutions (for engineering).
- Engaging in argument from evidence.
- Obtaining, evaluating, and communicating information.

Honors and Advanced Level Course Note: Advanced courses require a greater demand on students through increased academic rigor. Academic rigor is obtained through the application, analysis, evaluation, and creation of complex ideas that are often abstract and multi-faceted. Students are challenged to think and collaborate critically on the content they are learning. Honors level rigor will be achieved by increasing text complexity through text selection, focus on high-level qualitative measures, and complexity of task. Instruction will be structured to give students a deeper understanding of conceptual themes and organization within and across disciplines. Academic rigor is more than simply assigning to students a greater quantity of work.

Literacy Standards in Science

Secondary science courses include reading standards for literacy in science and technical subjects 6-12 and writing standards for literacy in history/social studies, science, and technical subjects 6-12. The courses also include speaking and listening standards. For a complete list of standards required for this course click on the blue tile labeled course standards. You may also download the complete course including all required standards and notes sections using the export function located at the top of this page.

English Language Development ELD Standards Special Notes Section:

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To access an ELL supporting document which delineates performance definitions and descriptors, please click on the following link: https://cpalmsmediaprod.blob.core.windows.net/uploads/docs/standards/eld/sc.pdf

GENERAL INFORMATION

Course Number: 2002530
Course Path: Section: Grades PreK to 12 Education Courses > Grade Group: Grades 9 to 12 and Adult Education Courses > Subject: Science > SubSubject: Marine Sciences
Abbreviated Title: MARINE SCI 2 HON
Number of Credits: One (1) credit
Course Length: Year (Y)
Course Attributes:
- Honors
Course Level: 3
Grade Group: 9,10,11,12
Graduation Requirement: Equally Rigorous Science

Educator Certifications

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<td>SC.912.L.17.16:</td>
<td>Discuss the large-scale environmental impacts resulting from human activity, including waste spills, oil spills, runoff, greenhouse gases, ozone depletion, and surface and groundwater pollution.</td>
</tr>
<tr>
<td>SC.912.L.18.12:</td>
<td>Discuss the special properties of water that contribute to Earth's suitability as an environment for life: cohesive behavior, ability to moderate temperature, expansion upon freezing, and versatility as a solvent.</td>
</tr>
<tr>
<td>SC.912.N.1.1:</td>
<td>Pose questions about the natural world, (Articulate the purpose of the investigation and identify the relevant scientific concepts).</td>
</tr>
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<td>SC.912.N.1.2:</td>
<td>Plan investigations, (Design and evaluate a scientific investigation).</td>
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<td>SC.912.N.1.3:</td>
<td>Use tools to gather, analyze, and interpret data (this includes the use of measurement in metric and other systems, and also the generation and interpretation of graphical representations of data, including data tables and graphs), (Collect data or evidence in an organized way. Properly use instruments, equipment, and materials (e.g., scales, probeware, meter sticks, microscopes, computers) including set-up, calibration, technique, maintenance, and storage).</td>
</tr>
<tr>
<td>SC.912.N.1.4:</td>
<td>Use appropriate evidence and reasoning to justify these explanations to others, (If the evidence is not already known to the students, provide appropriate examples).</td>
</tr>
<tr>
<td>SC.912.N.1.5:</td>
<td>Use appropriate evidence and reasoning to justify these explanations to others, (Collect data or evidence in an organized way. Properly use instruments, equipment, and materials (e.g., scales, probeware, meter sticks, microscopes, computers) including set-up, calibration, technique, maintenance, and storage).</td>
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<td>SC.912.N.1.6:</td>
<td>Construct a model of the natural or human world (such as those of the study of ecosystems, weather, or climate).</td>
</tr>
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<td>Construct a model of the natural or human world (such as those of the study of ecosystems, weather, or climate).</td>
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<td>Identify what is science, what clearly is not science, and what superficially resembles science (but fails to meet the criteria for science).</td>
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<td>SC.912.N.2.4:</td>
<td>Explain that scientific knowledge is both durable and robust and open to change. Scientific knowledge can change because it is often examined and re-examined by new investigations and scientific argumentation. Because of these frequent examinations, scientific knowledge becomes stronger, leading to its durability.</td>
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<td>SC.912.N.2.5:</td>
<td>Describe instances in which scientists' varied backgrounds, talents, interests, and goals influence the inferences and thus the explanations that they make about observations of natural phenomena and describe that competing interpretations (explanations) of scientists are a strength of science as they are a source of new, testable ideas that have the potential to add new evidence to support one or another of the explanations.</td>
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<td>SC.912.N.3.1:</td>
<td>Explain that a scientific theory is the culmination of many scientific investigations drawing together all the current evidence concerning a substantial range of phenomena; thus, a scientific theory represents the most powerful explanation scientists have to offer.</td>
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<td>SC.912.N.3.5:</td>
<td>Describe the function of models in science, and identify the wide range of models used in science.</td>
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<td>SC.912.N.4.1:</td>
<td>Explain how scientific knowledge and reasoning provide an empirically-based perspective to inform society's decision making.</td>
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<td>SC.912.N.4.2:</td>
<td>Weigh the merits of alternative strategies for solving a specific societal problem by comparing a number of different costs and benefits, such as human, economic, and environmental.</td>
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</table>
SC.912.P.10.2: Explore the Law of Conservation of Energy by differentiating among open, closed, and isolated systems and explain that the total energy in an isolated system is a conserved quantity.

SC.912.P.10.20: Describe the measurable properties of waves and explain the relationships among them and how these properties change when the wave moves from one medium to another.

Mathematicians who participate in effortful learning both individually and with others:
- Analyze the problem in a way that makes sense given the task.
- Ask questions that will help with solving the task.
- Build perseverance by modifying methods as needed while solving a challenging task.
- Stay engaged and maintain a positive mindset when working to solve tasks.
- Help and support each other when attempting a new method or approach.

**Clarifications:**
Teachers who encourage students to participate actively in effortful learning both individually and with others:
- Cultivate a community of growth mindset learners.
- Foster perseverance in students by choosing tasks that are challenging.
- Develop students' ability to analyze and problem solve.
- Recognize students' effort when solving challenging problems.

Demonstrate understanding by representing problems in multiple ways. Mathematicians who demonstrate understanding by representing problems in multiple ways:
- Build understanding through modeling and using manipulatives.
- Represent solutions to problems in multiple ways using objects, drawings, tables, graphs and equations.
- Progress from modeling problems with objects and drawings to using algorithms and equations.
- Express connections between concepts and representations.
- Choose a representation based on the given context or purpose.

**Clarifications:**
Teachers who encourage students to demonstrate understanding by representing problems in multiple ways:
- Help students make connections between concepts and representations.
- Provide opportunities for students to use manipulatives when investigating concepts.
- Guide students from concrete to pictorial to abstract representations as understanding progresses.
- Show students that various representations can have different purposes and can be useful in different situations.

Complete tasks with mathematical fluency. Mathematicians who complete tasks with mathematical fluency:
- Select efficient and appropriate methods for solving problems within the given context.
- Maintain flexibility and accuracy while performing procedures and mental calculations.
- Complete tasks accurately and with confidence.
- Adapt procedures to apply them to a new context.
- Use feedback to improve efficiency when performing calculations.

**Clarifications:**
Teachers who encourage students to complete tasks with mathematical fluency:
- Provide students with the flexibility to solve problems by selecting a procedure that allows them to solve efficiently and accurately.
- Offer multiple opportunities for students to practice efficient and generalizable methods.
- Provide opportunities for students to reflect on the method they used and determine if a more efficient method could have been used.

Engage in discussions that reflect on the mathematical thinking of self and others. Mathematicians who engage in discussions that reflect on the mathematical thinking of self and others:
- Communicate mathematical ideas, vocabulary and methods effectively.
- Analyze the mathematical thinking of others.
- Compare the efficiency of a method to those expressed by others.
- Recognize errors and suggest how to correctly solve the task.
- Justify results by explaining methods and processes.
- Construct possible arguments based on evidence.

**Clarifications:**
Teachers who encourage students to engage in discussions that reflect on the mathematical thinking of self and others:
- Establish a culture in which students ask questions of the teacher and their peers, and error is an opportunity for learning.
- Create opportunities for students to discuss their thinking with peers.
- Select, sequence and present student work to advance and deepen understanding of correct and increasingly efficient methods.
- Develop students' ability to justify methods and compare their responses to the responses of their peers.

Use patterns and structure to help understand and connect mathematical concepts. Mathematicians who use patterns and structure to help understand and connect mathematical concepts:
- Focus on relevant details within a problem.
- Create plans and procedures to logically order events, steps or ideas to solve problems.
- Decompose a complex problem into manageable parts.
- Relate previously learned concepts to new concepts.
- Look for similarities among problems.
- Connect solutions of problems to more complicated large-scale situations.

**Clarifications:**
Teachers who encourage students to use patterns and structure to help understand and connect mathematical concepts:
- Help students recognize the patterns in the world around them and connect these patterns to mathematical concepts.
### Assess the reasonableness of solutions.

Mathematicians who assess the reasonableness of solutions:
- Estimate to discover possible solutions.
- Use benchmark quantities to determine if a solution makes sense.
- Check calculations when solving problems.
- Verify possible solutions by explaining the methods used.
- Evaluate results based on the given context.

**Clarifications:**
Teachers who encourage students to assess the reasonableness of solutions:
- Have students estimate or predict solutions prior to solving.
- Prompt students to continually ask, “Does this solution make sense? How do you know?”
- Reinforce that students check their work as they progress within and after a task.
- Strengthen students’ ability to verify solutions through justifications.

### Apply mathematics to real-world contexts.

Mathematicians who apply mathematics to real-world contexts:
- Connect mathematical concepts to everyday experiences.
- Use models and methods to understand, represent and solve problems.
- Perform investigations to gather data or determine if a method is appropriate. • Redesign models and methods to improve accuracy or efficiency.

**Clarifications:**
Teachers who encourage students to apply mathematics to real-world contexts:
- Provide opportunities for students to create models, both concrete and abstract, and perform investigations.
- Challenge students to question the accuracy of their models and methods.
- Support students as they validate conclusions by comparing them to the given situation.
- Indicate how various concepts can be applied to other disciplines.

### Cite evidence to explain and justify reasoning.

K-1 Students include textual evidence in their oral communication with guidance and support from adults. The evidence can consist of details from the text without naming the text. During 1st grade, students learn how to incorporate the evidence in their writing.

2-3 Students include relevant textual evidence in their written and oral communication. Students should name the text when they refer to it. In 3rd grade, students should use a combination of direct and indirect citations.

4-5 Students continue with previous skills and reference comments made by speakers and peers. Students cite texts that they’ve directly quoted, paraphrased, or used for information. When writing, students will use the form of citation dictated by the instructor or the style guide referenced by the instructor.

6-8 Students continue with previous skills and use a style guide to create a proper citation.

9-12 Students continue with previous skills and should be aware of existing style guides and the ways in which they differ.

### Read and comprehend grade-level complex texts proficiently.

**Clarifications:**
See Text Complexity for grade-level complexity bands and a text complexity rubric.

### Make inferences to support comprehension.

**Clarifications:**
Students will make inferences before the words infer or inference are introduced. Kindergarten students will answer questions like “Why is the girl smiling?” or make predictions about what will happen based on the title page. Students will use the terms and apply them in 2nd grade and beyond.

### Use appropriate collaborative techniques and active listening skills when engaging in discussions in a variety of situations.

**Clarifications:**
In kindergarten, students learn to listen to one another respectfully.
In grades 1-2, students build upon these skills by justifying what they are thinking. For example: “I think _______ because _______.” The collaborative conversations are becoming academic conversations.

In grades 3-12, students engage in academic conversations discussing claims and justifying their reasoning, refining and applying skills. Students build on ideas, propel the conversation, and support claims and counterclaims with evidence.

### Use the accepted rules governing a specific format to create quality work.

**Clarifications:**
Students will incorporate skills learned into work products to produce quality work. For students to incorporate these skills appropriately, they must receive instruction. A 3rd grade student creating a poster board display must have instruction in how to effectively present information to do quality work.

### Use appropriate voice and tone when speaking or writing.

**Clarifications:**
In kindergarten and 1st grade, students learn the difference between formal and informal language. For example, the way we talk to our friends differs from the way we speak to adults. In 2nd grade and beyond, students practice appropriate social and academic language to discuss texts.

**ELD.K12.ELL.SC.1:**
English language learners communicate information, ideas and concepts necessary for academic success in the content area of Science.
General Course Information and Notes

GENERAL NOTES

While the content focus of this course is consistent with the Marine Science 2 course, students will explore these concepts in greater depth. In general, the academic pace and rigor will be greatly increased for honors level course work. Laboratory investigations that include the use of scientific inquiry, research, measurement, problem solving, laboratory apparatus and technologies, experimental procedures, and safety procedures are an integral part of this course. The National Science Teachers Association (NSTA) recommends that at the high school level, all students should be in the science lab or field, collecting data every week. School laboratory investigations (labs) are defined by the National Research Council (NRC) as an experience in the laboratory, classroom, or the field that provides students with opportunities to interact directly with natural phenomena or with data collected by others using tools, materials, data collection techniques, and models (NRC, 2006, p. 3). Laboratory investigations in the high school classroom should help all students develop a growing understanding of the complexity and ambiguity of empirical work, as well as the skills to calibrate and troubleshoot equipment used to make observations. Learners should understand measurement error, and have the skills to aggregate, interpret, and present the resulting data (National Research Council, 2006, p. 77; NSTA, 2007).

Special Notes:

Special Notes:

Instructional Practices
Teaching from a range of complex text is optimized when teachers in all subject areas implement the following strategies on a routine basis:

1. Ensuring wide reading from complex text that varies in length.
2. Making close reading and rereading of texts central to lessons.
3. Emphasizing text-specific complex questions, and cognitively complex tasks, reinforce focus on the text and cultivate independence.
4. Emphasizing students supporting answers based upon evidence from the text.
5. Providing extensive research and writing opportunities (claims and evidence).


- Asking questions (for science) and defining problems (for engineering).
- Developing and using models.
- Planning and carrying out investigations.
- Analyzing and interpreting data.
- Using mathematics, information and computer technology, and computational thinking.
- Constructing explanations (for science) and designing solutions (for engineering).
- Engaging in argument from evidence.
- Obtaining, evaluating, and communicating information.

Honors and Advanced Level Course Note: Advanced courses require a greater demand on students through increased academic rigor. Academic rigor is obtained through the application, analysis, evaluation, and creation of complex ideas that are often abstract and multi-faceted. Students are challenged to think and collaborate critically on the content they are learning. Honors level rigor will be achieved by increasing text complexity through text selection, focus on high-level qualitative measures, and complexity of task. Instruction will be structured to give students a deeper understanding of conceptual themes and organization within and across disciplines. Academic rigor is more than simply assigning to students a greater quantity of work.

Florida's Benchmarks for Excellent Student Thinking (B.E.S.T.) Standards

This course includes Florida's B.E.S.T. ELA Expectations (EE) and Mathematical Thinking and Reasoning Standards (MTRs) for students. Florida educators should intentionally embed these standards within the content and their instruction as applicable. For guidance on the implementation of the EE's and MTRs, please visit https://www.cpalms.org/Standards/BEST_Standards.aspx and select the appropriate B.E.S.T. Standards package.

English Language Development ELD Standards Special Notes Section:

Teachers are required to provide listening, speaking, reading and writing instruction that allows English language learners (ELL) to communicate information, ideas and concepts for academic success in the content area of Science. For the given level of English language proficiency and with visual, graphic, or interactive support, students will interact with grade level words, expressions, sentences and discourse to process or produce language necessary for academic success. The ELD standard should specify a relevant content area concept or topic of study chosen by curriculum developers and teachers which maximizes an ELL's need for communication and social skills. To access an ELL supporting document which delineates performance definitions and descriptors, please click on the following link: https://cpalmsmediaprod.blob.core.windows.net/uploads/docs/standards/eld/sc.pdf

GENERAL INFORMATION

Course Number: 2002530
Number of Credits: One (1) credit
Course Type: Core Academic Course
Course Status: State Board Approved
Grade Level(s): 9,10,11,12
Graduation Requirement: Equally Rigorous Science

Course Path: Section: Grades PreK to 12 Education
Courses > Grade Group: Grades 9 to 12 and Adult
Education Courses > Subject: Science > SubSubject: Marine Sciences
Abbreviated Title: MARINE SCI 2 HON
Course Length: Year (Y)
Course Attributes:
- Honors
Course Level: 3
**Educator Certifications**

<table>
<thead>
<tr>
<th>Subject</th>
<th>Grade Range</th>
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</thead>
<tbody>
<tr>
<td>Biology</td>
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<tr>
<td>Chemistry</td>
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</tr>
<tr>
<td>Physics</td>
<td>Grades 6-12</td>
</tr>
<tr>
<td>Science (Secondary)</td>
<td>Grades 7-12</td>
</tr>
</tbody>
</table>
General Course Information and Notes

GENERAL NOTES

For more information about this Cambridge course, visit http://www.cie.org.uk/programmes-and-qualifications/cambridge-advanced/cambridge-international-as-and-a-levels/curriculum/.

GENERAL INFORMATION

Course Number: 2002535

Course Path: Section: Grades PreK to 12 Education Courses > Grade Group: Grades 9 to 12 and Adult Education Courses > Subject: Science > SubSubject: Marine Sciences >

Abbreviated Title: AICE MARINE SCI 2 AL

Course Length: Year (Y)

Course Attributes:
- Advanced International Certificate of Education (AICE)

Course Level: 3

Course Status: Course Approved

Grade Level(s): 9, 10, 11, 12

Graduation Requirement: Equally Rigorous Science

Educator Certifications

Science (Secondary Grades 7-12)
Chemistry (Grades 6-12)
Earth/Space Science (Grades 6-12)
Biology (Grades 6-12)
Physics (Grades 6-12)
**Solar Energy Honors (#2002540)** 2015 - 2022 (current)

### Course Standards

<table>
<thead>
<tr>
<th>Name</th>
<th>Description</th>
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<tbody>
<tr>
<td>SC.912.E.5.4:</td>
<td>Explain the physical properties of the Sun and its dynamic nature and connect them to conditions and events on Earth.</td>
</tr>
<tr>
<td>SC.912.E.6.6:</td>
<td>Analyze past, present, and potential future consequences to the environment resulting from various energy production technologies.</td>
</tr>
<tr>
<td>SC.912.E.7.1:</td>
<td>Analyze the movement of matter and energy through the different biogeochemical cycles, including water and carbon.</td>
</tr>
<tr>
<td>SC.912.E.7.2:</td>
<td>Analyze the causes of the various kinds of surface and deep water motion within the oceans and their impacts on the transfer of energy between the poles and the equator.</td>
</tr>
<tr>
<td>SC.912.E.7.9:</td>
<td>Cite evidence that the ocean has had a significant influence on climate change by absorbing, storing, and moving heat, carbon, and water.</td>
</tr>
<tr>
<td>SC.912.L.7.11:</td>
<td>Evaluate the costs and benefits of renewable and nonrenewable resources, such as water, energy, fossil fuels, wildlife, and forests.</td>
</tr>
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<td>SC.912.L.7.12:</td>
<td>Discuss the political, social, and environmental consequences of sustainable use of land.</td>
</tr>
<tr>
<td>SC.912.L.7.13:</td>
<td>Discuss the need for adequate monitoring of environmental parameters when making policy decisions.</td>
</tr>
<tr>
<td>SC.912.L.7.15:</td>
<td>Discuss the effects of technology on environmental quality.</td>
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<td>SC.912.L.7.16:</td>
<td>Discuss the large-scale environmental impacts resulting from human activity, including waste spills, oil spills, runoff, greenhouse gases, ozone depletion, and surface and groundwater pollution.</td>
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<tr>
<td>SC.912.L.7.17:</td>
<td>Assess the effectiveness of innovative methods of protecting the environment.</td>
</tr>
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<td>SC.912.L.7.18:</td>
<td>Describe how human population size and resource use relate to environmental quality.</td>
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<td>SC.912.L.7.19:</td>
<td>Describe how different natural resources are produced and how their rates of use and renewal limit availability.</td>
</tr>
<tr>
<td>SC.912.L.7.20:</td>
<td>Predict the impact of individuals on environmental systems and examine how human lifestyles affect sustainability.</td>
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</table>

Define a problem based on a specific body of knowledge, for example: biology, chemistry, physics, and earth/space science, and do the following:

1. Pose questions about the natural world, (Articulate the purpose of the investigation and identify the relevant scientific concepts).
2. Conduct systematic observations, (Write procedures that are clear and replicable. Identify observables and examine relationships between test (independent) variable and outcome (dependent) variable. Employ appropriate methods for accurate and consistent observations; conduct and record measurements at appropriate levels of precision. Follow safety guidelines).
3. Examine books and other sources of information to see what is already known,
4. Review what is known in light of empirical evidence, (Examine whether available empirical evidence can be interpreted in terms of existing knowledge and models, and if not, modify or develop new models).
5. Plan investigations, (Design and evaluate a scientific investigation).
6. Use tools to gather, analyze, and interpret data (this includes the use of measurement in metric and other systems, and also the generation and interpretation of graphical representations of data, including data tables and graphs), (Collect data or evidence in an organized way. Properly use instruments, equipment, and materials (e.g., scales, probeware, meter sticks, microscopes, computers) including set-up, calibration, technique, maintenance, and storage).
7. Pose answers, explanations, or descriptions of events,
8. Generate explanations that explicate or describe natural phenomena (inferences),
9. Use appropriate evidence and reasoning to justify these explanations to others,
10. Communicate results of scientific investigations, and
11. Evaluate the merits of the explanations produced by others.

### SC.912.N.1.1:

Describe and explain what characterizes science and its methods.

### SC.912.N.1.2:

Recognize that the strength or usefulness of a scientific claim is evaluated through scientific argumentation, which depends on critical and logical thinking, and the active consideration of alternative scientific explanations to explain the data presented.

### SC.912.N.1.3:

Identify sources of information and assess their reliability according to the strict standards of scientific investigation.

### SC.912.N.1.4:

Describe and provide examples of how similar investigations conducted in many parts of the world result in the same outcome.

### SC.912.N.1.5:

Describe how scientific inferences are drawn from scientific observations and provide examples from the content being studied.

### SC.912.N.1.6:

Recognize the role of creativity in constructing scientific questions, methods and explanations.

### SC.912.N.1.7:

Identify what is science, what clearly is not science, and what superficially resembles science (but fails to meet the criteria for science).

### SC.912.N.2.1:

Identify which questions can be answered through science and which questions are outside the boundaries of scientific investigation, such as questions addressed by other ways of knowing, such as art, philosophy, and religion.

### SC.912.N.2.2:

Identify examples of pseudoscience (such as astrology, phrenology) in society.

### SC.912.N.2.3:

Explain that scientific knowledge is both durable and robust and open to change. Scientific knowledge can change because it is often examined and re-examined by new investigations and scientific argumentation. Because of these frequent examinations, scientific knowledge becomes stronger, leading to its durability.

### SC.912.N.2.4:

Describe instances in which scientists’ varied backgrounds, talents, interests, and goals influence the inferences and thus the explanations that they make about observations of natural phenomena and describe that competing interpretations (explanations) of scientists are a strength of science as they are a source of new, testable ideas that have the potential to add new evidence to support one or another of the explanations.

### SC.912.N.2.5:

Explain that a scientific theory is the culmination of many scientific investigations drawing together all the current evidence concerning a substantial range of phenomena; thus, a scientific theory represents the most powerful explanation scientists have to offer.

### SC.912.N.3.1:

Describe the function of models in science, and identify the wide range of models used in science.

### SC.912.N.4.1:

Explain how scientific knowledge and reasoning provide an empirically-based perspective to inform society's decision making.

### SC.912.N.4.2:

Weigh the merits of alternative strategies for solving a specific societal problem by comparing a number of different costs and benefits, such as human, economic, and environmental.

### SC.912.P.8.12:

Describe the properties of the carbon atom that make the diversity of carbon compounds possible.

### SC.912.P.8.13:

Identify selected functional groups and relate how they contribute to properties of carbon compounds.

### SC.912.P.10.1:

Differentiate among the various forms of energy and recognize that they can be transformed from one form to others.
Explore the Law of Conservation of Energy by differentiating among open, closed, and isolated systems and explain that the total energy in an isolated system is a conserved quantity.

Compare and contrast work and power qualitatively and quantitatively.

Describe heat as the energy transferred by convection, conduction, and radiation, and explain the connection of heat to change in temperature or states of matter.

Describe the quantization of energy at the atomic level.

Cite specific textual evidence to support analysis of science and technical texts, attending to important distinctions the author makes and to any gaps or inconsistencies in the account.

Determine the central ideas or conclusions of a text; summarize complex concepts, processes, or information presented in a text by paraphrasing them in simpler but still accurate terms.

Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks; analyze the specific results based on explanations in the text.

Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 11–12 texts and topics.

Analyze how the text structures information or ideas into categories or hierarchies, demonstrating understanding of the information or ideas.

Analyze the author's purpose in providing an explanation, describing a procedure, or discussing an experiment in a text, identifying important issues that remain unresolved.

Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g., quantitative data, video, multimedia) in order to address a question or solve a problem.

Evaluate the hypotheses, data, analysis, and conclusions in a science or technical text, verifying the data when possible and corroborating or challenging conclusions with other sources of information.

Synthesize information from a range of sources (e.g., texts, experiments, simulations) into a coherent understanding of a process, phenomenon, or concept, resolving conflicting information when possible.

By the end of grade 12, read and comprehend science/technical texts in grades 11–12 complexity band independently and proficiently.

Initiate and participate effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grades 11–12 topics, texts, and issues, building on others' ideas and expressing their own clearly and persuasively.

a. Come to discussions prepared, having read and researched material under study; explicitly draw on that preparation by referring to evidence from texts and other research on the topic or issue to stimulate a thoughtful, well-reasoned exchange of ideas.

b. Work with peers to promote civil, democratic discussions and decision-making, set clear goals and deadlines, and establish individual roles as needed.

c. Propose conversations by posing and responding to questions that probe reasoning and evidence; ensure a hearing for a full range of positions on a topic or issue; clarify, verify, or challenge ideas and conclusions; and promote divergent and creative perspectives.

d. Respond thoughtfully to diverse perspectives; synthesize comments, claims, and evidence made on all sides of an issue; resolve contradictions when possible; and determine what additional information or research is required to deepen the investigation or complete the task.

Integrate multiple sources of information presented in diverse formats and media (e.g., visually, quantitatively, orally) in order to make informed decisions and solve problems, evaluating the credibility and accuracy of each source and noting any discrepancies among the data.

Evaluate a speaker's point of view, reasoning, and use of evidence and rhetoric, assessing the stance, premises, links among ideas, word choice, points of emphasis, and tone used.

Present information, findings, and supporting evidence, conveying a clear and distinct perspective, such that listeners can follow the line of reasoning, alternative or opposing perspectives are addressed, and the organization, development, substance, and style are appropriate to purpose, audience, and a range of formal and informal tasks.

Make strategic use of digital media (e.g., textual, graphical, audio, visual, and interactive elements) in presentations to enhance understanding of findings, reasoning, and evidence and to add interest.

Write arguments focused on discipline-specific content.

a. Introduce precise, knowledgeable claim(s), establish the significance of the claim(s), distinguish the claim(s) from alternate or opposing claims, and create an organization that logically sequences the claim(s), counterclaims, reasons, and evidence.

b. Develop claim(s) and counterclaims fairly and thoroughly, supplying the most relevant data and evidence for each while pointing out the strengths and limitations of both claim(s) and counterclaims in a discipline-appropriate form that anticipates the audience's knowledge level, concerns, values, and possible biases.

c. Use words, phrases, and clauses as well as varied syntax to link the major sections of the text, create cohesion, and clarify the relationships between claim(s) and reasons, between reasons and evidence, and between claim(s) and counterclaims.

d. Establish and maintain a formal style and objective tone while attending to the norms and conventions of the discipline in which they are writing.

Produce a concluding statement or section that follows from or supports the argument presented.

Write informative/explanatory texts, including the narration of historical events, scientific procedures/experiments, or technical processes.

a. Introduce a topic and organize complex ideas, concepts, and information so that each new element builds on that which precedes it to create a unified whole; include parallel formatting (e.g., headings), graphics (e.g., figures, tables), and multimedia when useful to aid comprehension.

b. Develop the topic thoroughly by selecting the most significant and relevant facts, extended definitions, concrete details, quotations, or other information and examples appropriate to the audience's knowledge of the topic.

c. Use varied transitions and sentence structures to link the major sections of the text, create cohesion, and clarify the relationships among complex ideas and concepts.

d. Use precise language, domain-specific vocabulary and techniques such as metaphor, simile, and analogy to manage the complexity of the topic; convey a knowledgeable stance in a style that responds to the discipline and context as well as to the expertise of likely readers.

e. Provide a concluding statement or section that follows from and supports the information or explanation provided (e.g., articulating implications or the significance of the topic).

Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.

Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience.

Use technology, including the Internet, to produce, publish, and update individual or shared writing products in response to ongoing feedback, including new arguments or information.
**LAFS.1112.WHST.3.7:** Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation.

**LAFS.1112.WHST.3.8:** Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the strengths and limitations of each source in terms of the specific task, purpose, and audience; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and overreliance on any one source and following a standard format for citation.

**LAFS.1112.WHST.3.9:** Draw evidence from informational texts to support analysis, reflection, and research.

**LAFS.1112.WHST.4.10:** Write routinely over extended time frames (time for reflection and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences.

**MAFS.912.F-IF.2.4:** For a function that models a relationship between two quantities, interpret key features of graphs and tables in terms of the quantities, and sketch graphs showing key features given a verbal description of the relationship. Key features include: intercepts; intervals where the function is increasing, decreasing, positive, or negative; relative maximums and minimums; symmetries; end behavior; and periodicity. ★

<table>
<thead>
<tr>
<th>Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases. ★</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. Graph linear and quadratic functions and show intercepts, maxima, and minima.</td>
</tr>
<tr>
<td>b. Graph square root, cube root, and piecewise-defined functions, including step functions and absolute value functions.</td>
</tr>
<tr>
<td>c. Graph polynomial functions, identifying zeros when suitable factorizations are available, and showing end behavior.</td>
</tr>
<tr>
<td>d. Graph rational functions, identifying zeros and asymptotes when suitable factorizations are available, and showing end behavior.</td>
</tr>
<tr>
<td>e. Graph exponential and logarithmic functions, showing intercepts and end behavior, and trigonometric functions, showing period, midline, and amplitude, and using phase shift.</td>
</tr>
</tbody>
</table>

**MAFS.912.F-IF.2.6:** Graph polynomial functions, identifying zeros when suitable factorizations are available, and showing end behavior.

**MAFS.912.S-ID.2.6:** Graph square root, cube root, and piecewise-defined functions, including step functions and absolute value functions.

<table>
<thead>
<tr>
<th>Representation:</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. Fit a function to the data; use functions fitted to data to solve problems in the context of the data. Use given functions or choose a function suggested by the context. Emphasize linear, and exponential models.</td>
</tr>
<tr>
<td>b. Informally assess the fit of a function by plotting and analyzing residuals.</td>
</tr>
<tr>
<td>c. Fit a linear function for a scatter plot that suggests a linear association.</td>
</tr>
</tbody>
</table>

**MAFS.912.S-ID.1.1:** Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays. ★

**MAFS.912.S-ID.1.3:** Choose a level of accuracy appropriate to limitations on measurement when reporting quantities. ★

<table>
<thead>
<tr>
<th>Clarifications:</th>
</tr>
</thead>
<tbody>
<tr>
<td>In grades 6–8, students describe center and spread in a data distribution. Here they choose a summary statistic appropriate to the characteristics of the data distribution, such as the shape of the distribution or the existence of extreme data points.</td>
</tr>
</tbody>
</table>

**MAFS.912.S-ID.2.1:** Use statistics appropriate to the shape of the data distribution to compare center (median, mean) and spread (interquartile range, standard deviation) of two or more different data sets. ★

**MAFS.912.S-ID.2.2:** In grades 6–8, students describe center and spread in a data distribution. Here they choose a summary statistic appropriate to the characteristics of the data distribution, such as the shape of the distribution or the existence of extreme data points.

<table>
<thead>
<tr>
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<tr>
<td>In grades 6–8, students describe center and spread in a data distribution. Here they choose a summary statistic appropriate to the characteristics of the data distribution, such as the shape of the distribution or the existence of extreme data points.</td>
</tr>
</tbody>
</table>

**MAFS.912.S-ID.2.3:** Interpret differences in shape, center, and spread in the context of the data sets, accounting for possible effects of extreme data points (outliers). ★

**MAFS.912.S-ID.2.4:** Represent data on two quantitative variables on a scatter plot, and describe how the variables are related. ★

<table>
<thead>
<tr>
<th>Clarifications:</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. Students take a more sophisticated look at using a linear function to model the relationship between two numerical variables. In addition to fitting a line to data, students assess how well the model fits by analyzing residuals.</td>
</tr>
</tbody>
</table>

**MAFS.912.S-ID.2.5:** Make sense of problems and persevere in solving them.

Mathematically proficient students start by explaining to themselves the meaning of a problem and looking for entry points to its solution. They analyze givens, constraints, relationships, and goals. They make conjectures about the form and meaning of the solution and plan a solution pathway rather than simply jumping into a solution attempt. They consider analogous problems and try special cases and simpler forms of the original problem in order to gain insight into its solution. They monitor and evaluate their progress and change course if necessary. Older students might, depending on the context of the problem, transform algebraic expressions or change the viewing window on their graphing calculator to get the information they need. Mathematically proficient students can explain correspondences between equations, verbal descriptions, tables, and graphs or draw diagrams of important features and relationships, graph data, and search for regularity or trends. Younger students might rely on using concrete objects or pictures to help conceptualize and solve a problem. Mathematically proficient students check their answers to problems using a different method, and they continually ask themselves, “Does this make sense?” They can understand the approaches of others to solving complex problems and identify correspondences between different approaches. ★

**Standard Relation to Course:** Supporting

**MAFS.K12.MP.2.1:** Reason abstractly and quantitatively.

Mathematically proficient students make sense of quantities and their relationships in problem situations. They bring two complementary abilities to problems involving quantitative relationships: the ability to decontextualize—to abstract a given situation and represent it symbolically and manipulate the representing symbols as if they have a life of their own, without necessarily attending to their referents—and the ability to contextualize, to pause as needed during the manipulation process in order to probe into the referents for the symbols involved. Quantitative reasoning entails habits of creating a coherent representation of the problem at hand; considering the units involved; attending to the meaning of quantities, not just how to compute them; and knowing and flexibly using different properties of operations and objects. ★

**Standard Relation to Course:** Supporting

**MAFS.K12.MP.1.1:** Construct viable arguments and critique the reasoning of others.
Mathematically proficient students understand and use stated assumptions, definitions, and previously established results in constructing arguments. They make conjectures and build a logical progression of statements to explore the truth of their conjectures. They are able to analyze situations by breaking them into cases, and can recognize and use counterexamples. They justify their conclusions, communicate them to others, and respond to the arguments of others. They reason inductively about data, making plausible arguments that take into account the context from which the data arose. Mathematically proficient students are also able to compare the effectiveness of two plausible arguments, distinguish correct logic or reasoning from that which is flawed, and—if there is a flaw in an argument—explain what it is. Elementary students can construct arguments using concrete referents such as objects, drawings, diagrams, and actions. Such arguments can make sense and be correct, even though they are not generalized or made formal until later grades. Later, students learn to determine domains to which an argument applies. Students at all grades can listen or read the arguments of others, decide whether they make sense, and ask useful questions to clarify or improve the arguments.

**Standard Relation to Course: Supporting**

**Model with mathematics.**

Mathematically proficient students can apply the mathematics they know to solve problems arising in everyday life, society, and the workplace. In early grades, this might be as simple as writing an addition equation to describe a situation. In middle grades, a student might apply proportional reasoning to plan a school event or analyze a problem in the community. By high school, a student might use geometry to solve a design problem or use a function to describe how one quantity of interest depends on another. Mathematically proficient students who can apply what they know are comfortable making assumptions and approximations to simplify a complicated situation, realizing that these may need revision later. They are able to identify important quantities in a practical situation and map their relationships using such tools as diagrams, two-way tables, graphs, flowcharts and formulas. They can analyze those relationships mathematically to draw conclusions. They routinely interpret their mathematical results in the context of the situation and reflect on whether the results make sense, possibly improving the model if it has not served its purpose.

**Standard Relation to Course: Supporting**

**Use appropriate tools strategically.**

Mathematically proficient students consider the available tools when solving a mathematical problem. These tools might include pencil and paper, concrete models, a ruler, a protractor, a calculator, a spreadsheet, a computer algebra system, a statistical package, or dynamic geometry software. Proficient students are sufficiently familiar with tools appropriate for their grade or course to make sound decisions about when each of these tools might be helpful, recognizing both the insight to be gained and their limitations. For example, mathematically proficient high school students analyze graphs of functions and solutions generated using a graphing calculator. They detect possible errors by strategically using estimation and other mathematical knowledge. When making mathematical models, they know that technology can enable them to visualize the results of varying assumptions, explore consequences, and compare predictions with data. Mathematically proficient students at various grade levels are able to identify relevant external mathematical resources, such as digital content located on a website, and use them to pose or solve problems. They are able to use technological tools to explore and deepen their understanding of concepts.

**Standard Relation to Course: Supporting**

**Attend to precision.**

Mathematically proficient students try to communicate precisely to others. They try to use clear definitions in discussion with others and in their own reasoning. They state the meaning of the symbols they choose, including using the equal sign consistently and appropriately. They are careful about specifying units of measure, and labeling axes to clarify the correspondence with quantities in a problem. They calculate accurately and efficiently, express numerical answers with a degree of precision appropriate for the problem context. In the elementary grades, students give carefully formulated explanations to each other. By the time they reach high school they have learned to examine claims and make explicit use of definitions.

**Standard Relation to Course: Supporting**

**Look for and make use of structure.**

Mathematically proficient students look closely to discern a pattern or structure. Young students, for example, might notice that three and seven more is the same amount as seven and three more, or they may sort a collection of shapes according to how many sides the shapes have. Later, students will see 7 + 8 equals the well remembered 7 + 5 + 3, in preparation for learning about the distributive property. In the expression x² + 9x + 14, older students can see the 14 as 2 × 7 and the 9 as 2 + 7. They recognize the significance of an existing line in a geometric figure and can use the strategy of drawing an auxiliary line for solving problems. They also can step back for an overview and shift perspective. They can see complicated things, such as some algebraic expressions, as single objects or as being composed of several objects. For example, they can see 5 – 3(x – y)² as 5 minus a positive number times a square and use that to realize that its value cannot be more than 5 for any real numbers x and y.

**Standard Relation to Course: Supporting**

**Look for and express regularity in repeated reasoning.**

Mathematically proficient students notice if calculations are repeated, and look both for general methods and for shortcuts. Upper elementary students might notice when dividing 25 by 11 that they are repeating the same calculations over and over again, and conclude they have a repeating decimal. By paying attention to the calculation of slope as they repeatedly check whether points are on the line through (1, 2) with slope 3, middle school students might abstract the equation (y – 2)/(x – 1) = 3. Noticing the regularity in the way terms cancel when expanding (x – 1)(x² + x + 1), (x – 1)(x³ + x² + x + 1), and (x – 1)(x⁴ + x³ + x² + x + 1) might lead them to the general formula for the sum of a geometric series. As they work to solve a problem, mathematically proficient students maintain oversight of the process, while attending to the details. They continually evaluate the reasonableness of their intermediate results.

**Standard Relation to Course: Supporting**

**General Course Information and Notes**

**GENERAL NOTES**

Laboratory investigations that include the use of scientific inquiry, research, measurement, problem solving, laboratory apparatus and technologies, experimental procedures, and safety procedures are an integral part of this course. The National Science Teachers Association (NSTA) recommends that at the high school level, all
students should be in the science lab or field, collecting data every week. School laboratory investigations (labs) are defined by the National Research Council (NRC) as an experience in the laboratory, classroom, or the field that provides students with opportunities to interact directly with natural phenomena or with data collected by others using tools, materials, data collection techniques, and models (NRC, 2006, p. 3). Laboratory investigations in the high school classroom should help all students develop a growing understanding of the complexity and ambiguity of empirical work, as well as the skills to calibrate and troubleshoot equipment used to make observations. Learners should understand measurement error; and have the skills to aggregate, interpret, and present the resulting data (National Research Council, 2006, p.77; NSTA, 2007).

Special Notes:

Instructional Practices
Teaching from a range of complex text is optimized when teachers in all subject areas implement the following strategies on a routine basis:

1. Ensuring wide reading from complex text that varies in length.
2. Making close reading and rereading of texts central to lessons.
3. Emphasizing text-specific complex questions, and cognitively complex tasks, reinforce focus on the text and cultivate independence.
4. Emphasizing students supporting answers based upon evidence from the text.
5. Providing extensive research and writing opportunities (claims and evidence).

- Asking questions (for science) and defining problems (for engineering).
- Developing and using models.
- Planning and carrying out investigations.
- Analyzing and interpreting data.
- Using mathematics, information and computer technology, and computational thinking.
- Constructing explanations (for science) and designing solutions (for engineering).
- Engaging in argument from evidence.
- Obtaining, evaluating, and communicating information.

Honors and Advanced Level Course Note: Advanced courses require a greater demand on students through increased academic rigor. Academic rigor is obtained through the application, analysis, evaluation, and creation of complex ideas that are often abstract and multi-faceted. Students are challenged to think and collaborate critically on the content they are learning. Honors level rigor will be achieved by increasing text complexity through text selection, focus on high-level qualitative measures, and complexity of task. Instruction will be structured to give students a deeper understanding of conceptual themes and organization within and across disciplines. Academic rigor is more than simply assigning to students a greater quantity of work.

Literacy Standards in Science
Secondary science courses include reading standards for literacy in science and technical subjects 6-12 and writing standards for literacy in history/social studies, science, and technical subjects 6-12. The courses also include speaking and listening standards. For a complete list of standards required for this course click on the blue tile labeled course standards. You may also download the complete course including all required standards and notes sections using the export function located at the top of this page.

English Language Development ELD Standards Special Notes Section:
Teachers are required to provide listening, speaking, reading and writing instruction that allows English language learners (ELL) to communicate information, ideas and concepts for academic success in the content area of Science. For the given level of English language proficiency and with visual, graphic, or interactive support, students will interact with grade level words, expressions, sentences and discourse to process or produce language necessary for academic success. The ELD standard should specify a relevant content area concept or topic of study chosen by curriculum developers and teachers which maximizes an ELL's need for communication and social skills. To access an ELL supporting document which delineates performance definitions and descriptors, please click on the following link: https://cpalmsmediaprod.blob.core.windows.net/uploads/docs/standards/eld/sc.pdf

GENERAL INFORMATION

<table>
<thead>
<tr>
<th>Course Number</th>
<th>2002540</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of Credits</td>
<td>One (1) credit</td>
</tr>
<tr>
<td>Course Type</td>
<td>Elective Course</td>
</tr>
<tr>
<td>Course Status</td>
<td>Course Approved</td>
</tr>
<tr>
<td>Grade Level(s)</td>
<td>9,10,11,12</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Course Path: Section</th>
<th>Grades PreK to 12 Education Courses &gt; Grade Group: Grades 9 to 12 and Adult Education Courses &gt; Subject: Science &gt; SubSubject: Integrated Sciences</th>
</tr>
</thead>
<tbody>
<tr>
<td>Abbreviated Title</td>
<td>SOLAR ENERGY HON</td>
</tr>
<tr>
<td>Course Length</td>
<td>Year (Y)</td>
</tr>
<tr>
<td>Course Attributes</td>
<td>Honors</td>
</tr>
<tr>
<td>Course Level</td>
<td>3</td>
</tr>
</tbody>
</table>

Educator Certifications

| Earth/Space Science (Grades 6-12) |
| Physics (Grades 6-12) |
| Biology (Grades 6-12) |
| Chemistry (Grades 6-12) |
Define a problem based on a specific body of knowledge, for example: biology, chemistry, physics, and earth/space science, and do the following:

1. Pose questions about the natural world. (Articulate the purpose of the investigation and identify the relevant scientific concepts).
2. Conduct systematic observations. (Write procedures that are clear and replicable. Identify observables and examine relationships between test (independent) variable and outcome (dependent) variable. Employ appropriate methods for accurate and consistent observations; conduct and record measurements at appropriate levels of precision. Follow safety guidelines).
3. Examine books and other sources of information to see what is already known.
4. Review what is known in light of empirical evidence. (Examine whether available empirical evidence can be interpreted in terms of existing knowledge and models, and if not, modify or develop new models).
5. Plan investigations. (Design and evaluate a scientific investigation).
6. Use tools to gather, analyze, and interpret data (this includes the use of measurement in other systems and also the generation and interpretation of graphical representations of data, including data tables and graphs). (Collect data or evidence in an organized way. Properly use instruments, equipment, and materials (e.g., scales, probeware, meter sticks, microscopes, computers) including set-up, calibration, technique, maintenance, and storage).
7. Pose answers, explanations, or descriptions of events.
8. Generate explanations that explicate or describe natural phenomena (inferences).
9. Use appropriate evidence and reasoning to justify these explanations to others.
10. Communicate results of scientific investigations, and
11. Evaluate the merits of the explanations produced by others.

SC.912.E.6.1: Analyze past, present, and potential future consequences to the environment resulting from various energy production technologies.

SC.912.E.7.1: Analyze the movement of matter and energy through the different biogeochemical cycles, including water and carbon.

SC.912.E.7.2: Analyze the causes of the various kinds of surface and deep water motion within the oceans and their impacts on the transfer of energy between the poles and the equator.

SC.912.E.7.9: Cite evidence that the ocean has had a significant influence on climate change by absorbing, storing, and moving heat, carbon, and water.

SC.912.L.17.11: Evaluate the costs and benefits of renewable and nonrenewable resources, such as water, energy, fossil fuels, wildlife, and forests.

SC.912.L.17.12: Discuss the political, social, and environmental consequences of sustainable use of land.

SC.912.L.17.13: Discuss the need for adequate monitoring of environmental parameters when making policy decisions.

SC.912.L.17.15: Discuss the effects of technology on environmental quality.

SC.912.L.17.16: Discuss the large-scale environmental impacts resulting from human activity, including waste spills, oil spills, runoff, greenhouse gases, ozone depletion, and surface and groundwater pollution.

SC.912.L.17.17: Assess the effectiveness of innovative methods of protecting the environment.

SC.912.L.17.18: Describe how human population size and resource use relate to environmental quality.

SC.912.L.17.19: Describe how different natural resources are produced and how their rates of use and renewable limit availability.

SC.912.L.17.20: Predict the impact of individuals on environmental systems and examine how human lifestyles affect sustainability.

SC.912.N.1.1: SC.912.L.17.20: Predict the impact of individuals on environmental systems and examine how human lifestyles affect sustainability.

SC.912.N.1.2: Describe and explain what characterizes science and its methods.

SC.912.N.1.3: Recognize that the strength or usefulness of a scientific claim is evaluated through scientific argumentation, which depends on critical and logical thinking, and the active consideration of alternative scientific explanations to explain the data presented.

SC.912.N.1.4: Identify sources of information and assess their reliability according to the strict standards of scientific investigation.

SC.912.N.1.5: Describe and provide examples of how similar investigations conducted in many parts of the world result in the same outcome.

SC.912.N.1.6: Describe how scientific inferences are drawn from scientific observations and provide examples from the content being studied.

SC.912.N.1.7: Recognize the role of creativity in constructing scientific questions, methods and explanations.

SC.912.N.2.1: Identify what is science, what clearly is not science, and what superficially resembles science (but fails to meet the criteria for science).

SC.912.N.2.2: Identify which questions can be answered through science and which questions are outside the boundaries of scientific investigation, such as questions addressed by other ways of knowing, such as art, philosophy, and religion.

SC.912.N.2.3: Identify examples of pseudoscience (such as astrology, phrenology) in society.

SC.912.N.2.4: Explain that scientific knowledge is both durable and robust and open to change. Scientific knowledge can change because it is often examined and re-examined by new investigations and scientific argumentation. Because of these frequent examinations, scientific knowledge becomes stronger, leading to its durability.

SC.912.N.2.5: Describe instances in which scientists' varied backgrounds, talents, interests, and goals influence the inferences and thus the explanations that they make about observations of natural phenomena and describe that competing interpretations (explanations) of scientists are a strength of science as they are a source of new, testable ideas that have the potential to add new evidence to support one or another of the explanations.

SC.912.N.3.1: Explain that a scientific theory is the culmination of many scientific investigations drawing together all the current evidence concerning a substantial range of phenomena; thus, a scientific theory represents the most powerful explanation scientists have to offer.

SC.912.N.3.5: Describe the function of models in science, and identify the wide range of models used in science.

SC.912.N.4.1: Explain how scientific knowledge and reasoning provide an empirically-based perspective to inform society's decision making.

SC.912.N.4.2: Weigh the merits of alternative strategies for solving a specific societal problem by comparing a number of different costs and benefits, such as human, economic, and environmental.

SC.912.P.8.12: Describe the properties of the carbon atom that make the diversity of carbon compounds possible.

SC.912.P.8.13: Identify selected functional groups and relate how they contribute to properties of carbon compounds.

SC.912.P.10.1: Differentiate among the various forms of energy and recognize that they can be transformed from one form to others.
Explore the Law of Conservation of Energy by differentiating among open, closed, and isolated systems and explain that the total energy in an isolated system is a conserved quantity.

Compare and contrast work and power qualitatively and quantitatively.

Describe heat as the energy transferred by convection, conduction, and radiation, and explain the connection of heat to change in temperature or states of matter.

Describe the quantization of energy at the atomic level.

<table>
<thead>
<tr>
<th>MA.K12.MTR.1.1:</th>
<th>Mathematicians who participate in effortful learning both individually and with others:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>• Analyze the problem in a way that makes sense given the task.</td>
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<tr>
<td></td>
<td>• Ask questions that will help with solving the task.</td>
</tr>
<tr>
<td></td>
<td>• Build perseverance by modifying methods as needed while solving a challenging task.</td>
</tr>
<tr>
<td></td>
<td>• Stay engaged and maintain a positive mindset when working to solve tasks.</td>
</tr>
<tr>
<td></td>
<td>• Help and support each other when attempting a new method or approach.</td>
</tr>
</tbody>
</table>

**Clarifications:**
- Teachers who encourage students to participate actively in effortful learning both individually and with others:
  - Cultivate a community of growth mindset learners.
  - Foster perseverance in students by choosing tasks that are challenging.
  - Develop students’ ability to analyze and problem solve.
  - Recognize students’ effort when solving challenging problems.

Demonstrate understanding by representing problems in multiple ways. Mathematicians who demonstrate understanding by representing problems in multiple ways:

<table>
<thead>
<tr>
<th>MA.K12.MTR.2.1:</th>
<th>Build understanding through modeling and using manipulatives.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Represent solutions to problems in multiple ways using objects, drawings, tables, graphs and equations.</td>
</tr>
<tr>
<td></td>
<td>Progress from modeling problems with objects and drawings to using algorithms and equations.</td>
</tr>
<tr>
<td></td>
<td>Express connections between concepts and representations.</td>
</tr>
<tr>
<td></td>
<td>Choose a representation based on the given context or purpose.</td>
</tr>
</tbody>
</table>

**Clarifications:**
- Teachers who encourage students to demonstrate understanding by representing problems in multiple ways:
  - Help students make connections between concepts and representations.
  - Provide opportunities for students to use manipulatives when investigating concepts.
  - Guide students from concrete to pictorial to abstract representations as understanding progresses.
  - Show students that various representations can have different purposes and can be useful in different situations.

Complete tasks with mathematical fluency. Mathematicians who complete tasks with mathematical fluency:

<table>
<thead>
<tr>
<th>MA.K12.MTR.3.1:</th>
<th>Select efficient and appropriate methods for solving problems within the given context.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Maintain flexibility and accuracy while performing procedures and mental calculations.</td>
</tr>
<tr>
<td></td>
<td>Complete tasks accurately and with confidence.</td>
</tr>
<tr>
<td></td>
<td>Adapt procedures to apply them to a new context.</td>
</tr>
<tr>
<td></td>
<td>Use feedback to improve efficiency when performing calculations.</td>
</tr>
</tbody>
</table>

**Clarifications:**
- Teachers who encourage students to complete tasks with mathematical fluency:
  - Provide students with the flexibility to solve problems by selecting a procedure that allows them to solve efficiently and accurately.
  - Offer multiple opportunities for students to practice efficient and generalizable methods.
  - Provide opportunities for students to reflect on the method they used and determine if a more efficient method could have been used.

Engage in discussions that reflect on the mathematical thinking of self and others. Mathematicians who engage in discussions that reflect on the mathematical thinking of self and others:

<table>
<thead>
<tr>
<th>MA.K12.MTR.4.1:</th>
<th>Communicate mathematical ideas, vocabulary and methods effectively.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Analyze the mathematical thinking of others.</td>
</tr>
<tr>
<td></td>
<td>Compare the efficiency of a method to those expressed by others.</td>
</tr>
<tr>
<td></td>
<td>Recognize errors and suggest how to correctly solve the task.</td>
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<tr>
<td></td>
<td>Justify results by explaining methods and processes.</td>
</tr>
<tr>
<td></td>
<td>Construct possible arguments based on evidence.</td>
</tr>
</tbody>
</table>

**Clarifications:**
- Teachers who encourage students to engage in discussions that reflect on the mathematical thinking of self and others:
  - Establish a culture in which students ask questions of the teacher and their peers, and error is an opportunity for learning.
  - Create opportunities for students to discuss their thinking with peers.
  - Select, sequence and present student work to advance and deepen understanding of correct and increasingly efficient methods.
  - Develop students’ ability to justify methods and compare their responses to the responses of their peers.

Use patterns and structure to help understand and connect mathematical concepts. Mathematicians who use patterns and structure to help understand and connect mathematical concepts:

<table>
<thead>
<tr>
<th>MA.K12.MTR.5.1:</th>
<th>Focus on relevant details within a problem.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Create plans and procedures to logically order events, steps or ideas to solve problems.</td>
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<tr>
<td></td>
<td>Decompose a complex problem into manageable parts.</td>
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<tr>
<td></td>
<td>Relate previously learned concepts to new concepts.</td>
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<tr>
<td></td>
<td>Look for similarities among problems.</td>
</tr>
<tr>
<td></td>
<td>Connect solutions of problems to more complicated large-scale situations.</td>
</tr>
</tbody>
</table>

**Clarifications:**
Teachers who encourage students to use patterns and structure to help understand and connect mathematical concepts:
- Help students recognize the patterns in the world around them and connect these patterns to mathematical concepts.
- Support students to develop generalizations based on the similarities found among problems.
- Provide opportunities for students to create plans and procedures to solve problems.
- Develop students' ability to construct relationships between their current understanding and more sophisticated ways of thinking.

Assess the reasonableness of solutions. Mathematicians who assess the reasonableness of solutions:
- Estimate to discover possible solutions.
- Use benchmark quantities to determine if a solution makes sense.
- Check calculations when solving problems.
- Verify possible solutions by explaining the methods used.
- Evaluate results based on the given context.

Clarifications:
Teachers who encourage students to assess the reasonableness of solutions:
- Have students estimate or predict solutions prior to solving.
- Prompt students to continually ask, “Does this solution make sense? How do you know?”
- Reinforce that students check their work as they progress within and after a task.
- Strengthen students' ability to verify solutions through justifications.

Mathematicians who apply mathematics to real-world contexts:
- Connect mathematical concepts to everyday experiences.
- Use models and methods to understand, represent and solve problems.
- Perform investigations to gather data or determine if a method is appropriate. • Redesign models and methods to improve accuracy or efficiency.

Clarifications:
Teachers who encourage students to apply mathematics to real-world contexts:
- Provide opportunities for students to create models, both concrete and abstract, and perform investigations.
- Challenge students to question the accuracy of their models and methods.
- Support students as they validate conclusions by comparing them to the given situation.
- Indicate how various concepts can be applied to other disciplines.

Cite evidence to explain and justify reasoning.

Clarifications:
K-1 Students include textual evidence in their oral communication with guidance and support from adults. The evidence can consist of details from the text without naming the text. During 1st grade, students learn how to incorporate the evidence in their writing.
2-3 Students include relevant textual evidence in their written and oral communication. Students should name the text when they refer to it. In 3rd grade, students should use a combination of direct and indirect citations.
4-5 Students continue with previous skills and reference comments made by speakers and peers. Students cite texts that they've directly quoted, paraphrased, or used for information. When writing, students will use the form of citation dictated by the instructor or the style guide referenced by the instructor.
6-8 Students continue with previous skills and use a style guide to create a proper citation.
9-12 Students continue with previous skills and should be aware of existing style guides and the ways in which they differ.

Read and comprehend grade-level complex texts proficiently.

Clarifications:
See Text Complexity for grade-level complexity bands and a text complexity rubric.

Make inferences to support comprehension.

Clarifications:
Students will make inferences before the words infer or inference are introduced. Kindergarten students will answer questions like “Why is the girl smiling?” or make predictions about what will happen based on the title page. Students will use the terms and apply them in 2nd grade and beyond.

Use appropriate collaborative techniques and active listening skills when engaging in discussions in a variety of situations.

Clarifications:
In kindergarten, students learn to listen to one another respectfully.
In grades 1-2, students build upon these skills by justifying what they are thinking. For example: “I think ________ because ________.” The collaborative conversations are becoming academic conversations.
In grades 3-12, students engage in academic conversations discussing claims and justifying their reasoning, refining and applying skills. Students build on ideas, propel the conversation, and support claims and counterclaims with evidence.

Use the accepted rules governing a specific format to create quality work.

Clarifications:
Students will incorporate skills learned into work products to produce quality work. For students to incorporate these skills appropriately, they must receive instruction. A 3rd grade student creating a poster board display must have instruction in how to effectively present information to do quality work.

Use appropriate voice and tone when speaking or writing.

Clarifications:
In kindergarten and 1st grade, students learn the difference between formal and informal language. For example, the way we talk to our friends
General Course Information and Notes

GENERAL NOTES

Laboratory investigations that include the use of scientific inquiry, research, measurement, problem solving, laboratory apparatus and technologies, experimental procedures, and safety procedures are an integral part of this course. The National Science Teachers Association (NSTA) recommends that at the high school level, all students should be in the science lab or field, collecting data every week. School laboratory investigations (labs) are defined by the National Research Council (NRC) as an experience in the laboratory, classroom, or the field that provides students with opportunities to interact directly with natural phenomena or with data collected by others using tools, materials, data collection techniques, and models (NRC, 2006, p. 3). Laboratory investigations in the high school classroom should help all students develop a growing understanding of the complexity and ambiguity of empirical work, as well as the skills to calibrate and troubleshoot equipment used to make observations. Learners should understand measurement error; and have the skills to aggregate, interpret, and present the resulting data (National Research Council, 2006, p. 77; NSTA, 2007).

Special Notes:

Instructional Practices

Teaching from a range of complex text is optimized when teachers in all subject areas implement the following strategies on a routine basis:

1. Ensuring wide reading from complex text that varies in length,
2. Making close reading and rereading of texts central to lessons.
3. Emphasizing text-specific complex questions, and cognitively complex tasks, reinforce focus on the text and cultivate independence.
4. Emphasizing students supporting answers based upon evidence from the text.
5. Providing extensive research and writing opportunities (claims and evidence).


- Asking questions (for science) and defining problems (for engineering).
- Developing and using models.
- Planning and carrying out investigations.
- Analyzing and interpreting data.
- Using mathematics, information and computer technology, and computational thinking.
- Constructing explanations (for science) and designing solutions (for engineering).
- Engaging in argument from evidence.
- Obtaining, evaluating, and communicating information.

Honors and Advanced Level Course Note: Advanced courses require a greater demand on students through increased academic rigor. Academic rigor is obtained through the application, analysis, evaluation, and creation of complex ideas that are often abstract and multi-faceted. Students are challenged to think and collaborate critically on the content they are learning. Honors level rigor will be achieved by increasing text complexity through text selection, focus on high-level qualitative measures, and complexity of task. Instruction will be structured to give students a deeper understanding of conceptual themes and organization within and across disciplines. Academic rigor is more than simply assigning to students a greater quantity of work.

Florida's Benchmarks for Excellent Student Thinking (B.E.S.T.) Standards

This course includes Florida's B.E.S.T. ELA Expectations (EE) and Mathematical Thinking and Reasoning Standards (MTRs) for students. Florida educators should intentionally embed these standards within the content and their instruction as applicable. For guidance on the implementation of the EEs and MTRs, please visit https://www.fldoe.org/Standards/BEST_Standards.aspx and select the appropriate B.E.S.T. Standards package.

English Language Development ELD Standards Special Notes Section:

Teachers are required to provide listening, speaking, reading and writing instruction that allows English language learners (ELL) to communicate information, ideas and concepts for academic success in the content area of Science. For the given level of English language proficiency and with visual, graphic, or interactive support, students will interact with grade level words, expressions, sentences and discourse to process or produce language necessary for academic success. The ELD standard should specify a relevant content area concept or topic of study chosen by curriculum developers and teachers which maximizes an ELL's need for communication and social skills. To access an ELL supporting document which delineates performance definitions and descriptors, please click on the following link: https://cpalmsmediaprod.blob.core.windows.net/uploads/docs/standards/eld/sc.pdf

GENERAL INFORMATION

<table>
<thead>
<tr>
<th>Course Number: 2002540</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of Credits: One (1) credit</td>
</tr>
<tr>
<td>Course Type: Elective Course</td>
</tr>
<tr>
<td>Course Status: State Board Approved</td>
</tr>
<tr>
<td>Grade Level(s): 9,10,11,12</td>
</tr>
</tbody>
</table>

Course Path: Section: Grades PreK to 12 Education Courses > Grade Group: Grades 9 to 12 and Adult Education Courses > Subject: Science > SubSubject: Integrated Sciences |

Abbreviated Title: SOLAR ENERGY HON |

Course Length: Year (Y) |

Course Attributes: |
- Honors |
- Course Level: 3
### Educator Certifications

<table>
<thead>
<tr>
<th>Subject</th>
<th>Grades</th>
</tr>
</thead>
<tbody>
<tr>
<td>Earth/Space Science</td>
<td>6-12</td>
</tr>
<tr>
<td>Physics</td>
<td>6-12</td>
</tr>
<tr>
<td>Biology</td>
<td>6-12</td>
</tr>
<tr>
<td>Chemistry</td>
<td>6-12</td>
</tr>
</tbody>
</table>
General Course Information and Notes

GENERAL NOTES

The curriculum description for this IB course is provided at http://www.ibo.org/en/programmes/.

GENERAL INFORMATION

Course Number: 2002800

Course Path: Section: Grades PreK to 12 Education Courses > Grade Group: Grades 9 to 12 and Adult Education Courses > Subject: Science > SubSubject: Marine Sciences

Abbreviated Title: IB MARINE SCI 1

Course Length: Year (Y)

Course Attributes:
• International Baccalaureate (IB)

Course Level: 3

Number of Credits: One (1) credit

Course Type: Core Academic Course

Course Status: Course Approved

Grade Level(s): 9,10,11,12

Graduation Requirement: Equally Rigorous Science

Educator Certifications

<table>
<thead>
<tr>
<th>Chemistry (Grades 6-12)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Biology (Grades 6-12)</td>
</tr>
<tr>
<td>Earth/Space Science (Grades 6-12)</td>
</tr>
<tr>
<td>Science (Secondary Grades 7-12)</td>
</tr>
<tr>
<td>Physics (Grades 6-12)</td>
</tr>
</tbody>
</table>
General Course Information and Notes

GENERAL NOTES

The curriculum description for this IB course is provided at http://www.ibo.org/en/programmes/.

GENERAL INFORMATION

Course Number: 2002810

Number of Credits: One (1) credit

Course Type: Core Academic Course

Course Status: Course Approved

Grade Level(s): 9,10,11,12

Graduation Requirement: Equally Rigorous Science

Educator Certifications

<table>
<thead>
<tr>
<th>Subject</th>
<th>Grade Level</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chemistry</td>
<td>Grades 6-12</td>
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<tr>
<td>Biology</td>
<td>Grades 6-12</td>
</tr>
<tr>
<td>Earth/Space Science</td>
<td>Grades 6-12</td>
</tr>
<tr>
<td>Science (Secondary)</td>
<td>Grades 7-12</td>
</tr>
<tr>
<td>Physics</td>
<td>Grades 6-12</td>
</tr>
</tbody>
</table>
Course Standards

<table>
<thead>
<tr>
<th>Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>SC.912.E.7.1:</td>
<td>Analyze the movement of matter and energy through the different biogeochemical cycles, including water and carbon.</td>
</tr>
<tr>
<td>SC.912.L.18.7:</td>
<td>Identify the reactants, products, and basic functions of photosynthesis.</td>
</tr>
<tr>
<td>SC.912.L.18.8:</td>
<td>Identify the reactants, products, and basic functions of aerobic and anaerobic cellular respiration.</td>
</tr>
<tr>
<td>SC.912.L.18.12:</td>
<td>Discuss the special properties of water that contribute to Earth's suitability as an environment for life: cohesive behavior, ability to moderate temperature, expansion upon freezing, and versatility as a solvent.</td>
</tr>
<tr>
<td>SC.912.N.1.1:</td>
<td>Define a problem based on a specific body of knowledge, for example: biology, chemistry, physics, and earth/space science, and do the following: 1. Pose questions about the natural world, (Articulate the purpose of the investigation and identify the relevant scientific concepts). 2. Conduct systematic observations, (Write procedures that are clear and replicable. Identify observables and examine relationships between test (independent) variable and outcome (dependent) variable. Employ appropriate methods for accurate and consistent observations; conduct and record measurements at appropriate levels of precision. Follow safety guidelines). 3. Examine books and other sources of information to see what is already known, 4. Review what is known in light of empirical evidence, (Examine whether available empirical evidence can be interpreted in terms of existing knowledge and models, and if not, modify or develop new models). 5. Plan investigations, (Design and evaluate a scientific investigation). 6. Use tools to gather, analyze, and interpret data (this includes the use of measurement in metric and other systems, and also the generation and interpretation of graphical representations of data, including data tables and graphs), (Collect data or evidence in an organized way. Properly use instruments, equipment, and materials (e.g., scales, probeware, meter sticks, microscopes, computers) including set-up, calibration, technique, maintenance, and storage). 7. Pose answers, explanations, or descriptions of events, 8. Generate explanations that explicate or describe natural phenomena (inferences), 9. Use appropriate evidence and reasoning to justify these explanations to others, 10. Communicate results of scientific investigations, and 11. Evaluate the merits of the explanations produced by others.</td>
</tr>
<tr>
<td>SC.912.N.1.2:</td>
<td>Describe and explain what characterizes science and its methods.</td>
</tr>
<tr>
<td>SC.912.N.1.3:</td>
<td>Recognize that the strength or usefulness of a scientific claim is evaluated through scientific argumentation, which depends on critical and logical thinking, and the active consideration of alternative scientific explanations to explain the data presented.</td>
</tr>
<tr>
<td>SC.912.N.1.4:</td>
<td>Identify sources of information and assess their reliability according to the strict standards of scientific investigation.</td>
</tr>
<tr>
<td>SC.912.N.1.5:</td>
<td>Describe and provide examples of how similar investigations conducted in many parts of the world result in the same outcome.</td>
</tr>
<tr>
<td>SC.912.N.1.6:</td>
<td>Describe how scientific inferences are drawn from scientific observations and provide examples from the content being studied.</td>
</tr>
<tr>
<td>SC.912.N.1.7:</td>
<td>Recognize the role of creativity in constructing scientific questions, methods and explanations.</td>
</tr>
<tr>
<td>SC.912.N.2.1:</td>
<td>Identify what is science, what clearly is not science, and what superficially resembles science (but fails to meet the criteria for science).</td>
</tr>
<tr>
<td>SC.912.N.2.2:</td>
<td>Identify which questions can be answered through science and which questions are outside the boundaries of scientific investigation, such as questions addressed by other ways of knowing, such as art, philosophy, and religion.</td>
</tr>
<tr>
<td>SC.912.N.2.3:</td>
<td>Identify examples of pseudoscience (such as astrology, phrenology) in society.</td>
</tr>
<tr>
<td>SC.912.N.2.4:</td>
<td>Explain that scientific knowledge is both durable and robust and open to change. Scientific knowledge can change because it is often examined and re-examined by new investigations and scientific argumentation. Because of these frequent examinations, scientific knowledge becomes stronger, leading to its durability.</td>
</tr>
<tr>
<td>SC.912.N.2.5:</td>
<td>Describe instances in which scientists' varied backgrounds, talents, interests, and goals influence the inferences and thus the explanations that they make about observations of natural phenomena and describe that competing interpretations (explanations) of scientists are a strength of science as they are a source of new, testable ideas that have the potential to add new evidence to support one or another of the explanations.</td>
</tr>
<tr>
<td>SC.912.N.3.1:</td>
<td>Explain that a scientific theory is the culmination of many scientific investigations drawing together all the current evidence concerning a substantial range of phenomena; thus, a scientific theory represents the most powerful explanation scientists have to offer.</td>
</tr>
<tr>
<td>SC.912.N.3.2:</td>
<td>Describe the role consensus plays in the historical development of a theory in any one of the disciplines of science.</td>
</tr>
<tr>
<td>SC.912.N.3.3:</td>
<td>Explain that scientific laws are descriptions of specific relationships under given conditions in nature, but do not offer explanations for those relationships.</td>
</tr>
<tr>
<td>SC.912.N.3.4:</td>
<td>Recognize that theories do not become laws, nor do laws become theories; theories are well supported explanations and laws are well supported descriptions.</td>
</tr>
<tr>
<td>SC.912.N.3.5:</td>
<td>Describe the function of models in science, and identify the wide range of models used in science.</td>
</tr>
<tr>
<td>SC.912.N.4.1:</td>
<td>Explain how scientific knowledge and reasoning provide an empirically-based perspective to inform society's decision making.</td>
</tr>
<tr>
<td>SC.912.N.4.2:</td>
<td>Weigh the merits of alternative strategies for solving a specific societal problem by comparing a number of different costs and benefits, such as human, economic, and environmental.</td>
</tr>
<tr>
<td>SC.912.P.8.1:</td>
<td>Differentiate among the four states of matter.</td>
</tr>
<tr>
<td>SC.912.P.8.2:</td>
<td>Differentiate between physical and chemical properties and physical and chemical changes of matter.</td>
</tr>
<tr>
<td>SC.912.P.8.4:</td>
<td>Explore the scientific theory of atoms (also known as atomic theory) by describing the structure of atoms in terms of protons, neutrons and electrons, and differentiate among these particles in terms of their mass, electrical charges and locations within the atom.</td>
</tr>
<tr>
<td>SC.912.P.8.5:</td>
<td>Relate properties of atoms and their position in the periodic table to the arrangement of their electrons.</td>
</tr>
<tr>
<td>SC.912.P.8.7:</td>
<td>Interpret formula representations of molecules and compounds in terms of composition and structure.</td>
</tr>
<tr>
<td>SC.912.P.8.8:</td>
<td>Characterize types of chemical reactions, for example: redox, acid-base, synthesis, and single and double replacement reactions.</td>
</tr>
<tr>
<td>SC.912.P.8.11:</td>
<td>Relate acidity and basicity to hydronium and hydroxyl ion concentration and pH.</td>
</tr>
<tr>
<td>SC.912.P.10.1:</td>
<td>Differentiate among the various forms of energy and recognize that they can be transformed from one form to others.</td>
</tr>
</tbody>
</table>
Compare and contrast work and power qualitatively and quantitatively.

Analyze the structure of the relationships among concepts in a text.

Investigate and explain the relationships among current, voltage, resistance, and power.

Relate temperature to the average molecular kinetic energy.

Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 9–10 texts and topics.

Differentiate among conductors, semiconductors, and insulators.

Differentiate between chemical and nuclear reactions.

Present information, findings, and supporting evidence clearly.

Evaluate a speaker's point of view, reasoning, and use of evidence and examples appropriate to the audience's knowledge of the topic.

Explore the theory of electromagnetism by comparing and contrasting the electromagnetic waves due to the relative motion of a source or a receiver.

Compare the magnitude and range of the four fundamental forces (gravitational, electromagnetic, weak nuclear, strong nuclear).

Describe phase transitions in terms of kinetic molecular theory.

Differentiate between endothermic and exothermic chemical processes.

Integrate multiple sources of information presented in diverse media or formats.

Interpret the behavior of ideal gases in terms of kinetic molecular theory.

Describe heat as the energy transferred by convection, conduction, and radiation, and explain the connection of heat to change in temperature or states of matter.

Relate temperature to the average molecular kinetic energy.

Distinguish between endothermic and exothermic chemical processes.

Compare the magnitude and range of the four fundamental forces (gravitational, electromagnetic, weak nuclear, strong nuclear).

Differentiate between chemical and nuclear reactions.

Differentiate among conductors, semiconductors, and insulators.

Investigate and explain the relationships among current, voltage, resistance, and power.

Discuss phase transitions in terms of kinetic molecular theory.

Recognize that nothing travels faster than the speed of light in vacuum which is the same for all observers no matter how they or the light source are moving.

Interpret the behavior of ideal gases in terms of kinetic molecular theory.

Describe how the gravitational force between two objects depends on their masses and the distance between them.

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Describe the shift in frequency in sound or light due to the relative motion of a source or a receiver.

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Differentiate among conductors, semiconductors, and insulators.
Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.

Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on what is most significant for a specific purpose and audience.

Use technology, including the Internet, to produce, publish, and update individual or shared writing products, taking advantage of technology's capacity to link to other information and to display information flexibly and dynamically.

Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry as appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation.

Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the usefulness of each source in answering the research question; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and following a standard format for citation.

Draw evidence from informational texts to support analysis, reflection, and research.

Write routinely over extended time frames (time for reflection and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences.

Use varied transitions and sentence structures to link the major sections of the text, creating cohesion, and clarify the relationships among ideas and concepts.

Use precise language and domain-specific vocabulary to manage the complexity of the topic and convey a style appropriate to the discipline and context as well as to the expertise of likely readers.

Provide a concluding statement or section that follows from and supports the information or explanation presented (e.g., articulating implications or the significance of the topic).

Use varied transitions and sentence structures to link the major sections of the text, creating cohesion, and clarify the relationships among ideas and concepts.

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Provide a concluding statement or section that follows from and supports the information or explanation presented (e.g., articulating implications or the significance of the topic).

Make sense of problems and persevere in solving them.

Mathematically proficient students start by explaining to themselves the meaning of a problem and looking for entry points to its solution. They analyze givens, constraints, relationships, and goals. They make conjectures about the form and meaning of the solution and plan a solution pathway rather than simply jumping into a solution attempt. They consider analogous problems, and try special cases and simpler forms of the original problem in order to gain insight into its solution. They monitor and evaluate their progress and change course if necessary. Older students might, depending on the context of the problem, transform algebraic expressions or change the viewing window on their graphing calculator to get information they need. Mathematically proficient students can explain correspondences between equations, verbal descriptions, tables, and graphs or draw diagrams of important features and relationships, graph data, and search for regularity or trends. Younger students might rely on using concrete objects or pictures to help conceptualize and solve a problem. Mathematically proficient students check their answers to problems using a different method, and they continually ask themselves, “Does this make sense?” They can understand the approaches of others to solving complex problems and identify correspondences between different approaches.

Reason abstractly and quantitatively.

Mathematically proficient students make sense of quantities and their relationships in problem situations. They bring two complementary abilities to bear on problems involving quantitative relationships: the ability to decontextualize—to abstract a given situation and represent it symbolically and manipulate the representations — and the ability to contextualize, to pause as needed during the manipulation process in order to probe into the referents for the symbols involved. Quantitative reasoning entails habits of creating a coherent representation of the problem at hand; considering the units involved; attending to the meaning of quantities, not just how to compute them; and knowing and flexibly using different properties of operations and objects.

Construct viable arguments and critique the reasoning of others.

Mathematically proficient students understand and use stated assumptions, definitions, and previously established results in constructing arguments. They make conjectures and build a logical progression of statements to explore the truth of their conjectures. They are able to analyze situations by breaking them into cases, and can recognize and use counterexamples. They justify their conclusions, communicate them to others, and respond to the arguments of others. They reason inductively about data, making plausible arguments that take into account the context from which the data arose. Mathematically proficient students are also able to compare the effectiveness of two plausible arguments, distinguish correct logic or reasoning from that which is flawed, and—if there is a flaw in an argument—justify what it is. Elementary students can construct arguments using concrete referents such as objects, drawings, diagrams, and actions. Such arguments can make sense and be correct, even though they are not generalized or made formal until later grades. Later, students learn to determine domains to which an argument applies. Students at all grades can listen or read the arguments of others, decide whether they make sense, and ask useful questions to clarify or improve the arguments.

Model with mathematics.

Mathematically proficient students can apply the mathematics they know to solve problems arising in everyday life, society, and the workplace. In early grades, this might be as simple as writing an addition equation to describe a situation. In middle grades, a student might apply proportional reasoning to plan a school event or analyze a problem in the community. By high school, a student might use geometry to solve a design problem or use a function to describe how one quantity of interest depends on another. Mathematically proficient students who can apply what they know are comfortable making assumptions and approximations to simplify a complicated situation, realizing that these may need revision later. They are able to identify important quantities in a practical situation and map their relationships using such tools as diagrams, two-way tables, graphs, flowcharts and formulas. They can analyze those relationships mathematically to draw conclusions. They routinely interpret their mathematical results in the context of the situation and reflect on whether the results make sense, possibly improving the model if it has not served its purpose.

Use appropriate tools strategically.

Mathematically proficient students consider the available tools when solving a mathematical problem. These tools might include pencil and paper, concrete models, a ruler, a protractor, a calculator, a spreadsheet, a computer algebra system, a statistical package, or dynamic geometry software. Proficient students are sufficiently familiar with tools appropriate for their grade or course to make sound decisions about when each of these tools...
General Course Information and Notes

GENERAL NOTES

Laboratory investigations that include the use of scientific inquiry, research, measurement, problem solving, laboratory apparatus and technologies, experimental procedures, and safety procedures are an integral part of this course. The National Science Teachers Association (NSTA) recommends that at the high school level, all students should be in the science lab or field, collecting data every week. School laboratory investigations (labs) are defined by the National Research Council (NRC) as an experience in the laboratory, classroom, or the field that provides students with opportunities to interact directly with natural phenomena or with data collected by others using tools, materials, data collection techniques, and models (NRC, 2006, p. 3). Laboratory investigations in the high school classroom should help all students develop a growing understanding of the complexity and ambiguity of empirical work, as well as the skills to calibrate and troubleshoot equipment used to make observations. Learners should understand measurement error; and have the skills to aggregate, interpret, and present the resulting data (National Research Council, 2006, p. 77; NSTA, 2007).

Special Notes:

Instructional Practices: Teaching from a range of complex text is optimized when teachers in all subject areas implement the following strategies on a routine basis:

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- Asking questions (for science) and defining problems (for engineering).
- Developing and using models.
- Planning and carrying out investigations.
- Analyzing and interpreting data.
- Using mathematics, information and computer technology, and computational thinking.
- Constructing explanations (for science) and designing solutions (for engineering).
- Engaging in argument from evidence.
- Obtaining, evaluating, and communicating information.

Literacy Standards in Science

Secondary science courses include reading standards for literacy in science and technical subjects 6-12 and writing standards for literacy in history/social studies, science,
The courses also include speaking and listening standards. For a complete list of standards required for this course click on the blue tile labeled course standards. You may also download the complete course including all required standards and notes sections using the export function located at the top of this page.

**English Language Development ELD Standards Special Notes Section:**

Teachers are required to provide listening, speaking, reading and writing instruction that allows English language learners (ELL) to communicate information, ideas and concepts for academic success in the content area of Science. For the given level of English language proficiency and with visual, graphic, or interactive support, students will interact with grade level words, expressions, sentences and discourse to process or produce language necessary for academic success. The ELD standard should specify a relevant content area concept or topic of study chosen by curriculum developers and teachers which maximizes an ELL's need for communication and social skills. To access an ELL supporting document which delineates performance definitions and descriptors, please click on the following link:

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**Additional Instructional Resources:**

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### GENERAL INFORMATION

<table>
<thead>
<tr>
<th>Course Number: 2003310</th>
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<tbody>
<tr>
<td>Number of Credits: One (1) credit</td>
</tr>
<tr>
<td>Course Type: Core Academic Course</td>
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<tr>
<td>Course Status: Course Approved</td>
</tr>
<tr>
<td>Grade Level(s): 9,10,11,12</td>
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<tr>
<td>Graduation Requirement: Equally Rigorous Science</td>
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</table>

### Educator Certifications

- Science (Secondary Grades 7-12)
- Earth/Space Science (Grades 6-12)
- Physics (Grades 6-12)
- Chemistry (Grades 6-12)
- Middle Grades General Science (Middle Grades 5-9)
### Course Standards

<table>
<thead>
<tr>
<th>Name</th>
<th>Description</th>
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<tbody>
<tr>
<td>SC.912.E.7.1</td>
<td>Analyze the movement of matter and energy through the different biogeochemical cycles, including water and carbon.</td>
</tr>
<tr>
<td>SC.912.L.18.7</td>
<td>Identify the reactants, products, and basic functions of photosynthesis.</td>
</tr>
<tr>
<td>SC.912.L.18.8</td>
<td>Identify the reactants, products, and basic functions of aerobic and anaerobic cellular respiration.</td>
</tr>
<tr>
<td>SC.912.L.18.12</td>
<td>Discuss the special properties of water that contribute to Earth's suitability as an environment for life: cohesive behavior, ability to moderate temperature, expansion upon freezing, and versatility as a solvent.</td>
</tr>
<tr>
<td>SC.912.N.1.1</td>
<td>Define a problem based on a specific body of knowledge, for example: biology, chemistry, physics, and earth/space science, and do the following:</td>
</tr>
<tr>
<td></td>
<td>1. Pose questions about the natural world.</td>
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<td></td>
<td>2. Conduct systematic observations.</td>
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<td></td>
<td>3. Examine books and other sources of information to see what is already known,</td>
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<td></td>
<td>4. Review what is known in light of empirical evidence,</td>
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<td></td>
<td>5. Plan investigations.</td>
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<td></td>
<td>6. Use tools to gather, analyze, and interpret data.</td>
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<td></td>
<td>7. Pose answers, explanations, or descriptions of events,</td>
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<td></td>
<td>8. Generate explanations that explicate or describe natural phenomena (inferences),</td>
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<td></td>
<td>9. Use appropriate evidence and reasoning to justify these explanations to others,</td>
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<td></td>
<td>10. Communicate results of scientific investigations, and</td>
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<td></td>
<td>11. Evaluate the merits of the explanations produced by others.</td>
</tr>
<tr>
<td>SC.912.N.1.2</td>
<td>Describe and explain what characterizes science and its methods.</td>
</tr>
<tr>
<td>SC.912.N.1.3</td>
<td>Recognize that the strength or usefulness of a scientific claim is evaluated through scientific argumentation, which depends on critical and logical thinking, and the active consideration of alternative scientific explanations to explain the data presented.</td>
</tr>
<tr>
<td>SC.912.N.1.4</td>
<td>Identify sources of information and assess their reliability according to the strict standards of scientific investigation.</td>
</tr>
<tr>
<td>SC.912.N.1.5</td>
<td>Describe and provide examples of how similar investigations conducted in many parts of the world result in the same outcome.</td>
</tr>
<tr>
<td>SC.912.N.1.6</td>
<td>Describe how scientific inferences are drawn from scientific observations and provide examples from the content being studied.</td>
</tr>
<tr>
<td>SC.912.N.1.7</td>
<td>Recognize the role of creativity in constructing scientific questions, methods and explanations.</td>
</tr>
<tr>
<td>SC.912.N.2.1</td>
<td>Identify what is science, what clearly is not science, and what superficially resembles science (but fails to meet the criteria for science).</td>
</tr>
<tr>
<td>SC.912.N.2.2</td>
<td>Identify which questions can be answered through science and which questions are outside the boundaries of scientific investigation, such as questions addressed by other ways of knowing, such as art, philosophy, and religion.</td>
</tr>
<tr>
<td>SC.912.N.2.3</td>
<td>Identify examples of pseudoscience (such as astrology, phrenology) in society.</td>
</tr>
<tr>
<td>SC.912.N.2.4</td>
<td>Explain that scientific knowledge is both durable and robust and open to change.</td>
</tr>
<tr>
<td>SC.912.N.2.5</td>
<td>Describe instances in which scientists’ varied backgrounds, talents, interests, and goals influence the inferences and thus the explanations that they make about observations of natural phenomena describe that competing interpretations (explanations) of scientists are a strength of science as they are a source of new, testable ideas that have the potential to add new evidence to support one or another of the explanations.</td>
</tr>
<tr>
<td>SC.912.N.3.1</td>
<td>Explain that a scientific theory is the culmination of many scientific investigations drawing together all the current evidence concerning a substantial range of phenomena; thus, a scientific theory represents the most powerful explanation scientists have to offer.</td>
</tr>
<tr>
<td>SC.912.N.3.2</td>
<td>Describe the role consensus plays in the historical development of a theory in any one of the disciplines of science.</td>
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<tr>
<td>SC.912.N.3.3</td>
<td>Explain that scientific laws are descriptions of specific relationships under given conditions in nature, but do not offer explanations for those relationships.</td>
</tr>
<tr>
<td>SC.912.N.3.4</td>
<td>Recognize that theories do not become laws, nor do laws become theories; theories are well supported explanations and laws are well supported descriptions.</td>
</tr>
<tr>
<td>SC.912.N.3.5</td>
<td>Describe the function of models in science, and identify the wide range of models used in science.</td>
</tr>
<tr>
<td>SC.912.N.4.1</td>
<td>Explain how scientific knowledge and reasoning provide an empirically-based perspective to inform society's decision making.</td>
</tr>
<tr>
<td>SC.912.N.4.2</td>
<td>Weigh the merits of alternative strategies for solving a specific societal problem by comparing a number of different costs and benefits, such as human, economic, and environmental.</td>
</tr>
<tr>
<td>SC.912.P.8.1</td>
<td>Differentiate among the four states of matter.</td>
</tr>
<tr>
<td>SC.912.P.8.2</td>
<td>Differentiate between physical and chemical properties and physical and chemical changes of matter.</td>
</tr>
<tr>
<td>SC.912.P.8.4</td>
<td>Explore the scientific theory of atoms (also known as atomic theory) by describing the structure of atoms in terms of protons, neutrons and electrons, and differentiate among these particles in terms of their mass, electrical charges and locations within the atom.</td>
</tr>
<tr>
<td>SC.912.P.8.5</td>
<td>Relate properties of atoms and their position in the periodic table to the arrangement of their electrons.</td>
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<tr>
<td>SC.912.P.8.7</td>
<td>Interpret formula representations of molecules and compounds in terms of composition and structure.</td>
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<td>SC.912.P.8.8</td>
<td>Characterize types of chemical reactions, for example: redox, acid-base, synthesis, and single and double replacement reactions.</td>
</tr>
<tr>
<td>SC.912.P.8.11</td>
<td>Relate acidity and basicity to hydronium and hydroxyl ion concentration and pH.</td>
</tr>
<tr>
<td>SC.912.P.10.1</td>
<td>Differentiate among the various forms of energy and recognize that they can be transformed from one form to others.</td>
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<tr>
<td>SC.912.P.10.3</td>
<td>Compare and contrast work and power qualitatively and quantitatively.</td>
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<tr>
<td>SC.912.P.10.4</td>
<td>Describe heat as the energy transferred by convection, conduction, and radiation, and explain the connection of heat to change in temperature or states of matter.</td>
</tr>
<tr>
<td>SC.912.P.10.5</td>
<td>Relate temperature to the average molecular kinetic energy.</td>
</tr>
<tr>
<td>SC.912.P.10.7</td>
<td>Distinguish between endothermic and exothermic chemical processes.</td>
</tr>
<tr>
<td>SC.912.P.10.10</td>
<td>Compare the magnitude and range of the four fundamental forces (gravitational, electromagnetic, weak nuclear, strong nuclear).</td>
</tr>
<tr>
<td>SC.912.P.10.12</td>
<td>Differentiate between chemical and nuclear reactions.</td>
</tr>
<tr>
<td>SC.912.P.10.15</td>
<td>Investigate and explain the relationships among current, voltage, resistance, and power.</td>
</tr>
<tr>
<td>SC.912.P.10.18</td>
<td>Explore the theory of electromagnetism by comparing and contrasting the different parts of the electromagnetic spectrum in terms of wavelength, frequency, and energy, and relate them to phenomena and applications.</td>
</tr>
<tr>
<td>SC.912.P.10.21</td>
<td>Qualitatively describe the shift in frequency in sound or electromagnetic waves due to the relative motion of a source or a receiver.</td>
</tr>
<tr>
<td>SC.912.P.12.2</td>
<td>Analyze the motion of an object in terms of its position, velocity, and acceleration (with respect to a frame of reference) as functions of time.</td>
</tr>
<tr>
<td>SC.912.P.12.3</td>
<td>Interpret and apply Newton's three laws of motion.</td>
</tr>
<tr>
<td>SC.912.P.12.4</td>
<td>Describe how the gravitational force between two objects depends on their masses and the distance between them.</td>
</tr>
<tr>
<td>SC.912.P.12.7</td>
<td>Recognize that nothing travels faster than the speed of light in vacuum which is the same for all observers no matter how they or the light source are moving.</td>
</tr>
<tr>
<td>SC.912.P.12.10</td>
<td>Interpret the behavior of ideal gases in terms of kinetic molecular theory.</td>
</tr>
<tr>
<td>SC.912.P.12.11</td>
<td>Describe phase transitions in terms of kinetic molecular theory.</td>
</tr>
<tr>
<td>SC.912.P.12.12</td>
<td>Explain how various factors, such as concentration, temperature, and presence of a catalyst affect the rate of a chemical reaction.</td>
</tr>
</tbody>
</table>

### Clarifications

**Mathematicians who participate in effortful learning both individually and with others:**
- Analyze the problem in a way that makes sense given the task.
- Ask questions that will help with solving the task.
- Build perseverance by modifying methods as needed while solving a challenging task.
- Stay engaged and maintain a positive mindset while working to solve tasks.
- Help and support each other when attempting a new method or approach.

**Mathematicians who demonstrate understanding by representing problems in multiple ways:**
- Build understanding through modeling and using manipulatives.
- Represent solutions to problems in multiple ways using objects, drawings, tables, graphs and equations.
- Progress from modeling problems with objects and drawings to using algorithms and equations.
- Express connections between concepts and representations.
- Choose a representation based on the given context or purpose.

**Mathematicians who complete tasks with mathematical fluency:**
- Select efficient and appropriate methods for solving problems within the given context.
- Maintain flexibility and accuracy while performing procedures and mental calculations.
- Complete tasks accurately and with confidence.
- Adapt procedures to apply them to a new context.
- Use feedback to improve efficiency when performing calculations.

**Teachers who encourage students to participate actively in effortful learning both individually and with others:**
- Cultivate a community of growth mindset learners.
- Foster perseverance in students by choosing tasks that are challenging.
- Develop students' ability to analyze and problem solve.
- Recognize students' effort when solving challenging problems.

**Teachers who encourage students to demonstrate understanding by representing problems in multiple ways:**
- Help students make connections between concepts and representations.
- Provide opportunities for students to use manipulatives when investigating concepts.
- Guide students from concrete to pictorial to abstract representations as understanding progresses.
- Show students that various representations can have different purposes and can be useful in different situations.

**Teachers who encourage students to complete tasks with mathematical fluency:**
- Provide students with the flexibility to solve problems by selecting a procedure that allows them to solve efficiently and accurately.
- Offer multiple opportunities for students to practice efficient and generalizable methods.
- Provide opportunities for students to reflect on the method they used and determine if a more efficient method could have been used.

**Teachers who encourage students to engage in discussions that reflect on the mathematical thinking of self and others:**
- Communicate mathematical ideas, vocabulary and methods effectively.
- Analyze the mathematical thinking of others.
- Compare the efficiency of a method to those expressed by others.
- Recognize errors and suggest how to correctly solve the task.
- Justify results by explaining methods and processes.
- Construct possible arguments based on evidence.
Establish a culture in which students ask questions of the teacher and their peers, and error is an opportunity for learning. Create opportunities for students to discuss their thinking with peers. Select, sequence and present student work to advance and deepen understanding of correct and increasingly efficient methods. Develop students' ability to justify methods and compare their responses to the responses of their peers.

Use patterns and structure to help understand and connect mathematical concepts. Mathematicians who use patterns and structure to help understand and connect mathematical concepts:

- Focus on relevant details within a problem.
- Create plans and procedures to logically order events, steps or ideas to solve problems.
- Decompose a complex problem into manageable parts.
- Relate previously learned concepts to new concepts.
- Look for similarities among problems.
- Connect solutions of problems to more complicated large-scale situations.

Teachers who encourage students to use patterns and structure to help understand and connect mathematical concepts:

- Help students recognize the patterns in the world around them and connect these patterns to mathematical concepts.
- Support students to develop generalizations based on the similarities found among problems.
- Provide opportunities for students to create plans and procedures to solve problems.
- Develop students' ability to construct relationships between their current understanding and more sophisticated ways of thinking.

Assess the reasonableness of solutions. Mathematicians who assess the reasonableness of solutions:

- Estimate to discover possible solutions.
- Use benchmark quantities to determine if a solution makes sense.
- Check calculations when solving problems.
- Verify possible solutions by explaining the methods used.
- Evaluate results based on the given context.

Teachers who encourage students to assess the reasonableness of solutions:

- Have students estimate or predict solutions prior to solving.
- Prompt students to continually ask, “Does this solution make sense? How do you know?”
- Reinforce that students check their work as they progress within and after a task.
- Strengthen students’ ability to verify solutions through justifications.

Apply mathematics to real-world contexts. Mathematicians who apply mathematics to real-world contexts:

- Connect mathematical concepts to everyday experiences.
- Use models and methods to understand, represent and solve problems.
- Perform investigations to gather data or determine if a method is appropriate. • Redesign models and methods to improve accuracy or efficiency.

Teachers who encourage students to apply mathematics to real-world contexts:

- Provide opportunities for students to create models, both concrete and abstract, and perform investigations.
- Challenge students to question the accuracy of their models and methods.
- Support students as they validate conclusions by comparing them to the given situation.
- Indicate how various concepts can be applied to other disciplines.

Cite evidence to explain and justify reasoning. Clarifications:

K-1 Students include textual evidence in their oral communication with guidance and support from adults. The evidence can consist of details from the text without naming the text. During 1st grade, students learn how to incorporate the evidence in their writing. 2-3 Students include relevant textual evidence in their written and oral communication. Students should name the text when they refer to it. In 3rd grade, students should use a combination of direct and indirect citations. 4-5 Students continue with previous skills and reference comments made by speakers and peers. Students cite texts that they've directly quoted, paraphrased, or used for information. When writing, students will use the form of citation dictated by the instructor or the style guide referenced by the instructor. 6-8 Students continue with previous skills and use a style guide to create a proper citation. 9-12 Students continue with previous skills and should be aware of existing style guides and the ways in which they differ.

Read and comprehend grade-level complex texts proficiently.

Make inferences to support comprehension.

Students will make inferences before the words infer or inference are introduced. Kindergarten students will answer questions like “Why is the girl smiling?” or make predictions about what will happen based on the title page. Students will use the terms and apply them in 2nd grade and beyond.

Use appropriate collaborative techniques and active listening skills when engaging in discussions in a variety of situations.
In kindergarten, students learn to listen to one another respectfully. In grades 1-2, students build upon these skills by justifying what they are thinking. For example: “I think _____ because ____.” The collaborative conversations are becoming academic conversations.

In grades 3-12, students engage in academic conversations discussing claims and justifying their reasoning, refining and applying skills. Students build on ideas, propel the conversation, and support claims and counterclaims with evidence.

Use the accepted rules governing a specific format to create quality work.

Students will incorporate skills learned into work products to produce quality work. For students to incorporate these skills appropriately, they must receive instruction. A 3rd grade student creating a poster board display must have instruction in how to effectively present information to do quality work.

Use appropriate voice and tone when speaking or writing.

In kindergarten and 1st grade, students learn the difference between formal and informal language. For example, the way we talk to our friends differs from the way we speak to adults. In 2nd grade and beyond, students practice appropriate social and academic language to discuss texts.

English language learners communicate information, ideas and concepts necessary for academic success in the content area of Science.

English language learners communicate for social and instructional purposes within the school setting.

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Florida's Benchmarks for Excellent Student Thinking (B.E.S.T.) Standards

This course includes Florida's B.E.S.T. ELA Expectations (EE) and Mathematical Thinking and Reasoning Standards (MTRs) for students. Florida educators should intentionally embed these standards within the content and their instruction as applicable. For guidance on the implementation of the EE and MTRs, please visit https://www.cpalms.org/Standards/BEST_Standards.aspx and select the appropriate B.E.S.T. Standards package.

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Number of Credits: One (1) credit
Course Type: Core Academic Course
Course Status: State Board Approved
Grade Level(s): 9,10,11,12
Graduation Requirement: Equally Rigorous Science

Course Path: Section: Grades PreK to 12 Education
Courses > Grade Group: Grades 9 to 12 and Adult Education Courses > Subject: Science > SubSubject: Physical Sciences
Abbreviated Title: PHY SCI
Course Length: Year (Y)
Course Level: 2

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</table>
Relate acidity and basicity to hydronium and hydroxyl ion concentration and pH.

Differentiate among the various forms of energy and recognize that they can be transformed from one form to others.

Explore the Law of Conservation of Energy by differentiating among open, closed, and isolated systems and explain that the total energy in an isolated system is a conserved quantity.

Compare and contrast work and power qualitatively and quantitatively.

Describe heat as the energy transferred by convection, conduction, and radiation, and explain the connection of heat to change in temperature or states of matter.

Relate temperature to the average molecular kinetic energy.

Create and interpret potential energy diagrams, for example: chemical reactions, orbits around a central body, motion of a pendulum.

Distinguish between endothermic and exothermic chemical processes.

Compare the magnitude and range of the four fundamental forces (gravitational, electromagnetic, weak nuclear, strong nuclear).

Explain and compare nuclear reactions (radioactive decay, fission and fusion), the energy changes associated with them and their associated safety issues.

Differentiate between chemical and nuclear reactions.

Differentiate among conductors, semiconductors, and insulators.

Investigate and explain the relationships among current, voltage, resistance, and power.

Describe phase transitions in terms of kinetic molecular theory.

Describe how the gravitational force between two objects depends on their masses and the distance between them.

Apply the law of conservation of linear momentum to interactions, such as collisions between objects.

Evaluate a speaker's point of view, reasoning, and use of evidence and rhetorical devices in speeches by determining the credibility and accuracy of each source.

Initiate and participate effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grades 9–10 topics, texts, and issues, building on others' ideas; activelylisten to others, integrating and responding to others' comments and questions, and contribute relatively equal amounts of dialogue.

Write arguments focused on discipline-specific content. a. Introduce precise claim(s), distinguish the claim(s) from alternate or opposing claims, and create an organization that establishes clear relationships among the claim(s), counterclaims, reasons, and evidence.

Make strategic use of digital media (e.g., textual, graphical, audio, visual, and interactive elements) in presentations to enhance understanding of findings, reasoning, and evidence and to add interest.
and counterclaims in a discipline-appropriate form and in a manner that anticipates the audience's knowledge level and concerns.

- Use words, phrases, and clauses to link the major sections of the text, create cohesion, and clarify the relationships between claim(s) and reasons, between reasons and evidence, and between claim(s) and counterclaims.

- Establish and maintain a formal style and objective tone while attending to the norms and conventions of the discipline in which they are writing.

- Provide a concluding statement or section that follows from or supports the argument presented.

**LAFS.910.WHST.1.1:**
Write routinely over extended time frames (time for reflection and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences.

- For a function that models a relationship between two quantities, interpret key features of graphs and tables in terms of the quantities, and sketch graphs showing key features given a verbal description of the relationship. Key features include: intercepts; intervals where the function is increasing, decreasing, positive, or negative; relative maximums and minimums; symmetries; end behavior; and periodicity.

**LAFS.910.WHST.1.2:**
Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.

- Make sure there are no breaks in the line of reasoning, argument, or evidence.

- Use varied transitions and sentence structures to link the major sections of the text, create cohesion, and clarify the relationships among ideas and concepts.

- Use precise language and domain-specific vocabulary to manage the complexity of the topic and convey a style appropriate to the discipline and context as well as to the expertise of likely readers.

- Establish and maintain a formal style and objective tone while attending to the norms and conventions of the discipline in which they are writing.

- Provide a concluding statement or section that follows from and supports the information or explanation presented (e.g., articulating implications or the significance of the topic).

**LAFS.910.WHST.1.3:**
Use the mean and standard deviation of a data set to fit it to a normal distribution. Use calculators, spreadsheets, and tables to estimate areas under the normal curve.

- Use the mean and standard deviation of a data set to fit it to a normal distribution and to estimate population percentages. Recognize that there are data sets for which such a procedure is not appropriate. Use calculators, spreadsheets, and tables to estimate areas under the normal curve.

- Summarize categorical data for two categories in two-way frequency tables. Interpret relative frequencies in the context of the data (including joint, marginal, and conditional relative frequencies). Recognize possible associations and trends in the data.

- Represent data on two quantitative variables on a scatter plot, and describe how the variables are related.

**LAFS.910.WHST.1.4:**
Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the usefulness of each source in answering the research question; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and following a standard format for citation.

**LAFS.910.WHST.1.5:**
Use symbols for vectors and their magnitudes (e.g., , |v|, ||v||).

- Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases.

**LAFS.910.WHST.1.6:**
Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience.

- Rearrange formulas to highlight a quantity of interest, using the same reasoning as in solving equations. For example, rearrange Ohm's law V = IR to highlight resistance R.

- Draw evidence from informational texts to support analysis, reflection, and research.

- Use statistics appropriate to the shape of the data distribution, such as the shape of the distribution or the existence of extreme data points.

**LAFS.910.WHST.2.4:**
Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.

- Use statistics appropriate to the shape of the data distribution to compare center (median, mean) and spread (interquartile range, standard deviation) of two or more different data sets.

- Use statistics appropriate to the shape of the data distribution to compare center (median, mean) and spread (interquartile range, standard deviation) of two or more different data sets.

- Use the mean and standard deviation of a data set to fit it to a normal distribution and to estimate population percentages. Recognize that there are data sets for which such a procedure is not appropriate. Use calculators, spreadsheets, and tables to estimate areas under the normal curve.

- Use the mean and standard deviation of a data set to fit it to a normal distribution and to estimate population percentages. Recognize that there are data sets for which such a procedure is not appropriate. Use calculators, spreadsheets, and tables to estimate areas under the normal curve.
a. Fit a function to the data; use functions fitted to data to solve problems in the context of the data. Use given functions or choose a function suggested by the context. Emphasize linear, and exponential models.

b. Informally assess the fit of a function by plotting and analyzing residuals.

c. Fit a linear function for a scatter plot that suggests a linear association.

**Clarifications:**
Students take a more sophisticated look at using a linear function to model the relationship between two numerical variables. In addition to fitting a line to data, students assess how well the model fits by analyzing residuals.

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**MAFS.912.S-ID.2.6:**

**Make sense of problems and persevere in solving them.**

Mathematically proficient students start by explaining to themselves the meaning of a problem and looking for entry points to its solution. They analyze givers, constraints, relationships, and goals. They make conjectures about the form and meaning of the solution and plan a solution pathway rather than simply jumping into a solution attempt. They consider analogous problems, and try special cases and simpler forms of the original problem in order to gain insight into its solution. They monitor and evaluate their progress and change course if necessary. Older students might, depending on the context of the problem, transform algebraic expressions or change the viewing window on their graphing calculator to get the information they need. Mathematically proficient students can explain correspondences between equations, verbal descriptions, tables, and graphs or draw diagrams of important features and relationships, graph data, and search for regularity or trends. Younger students might rely on using concrete objects or pictures to help conceptualize and solve a problem. Mathematically proficient students check their answers to problems using a different method, and they continually ask themselves, “Does this make sense?” They can understand the approaches of others to solving complex problems and identify correspondences between different approaches.

**Standard Relation to Course: Supporting**

**MAFS.K12.MP.1.a:**

**Reason abstractly and quantitatively.**

Mathematically proficient students make sense of quantities and their relationships in problem situations. They bring two complementary abilities to bear on problems involving quantitative relationships: the ability to decontextualize—to abstract a given situation and represent it symbolically and manipulate the representing symbols as if they have a life of their own, without necessarily attending to their referents—and the ability to contextualize, to pause as needed during the manipulation process in order to probe into the referents for the symbols involved. Quantitative reasoning entail habits of creating a coherent representation of the problem at hand; considering the units involved; attending to the meaning of quantities, not just how to compute them; and knowing and flexibly using different properties of operations and objects.

**Standard Relation to Course: Supporting**

**MAFS.K12.MP.1.b:**

**Construct viable arguments and critique the reasoning of others.**

Mathematically proficient students understand and use stated assumptions, definitions, and previously established results in constructing arguments. They make conjectures and build a logical progression of statements to explore the truth of their conjectures. They are able to analyze situations by breaking them into cases, and can recognize and use counterexamples. They justify their conclusions, communicate them to others, and respond to the arguments of others. They reason inductively about data, making plausible arguments that take into account the context from which the data arose. Mathematically proficient students are also able to compare the effectiveness of two plausible arguments, distinguish correct logic or reasoning from that which is flawed, and—if there is a flaw in an argument—explain what it is. Elementary students can construct arguments using concrete referents such as objects, drawings, diagrams, and actions. Such arguments can make sense and be correct, even though they are not generalized or made formal until later grades. Later, students learn to determine domains to which an argument applies. Students at all grades can listen or read the arguments of others, decide whether they make sense, and ask useful questions to clarify or improve the arguments.

**Standard Relation to Course: Supporting**

**MAFS.K12.MP.1.c:**

**Model with mathematics.**

Mathematically proficient students apply the mathematics they know to solve problems arising in everyday life, society, and the workplace. In early grades, this might be as simple as writing an addition equation to describe a situation. In middle grades, a student might apply proportional reasoning to plan a school event or analyze a problem in the community. By high school, a student might use geometry to solve a design problem or use a function to describe how one quantity of interest depends on another. Mathematically proficient students who can apply what they know are comfortable making assumptions and approximations to simplify a complicated situation, realizing that these may need revision later. They are able to identify important quantities in a practical situation and map their relationships using such tools as diagrams, two-way tables, graphs, flowcharts and formulas. They can analyze those relationships mathematically to draw conclusions. They routinely interpret their mathematical results in the context of the situation and reflect on whether the results make sense, possibly improving the model if it has not served its purpose.

**Standard Relation to Course: Supporting**

**MAFS.K12.MP.1.d:**

**Use appropriate tools strategically.**

Mathematically proficient students consider the available tools when solving a mathematical problem. These tools might include pencil and paper, concrete models, a ruler, a protractor, a calculator, a spreadsheet, a computer algebra system, a statistical package, or dynamic geometry software. Proficient students are sufficiently familiar with tools appropriate for their grade or course to make sound decisions about when each of these tools might be helpful, recognizing both the insight to be gained and their limitations. For example, mathematically proficient high school students analyze graphs of functions and solutions generated using a graphing calculator. They detect possible errors by strategically using estimation and other mathematical knowledge. When making mathematical models, they know that technology can enable them to visualize the results of varying assumptions, explore consequences, and compare predictions with data. Mathematically proficient students at various grade levels are able to identify relevant external mathematical resources, such as digital content located on a website, and use them to pose or solve problems. They are able to use technological tools to explore and deepen their understanding of concepts.

**Standard Relation to Course: Supporting**

**MAFS.K12.MP.2.a:**

**Attend to precision.**

Mathematically proficient students try to communicate precisely to others. They try to use clear definitions in discussion with others and in their own reasoning. They state the meaning of the symbols they choose, including using the equal sign consistently and appropriately. They are careful about specifying units of measure, and labeling axes to clarify the correspondence with quantities in a problem. They calculate accurately and efficiently, express numerical answers with a degree of precision appropriate for the problem context. In the elementary grades, students give carefully formulated explanations to each other. By the time they reach high school they have learned to examine claims and make explicit use of definitions.

**Standard Relation to Course: Supporting**
General Course Information and Notes

**GENERAL NOTES**

While the content focus of this course is consistent with the Physical Science course, students will explore these concepts in greater depth. In general, the academic pace and rigor will be greatly increased for honors level course work. Laboratory investigations that include the use of scientific inquiry, research, measurement, problem solving, laboratory apparatus and technologies, experimental procedures, and safety procedures are an integral part of this course. The National Science Teachers Association (NSTA) recommends that at the high school level, all students should be in the science lab or field, collecting data every week. School laboratory investigations (labs) are defined by the National Research Council (NRC) as an experience in the laboratory, classroom, or the field that provides students with opportunities to interact directly with natural phenomena or with data collected by others using tools, materials, data collection techniques, and models (NRC, 2006, p. 3). Laboratory investigations in the high school classroom should help all students develop a growing understanding of the complexity and ambiguity of empirical work, as well as the skills to calibrate and troubleshoot equipment used to make observations. Learners should understand measurement error; and have the skills to aggregate, interpret, and present the resulting data (National Research Council, 2006, p.77; NSTA, 2007).

**Special Notes:**

**Instructional Practices:** Teaching from a range of complex text is optimized when teachers in all subject areas implement the following strategies on a routine basis:

1. Ensuring wide reading from complex text that varies in length.
2. Making close reading and rereading of texts central to lessons.
3. Emphasizing text-specific complex questions, and cognitively complex tasks, reinforce focus on the text and cultivate independence.
4. Emphasizing students supporting answers based upon evidence from the text.
5. Providing extensive research and writing opportunities (claims and evidence).

**Science and Engineering Practices** (NRC Framework for K-12 Science Education, 2010)

- Asking questions (for science) and defining problems (for engineering).
- Developing and using models.
- Planning and carrying out investigations.
- Analyzing and interpreting data.
- Using mathematics, information and computer technology, and computational thinking.
- Constructing explanations (for science) and designing solutions (for engineering).
- Engaging in argument from evidence.
- Obtaining, evaluating, and communicating information.

**Honors and Advanced Level Course Notes:** Advanced courses require a greater demand on students through increased academic rigor. Academic rigor is obtained through the application, analysis, evaluation, and creation of complex ideas that are often abstract and multi-faceted. Students are challenged to think and collaborate critically on the content they are learning. Honors level rigor will be achieved by increasing text complexity through text selection, focus on high-level qualitative measures, and complexity of task. Instruction will be structured to give students a deeper understanding of conceptual themes and organization within and across disciplines. Academic rigor is more than simply assigning to students a greater quantity of work.

**Literacy Standards in Science**

Secondary science courses include reading standards for literacy in science and technical subjects 6-12 and writing standards for literacy in history/social studies, science, and technical subjects 6-12. The courses also include speaking and listening standards. For a complete list of standards required for this course click on the blue tile labeled course standards. You may also download the complete course including all required standards and notes sections using the export function located at the top of this page.

**English Language Development ELD Standards Special Notes Section:**

Teachers are required to provide listening, speaking, reading and writing instruction that allows English language learners (ELL) to communicate information, ideas and concepts for academic success in the content area of Science. For the given level of English language proficiency and with visual, graphic, or interactive support, students will interact with grade level words, expressions, sentences and discourse to process or produce language necessary for academic success. The ELD standard should...
specify a relevant content area concept or topic of study chosen by curriculum developers and teachers which maximizes an ELL's need for communication and social skills. To access an ELL supporting document which delineates performance definitions and descriptors, please click on the following link: https://cpalmsmediaprod.blob.core.windows.net/uploads/docs/standards/eld/sc.pdf

**GENERAL INFORMATION**

- **Course Number:** 2003320
- **Number of Credits:** One (1) credit
- **Course Path:** Sections: Grades PreK to 12 Education Courses > Grade Group: Grades 9 to 12 and Adult Education Courses > Subject: Science > SubSubject: Physical Sciences
- **Abbreviated Title:** PHY SCI HON
- **Course Length:** Year (Y)
- **Course Attributes:** Honors
- **Course Level:** 3

**Educator Certifications**

<table>
<thead>
<tr>
<th>Science (Secondary Grades 7-12)</th>
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<tbody>
<tr>
<td>Earth/Space Science (Grades 6-12)</td>
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<tr>
<td>Physics (Grades 6-12)</td>
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<tr>
<td>Chemistry (Grades 6-12)</td>
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<tr>
<td>Middle Grades General Science (Middle Grades 5-9)</td>
</tr>
</tbody>
</table>
### Course Standards

<table>
<thead>
<tr>
<th>Name</th>
<th>Description</th>
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<tbody>
<tr>
<td>SC.912.E.7.1:</td>
<td>Analyze the movement of matter and energy through the different biogeochemical cycles, including water and carbon.</td>
</tr>
<tr>
<td>SC.912.L.18.7:</td>
<td>Identify the reactants, products, and basic functions of photosynthesis.</td>
</tr>
<tr>
<td>SC.912.L.18.8:</td>
<td>Identify the reactants, products, and basic functions of aerobic and anaerobic cellular respiration.</td>
</tr>
<tr>
<td>SC.912.L.18.12:</td>
<td>Discuss the special properties of water that contribute to Earth's suitability as an environment for life: cohesive behavior, ability to moderate temperature, expansion upon freezing, and versatility as a solvent.</td>
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</tbody>
</table>

- Define a problem based on a specific body of knowledge, for example: biology, chemistry, physics, and earth/space science, and do the following:
  1. Pose questions about the natural world. (Articulate the purpose of the investigation and identify the relevant scientific concepts).
  2. Conduct systematic observations. (Write procedures that are clear and replicable. Identify observables and examine relationships between test (independent) variable and outcome (dependent) variable. Employ appropriate methods for accurate and consistent observations; conduct and record measurements at appropriate levels of precision. Follow safety guidelines).
  3. Examine books and other sources of information to see what is already known.
  4. Review what is known in light of empirical evidence. (Examine whether available empirical evidence can be interpreted in terms of existing knowledge and models, and if not, modify or develop new models).
  5. Plan investigations. (Design and evaluate a scientific investigation).
  6. Use tools to gather, analyze, and interpret data (this includes the use of measurement in metric and other systems, and also the generation and interpretation of graphical representations of data, including data tables and graphs). (Collect data or evidence in an organized way. Properly use instruments, equipment, and materials (e.g., scales, probeware, meter sticks, microscopes, computers) including set-up, calibration, technique, maintenance, and storage).
  7. Pose answers, explanations, or descriptions of events.
  8. Generate explanations that explicate or describe natural phenomena (inferences).
  9. Use appropriate evidence and reasoning to justify these explanations to others.
  10. Communicate results of scientific investigations, and evaluate the merits of the explanations produced by others.

- Identify which questions can be answered through science and which questions are outside the boundaries of scientific investigation, such as questions addressed by other ways of knowing, such as art, philosophy, and religion.

- Identify examples of pseudoscience (such as astrology, phrenology) in society.

- Because of these frequent examinations, scientific knowledge becomes more powerful explanation scientists have to offer.

- Describe and evaluate a scientific investigation. (Explain what characterizes science and its methods.)

- Describe the role consensus plays in the historical development of a theory in any one of the disciplines of science.

- Describe the function of models in science, and identify the wide range of models used in science.

- Describe how scientific knowledge is both durable and robust and open to change. Scientific knowledge can change because it is often examined and re-examined by new investigations and scientific argumentation. Because of these frequent examinations, scientific knowledge becomes stronger, leading to its durability.

- Describe instances in which scientists’ varied backgrounds, talents, interests, and goals influence the inferences and thus the explanations that they make about observations of natural phenomena and describe that competing interpretations (explanations) of scientists are a strength of science as they are a source of new, testable ideas that have the potential to add new evidence to support one or another of the explanations.

- Explain that a scientific theory is the culmination of many scientific investigations drawing together all the current evidence concerning a substantial range of phenomena; thus, a scientific theory represents the most powerful explanation scientists have to offer.

- Explain that scientific knowledge is both durable and robust and open to change. Scientific knowledge can change because it is often examined and re-examined by new investigations and scientific argumentation. Because of these frequent examinations, scientific knowledge becomes stronger, leading to its durability.

- Explain that scientific laws are descriptions of specific relationships under given conditions in nature, but do not offer explanations for those relationships.

- Explain that theories do not become laws, nor do laws become theories; theories are well supported explanations and laws are well supported descriptions.

- Explain how scientific knowledge and reasoning provide an empirically-based perspective to inform society's decision making.

- Weigh the merits of alternative strategies for solving a specific societal problem by comparing a number of different costs and benefits, such as human, economic, and environmental.

- Differentiate among the four states of matter.

- Differentiate between physical and chemical properties and physical and chemical changes of matter.

- Explore the scientific theory of atoms (also known as atomic theory) by describing changes in the atomic model over time and why those changes were necessitated by experimental evidence.

- Explore the scientific theory of atoms (also known as atomic theory) by describing the structure of atoms in terms of protons, neutrons, and electrons, and differentiate among these particles in terms of their mass, electrical charges and locations within the atom.

- Relate properties of atoms and their position in the periodic table to the arrangement of their electrons.

- Interpret formula representations of molecules and compounds in terms of composition and structure.

- Characterize types of chemical reactions, for example: redox, acid-base, synthesis, and single and double replacement reactions.
Relate acidity and basicity to hydronium and hydroxyl ion concentration and pH.

Analyze the motion of an object in terms of its position, velocity, and acceleration.

Distinguish between endothermic and exothermic chemical processes.

Compare and contrast work and power qualitatively and quantitatively.

Describe phase transitions in terms of kinetic molecular theory.

Explain and compare nuclear reactions (radioactive decay, fission and fusion), the energy changes associated with them and their associated safety issues.

Differentiate between chemical and nuclear reactions.

Qualitatively apply the concept of angular momentum.

Apply the law of conservation of linear momentum to interactions, such as collisions between objects.

Interpret the behavior of ideal gases in terms of kinetic molecular theory.

Compare the magnitude and range of the four fundamental forces (gravitational, electromagnetic, weak nuclear, strong nuclear).

Relate temperature to the average molecular kinetic energy.

Differentiate among conductors, semiconductors, and insulators.

Describe heat as the energy transferred by convection, conduction, and radiation, and explain the connection of heat to change in temperature or states of matter.

Relate acidity and basicity to the average molecular kinetic energy.

Create and interpret potential energy diagrams, for example: chemical reactions, orbits around a central body, motion of a pendulum.

Distinguish between endothermic and exothermic chemical processes.

Compare the magnitude and range of the four fundamental forces (gravitational, electromagnetic, weak nuclear, strong nuclear).

Explain and compare nuclear reactions (radioactive decay, fission and fusion), the energy changes associated with them and their associated safety issues.

Differentiate between chemical and nuclear reactions.

Distinguish among conductors, semiconductors, and insulators.

Investigate and explain the relationships among current, voltage, resistance, and power.

Explore the theory of electromagnetism by comparing and contrasting the different parts of the electromagnetic spectrum in terms of wavelength, frequency, and energy, and relate them to phenomena and applications.

Qualitatively describe the shift in frequency in sound or electromagnetic waves due to the relative motion of a source or a receiver.

Distinguish between scalar and vector quantities and assess which should be used to describe an event.

Analyze the motion of an object in terms of its position, velocity, and acceleration (with respect to a frame of reference) as functions of time.

Interpret and apply Newton's three laws of motion.

Describe how the gravitational force between two objects depends on their masses and the distance between them.

Apply the law of conservation of linear momentum to interactions, such as collisions between objects.

Qualitatively apply the concept of angular momentum.

Recognize that nothing travels faster than the speed of light in vacuum which is the same for all observers no matter how they or the light source are moving.

Interpret the behavior of ideal gases in terms of kinetic molecular theory.

Describe phase transitions in terms of kinetic molecular theory.

Mathematicians who participate in effortful learning both individually and with others:
- Analyze the problem in a way that makes sense given the task.
- Ask questions that will help with solving the task.
- Build perseverance by modifying methods as needed while solving a challenging task.
- Stay engaged and maintain a positive mindset when working to solve tasks.
- Help and support each other when attempting a new method or approach.

Clariﬁcations:
- Teachers who encourage students to participate actively in effortful learning both individually and with others:
  - Cultivate a community of growth mindset learners.
  - Foster perseverance in students by choosing tasks that are challenging.
  - Develop students' ability to analyze and problem solve.
  - Recognize students' effort when solving challenging problems.

Mathematicians who demonstrate understanding by representing problems in multiple ways:
- Build understanding through modeling and using manipulatives.
- Represent solutions to problems in multiple ways using objects, drawings, tables, graphs and equations.
- Progress from modeling problems with objects and drawings to using algorithms and equations.
- Express connections between concepts and representations.
- Choose a representation based on the given context or purpose.

Clariﬁcations:
- Teachers who encourage students to demonstrate understanding by representing problems in multiple ways:
  - Help students make connections between concepts and representations.
  - Provide opportunities for students to use manipulatives when investigating concepts.
  - Guide students from concrete to pictorial to abstract representations as understanding progresses.
  - Show students that various representations can have different purposes and can be useful in different situations.

Mathematicians who complete tasks with mathematical ﬂuency:
- Select efficient and appropriate methods for solving problems within the given context.
- Maintain ﬂexibility and accuracy while performing procedures and mental calculations.
- Complete tasks accurately and with conﬁdence.
- Adapt procedures to apply them to a new context.
- Use feedback to improve efﬁciency when performing calculations.

Clariﬁcations:
- Teachers who encourage students to complete tasks with mathematical ﬂuency:
  - Provide students with the ﬂexibility to solve problems by selecting a procedure that allows them to solve efﬁciently and accurately.
  - Offer multiple opportunities for students to practice efﬁcient and generalizable methods.
  - Provide opportunities for students to reﬂect on the method they used and determine if a more efﬁcient method could have been used.

Engage in discussions that reﬂect on the mathematical thinking of self and others.
Mathematicians who engage in discussions that reflect on the mathematical thinking of self and others:

- Communicate mathematical ideas, vocabulary and methods effectively.
- Analyze the mathematical thinking of others.
- Compare the efficiency of a method to those expressed by others.
- Recognize errors and suggest how to correctly solve the task.
- Justify results by explaining methods and processes.
- Construct possible arguments based on evidence.

**Clarifications:**
Teachers who encourage students to engage in discussions that reflect on the mathematical thinking of self and others:

- Establish a culture in which students ask questions of the teacher and their peers, and error is an opportunity for learning.
- Create opportunities for students to discuss their thinking with peers.
- Select, sequence and present student work to advance and deepen understanding of correct and increasingly efficient methods.
- Develop students’ ability to justify methods and compare their responses to the responses of their peers.

Use patterns and structure to help understand and connect mathematical concepts.

Mathematicians who use patterns and structure to help understand and connect mathematical concepts:

- Focus on relevant details within a problem.
- Create plans and procedures to logically order events, steps or ideas to solve problems.
- Decompose a complex problem into manageable parts.
- Relate previously learned concepts to new concepts.
- Look for similarities among problems.
- Connect solutions of problems to more complicated large-scale situations.

**Clarifications:**
Teachers who encourage students to use patterns and structure to help understand and connect mathematical concepts:

- Help students recognize the patterns in the world around them and connect these patterns to mathematical concepts.
- Support students to develop generalizations based on the similarities found among problems.
- Provide opportunities for students to create plans and procedures to solve problems.
- Develop students’ ability to construct relationships between their current understanding and more sophisticated ways of thinking.

Assess the reasonableness of solutions.

Mathematicians who assess the reasonableness of solutions:

- Estimate to discover possible solutions.
- Use benchmark quantities to determine if a solution makes sense.
- Check calculations when solving problems.
- Verify possible solutions by explaining the methods used.
- Evaluate results based on the given context.

**Clarifications:**
Teachers who encourage students to assess the reasonableness of solutions:

- Have students estimate or predict solutions prior to solving.
- Prompt students to continually ask, “Does this solution make sense? How do you know?”
- Reinforce that students check their work as they progress within and after a task.
- Strengthen students’ ability to verify solutions through justifications.

Apply mathematics to real-world contexts.

Mathematicians who apply mathematics to real-world contexts:

- Connect mathematical concepts to everyday experiences.
- Use models and methods to understand, represent and solve problems.
- Perform investigations to gather data or determine if a method is appropriate. • Redesign models and methods to improve accuracy or efficiency.

**Clarifications:**
Teachers who encourage students to apply mathematics to real-world contexts:

- Provide opportunities for students to create models, both concrete and abstract, and perform investigations.
- Challenge students to question the accuracy of their models and methods.
- Support students as they validate conclusions by comparing them to the given situation.
- Indicate how various concepts can be applied to other disciplines.

Cite evidence to explain and justify reasoning.

**Clarifications:**

K-1 Students include textual evidence in their oral communication with guidance and support from adults. The evidence can consist of details from the text without naming the text. During 1st grade, students learn how to incorporate the evidence in their writing.

2-3 Students include relevant textual evidence in their written and oral communication. Students should name the text when they refer to it. In 3rd grade, students should use a combination of direct and indirect citations.

4-5 Students continue with previous skills and reference comments made by speakers and peers. Students cite texts that they’ve directly quoted, paraphrased, or used for information. When writing, students will use the form of citation dictated by the instructor or the style guide referenced by the instructor.

6-8 Students continue with previous skills and use a style guide to create a proper citation.

9-12 Students continue with previous skills and should be aware of existing style guides and the ways in which they differ.

Read and comprehend grade-level complex texts proficiently.
Clarifications:
English language learners communicate for social and instructional purposes within the school setting. They communicate information, ideas, and concepts.

ELA.K12.EE.2.1: Clarifications:
Make inferences to support comprehension.

ELA.K12.EE.3.1: Clarifications:
Students will make inferences before the words infer or inference are introduced. Kindergarten students will answer questions like “Why is the girl smiling?” or make predictions about what will happen based on the title page. Students will use the terms and apply them in 2nd grade and beyond.

ELA.K12.EE.4.1: Clarifications:
In kindergarten, students learn to listen to one another respectfully.
In grades 1-2, students build upon these skills by justifying what they are thinking. For example: “I think ______ because ______.” The collaborative conversations are becoming academic conversations.
In grades 3-12, students engage in academic conversations discussing claims and justifying their reasoning, refining and applying skills. Students build on ideas, propel the conversation, and support claims and counterclaims with evidence.

ELA.K12.EE.5.1: Clarifications:
Students will incorporate skills learned into work products to produce quality work. For students to incorporate these skills appropriately, they must receive instruction. A 3rd grade student creating a poster board display must have instruction in how to effectively present information to do quality work.

ELA.K12.EE.6.1: Clarifications:
In kindergarten and 1st grade, students learn the difference between formal and informal language. For example, the way we talk to our friends differs from the way we speak to adults. In 2nd grade and beyond, students practice appropriate social and academic language to discuss texts.

ELD.K12.ELL.SI.1: English language learners communicate information, ideas, and concepts necessary for academic success in the content area of Science.

ELD.K12.ELL.SI.1: English language learners communicate for social and instructional purposes within the school setting.

General Course Information and Notes

GENERAL NOTES

While the content focus of this course is consistent with the Physical Science course, students will explore these concepts in greater depth. In general, the academic pace and rigor will be greatly increased for honors level course work. Laboratory investigations that include the use of scientific inquiry, research, measurement, problem solving, laboratory apparatus and technologies, experimental procedures, and safety procedures are an integral part of this course. The National Science Teachers Association (NSTA) recommends that at the high school level, all students should be in the science lab or field, collecting data every week. School laboratory investigations (labs) are defined by the National Research Council (NRC) as an experience in the laboratory, classroom, or the field that provides students with opportunities to interact directly with natural phenomena or with data collected by others using tools, materials, data collection techniques, and models (NRC, 2006, p. 3). Laboratory investigations in the high school classroom should help all students develop a growing understanding of the complexity and ambiguity of empirical work, as well as the skills to calibrate and troubleshoot equipment used to make observations. Learners should understand measurement error; and have the skills to aggregate, interpret, and present the resulting data (National Research Council, 2006, p.77; NSTA, 2007).

Special Notes:

Instructional Practices: Teaching from a range of complex text is optimized when teachers in all subject areas implement the following strategies on a routine basis:

1. Ensuring wide reading from complex text that varies in length.
2. Making close reading and rereading of texts central to lessons.
3. Emphasizing text-specific complex questions, and cognitively complex tasks, reinforce focus on the text and cultivate independence.
4. Emphasizing students supporting answers based upon evidence from the text.
5. Providing extensive research and writing opportunities (claims and evidence).


- Asking questions (for science) and defining problems (for engineering).
- Developing and using models.
- Planning and carrying out investigations.
- Analyzing and interpreting data.
- Using mathematics, information and computer technology, and computational thinking.
- Constructing explanations (for science) and designing solutions (for engineering).
- Engaging in argument from evidence.
- Obtaining, evaluating, and communicating information.

Honors and Advanced Level Course Note: Advanced courses require a greater demand on students through increased academic rigor. Academic rigor is obtained through the application, analysis, evaluation, and creation of complex ideas that are often abstract and multi-faceted. Students are challenged to think and collaborate critically on the content they are learning. Honors level rigor will be achieved by increasing text complexity through text selection, focus on high-level qualitative measures, and complexity of task. Instruction will be structured to give students a deeper understanding of conceptual themes and organization within and across disciplines. Academic rigor is more than simply assigning to students a greater quantity of work.

Florida's Benchmarks for Excellent Student Thinking (B.E.S.T.) Standards

This course includes Florida's B.E.S.T. ELA Expectations (EE) and Mathematical Thinking and Reasoning Standards (MTRs) for students. Florida educators should intentionally embed these standards within the content and their instruction as applicable. For guidance on the implementation of the EEs and MTRs, please visit the content and their instruction as applicable. For guidance on the implementation of the EEs and MTRs, please visit...
Educator Certifications

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<td>Science (Secondary Grades 7-12)</td>
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<td>Earth/Space Science (Grades 6-12)</td>
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<td>Chemistry (Grades 6-12)</td>
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<tr>
<td>Middle Grades General Science (Middle Grades 5-9)</td>
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</table>

English Language Development ELD Standards Special Notes Section:
Teachers are required to provide listening, speaking, reading and writing instruction that allows English language learners (ELL) to communicate information, ideas and concepts for academic success in the content area of Science. For the given level of English language proficiency and with visual, graphic, or interactive support, students will interact with grade level words, expressions, sentences and discourse to process or produce language necessary for academic success. The ELD standard should specify a relevant content area concept or topic of study chosen by curriculum developers and teachers which maximizes an ELL's need for communication and social skills. To access an ELL supporting document which delineates performance definitions and descriptors, please click on the following link:
https://cpalmsmediaprod.blob.core.windows.net/uploads/docs/standards/eld/sc.pdf
General Course Information and Notes

GENERAL NOTES


**GENERAL INFORMATION**

- **Course Number:** 2003335
- **Number of Credits:** One (1) credit
- **Course Type:** Core Academic Course
- **Course Status:** Course Approved
- **Grade Level(s):** 9, 10, 11, 12
- **Graduation Requirement:** Equally Rigorous Science

**Course Path: Section:** Grades PreK to 12 Education Courses > **Grade Group:** Grades 9 to 12 and Adult Education Courses > **Subject:** Science > **SubSubject:** Physical Sciences > **Abbreviated Title:** PRE-AICE PHYS SCI IG

- **Course Length:** Year (Y)
- **Course Attributes:**
  - Advanced International Certificate of Education (AICE)

- **Course Level:** 3

**Educator Certifications**

- Science (Secondary Grades 7-12)
- Chemistry (Grades 6-12)
- Physics (Grades 6-12)
Course Standards

<table>
<thead>
<tr>
<th>Name</th>
<th>Description</th>
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<tr>
<td>SC.912.L.18.12:</td>
<td>Discuss the special properties of water that contribute to Earth's suitability as an environment for life: cohesive behavior, ability to moderate temperature, expansion upon freezing, and versatility as a solvent.</td>
</tr>
<tr>
<td>SC.912.N.1.1:</td>
<td>Define a problem based on a specific body of knowledge, for example: biology, chemistry, physics, and earth/space science, and do the following: 1. Pose questions about the natural world, (Articulate the purpose of the investigation and identify the relevant scientific concepts).  2. Conduct systematic observations, (Write procedures that are clear and replicable. Identify observables and examine relationships between test (independent) variable and outcome (dependent) variable. Employ appropriate methods for accurate and consistent observations; conduct and record measurements at appropriate levels of precision. Follow safety guidelines).  3. Examine books and other sources of information to see what is already known, 4. Review what is known in light of empirical evidence, (Examine whether available empirical evidence can be interpreted in terms of existing knowledge and models, and if not, modify or develop new models).  5. Plan investigations, (Design and evaluate a scientific investigation). 6. Use tools to gather, analyze, and interpret data (this includes the use of measurement in metric and other systems, and also the generation and interpretation of graphical representations of data, including data tables and graphs), (Collect data or evidence in an organized way. Properly use instruments, equipment, and materials (e.g., scales, probeware, meter sticks, microscopes, computers) including set-up, calibration, technique, maintenance, and storage).  7. Pose answers, explanations, or descriptions of events, 8. Generate explanations that explicate or describe natural phenomena (inferences), 9. Use appropriate evidence and reasoning to justify these explanations to others, 10. Communicate results of scientific investigations, and 11. Evaluate the merits of the explanations produced by others.</td>
</tr>
</tbody>
</table>
SC.912.P.12.12: Explain how various factors, such as concentration, temperature, and presence of a catalyst affect the rate of a chemical reaction.

SC.912.P.12.13: Cite specific textual evidence to support analysis of science and technical texts, attending to important distinctions the author makes and to any gaps or inconsistencies in the account.

LAFS.1112.RST.1.1: Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience.

LAFS.1112.RST.1.2: Cite specific textual evidence to support analysis of science and technical texts, attending to important distinctions the author makes and to any gaps or inconsistencies in the account.

LAFS.1112.RST.1.3: Determine the central ideas or conclusions of a text; summarize complex concepts, processes, or information presented in a text by paraphrasing them in simpler but still accurate terms.

LAFS.1112.RST.1.4: Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 11–12 texts and topics.

LAFS.1112.RST.2.5: Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks; analyze the specific results based on explanations in the text.

LAFS.1112.RST.2.6: Explain how various factors, such as concentration, temperature, and presence of a catalyst affect the rate of a chemical reaction.

LAFS.1112.RST.3.7: Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g., quantitative data, video, multimedia) in order to address a question or solve a problem.

LAFS.1112.RST.3.8: Evaluate the hypotheses, data, analysis, and conclusions in a science or technical text, verifying the data when possible and corroborating or challenging conclusions with other sources of information.

LAFS.1112.RST.3.9: Synthesize information from a range of sources (e.g., texts, experiments, simulations) into a coherent understanding of a process, phenomenon, or concept, resolving conflicting information when possible.

LAFS.1112.RST.4.10: By the end of grade 12, read and comprehend science/technical texts in the grades 11–12 text complexity band independently and proficiently.

LAFS.1112.SL.1.1: Initiate and participate effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grades 11–12 topics, texts, and issues, building on others' ideas and expressing their own clearly and persuasively.

LAFS.1112.SL.1.2: Integrate multiple sources of information presented in diverse formats and media (e.g., quantitative data, video, multimedia) in order to narrow or broaden the inquiry when appropriate; synthesize multiple sources, taking into account the contributor's point of view, reasoning, and use of evidence and rhetoric.

LAFS.1112.SL.1.3: Evaluate a speaker's point of view, reasoning, and use of evidence and rhetoric, assessing the stance, premises, links among ideas, word choice, points of emphasis, and tone used.

LAFS.1112.SL.2.4: Present information, findings, and supporting evidence, conveying a clear and distinct perspective, such that listeners can follow the line of reasoning, alternative or opposing perspectives are addressed, and the organization, development, substance, and style are appropriate to purpose, audience, and a range of formal and informal tasks.

LAFS.1112.SL.2.5: Make strategic use of digital media (e.g., textual, graphical, audio, visual, and interactive elements) in presentations to enhance understanding of findings, reasoning, and evidence and to add interest.

LAFS.1112.WHST.1.1: Write arguments focused on discipline-specific content.

LAFS.1112.WHST.1.2: Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes.

LAFS.1112.WHST.2.4: Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.

LAFS.1112.WHST.2.5: Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience.

LAFS.1112.WHST.2.6: Use technology, including the Internet, to produce, publish, and update individual or shared writing products in response to ongoing feedback, including new arguments or information.

LAFS.1112.WHST.2.7: Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation.

LAFS.1112.WHST.2.8: Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the strengths and limitations of each source in terms of the specific task, purpose, and audience; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and overreliance on any one source and following a standard format for citation.
### Draw evidence from informational texts to support analysis, reflection, and research.

**LAFS.1112.WHST.3.9:**
- Choose a level of accuracy appropriate to limitations on measurement when reporting quantities.
- Write routinely over extended time frames (time for reflection and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences.

**MAFS.912.F-IF.2.4:**
- Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases.
  - a. Graph linear and quadratic functions and show intercepts, maxima, and minima.
  - b. Graph square root, cube root, and piecewise-defined functions, including step functions and absolute value functions.
  - c. Graph polynomial functions, identifying zeros when suitable factorizations are available, and showing end behavior.
  - d. Graph rational functions, identifying zeros and asymptotes when suitable factorizations are available, and showing end behavior.
  - e. Graph exponential and logarithmic functions, showing intercepts and end behavior, and trigonometric functions, showing period, midline, and amplitude, and using phase shift.

**MAFS.912.F-IF.3.7:**
- Represent data on two quantitative variables on a scatter plot, and describe how the variables are related.
  - a. Fit a linear function for a scatter plot that suggests a linear association.
  - b. Represent data on two quantitative variables on a scatter plot, and describe how the variables are related.
  - c. Fit a function to the data; use functions fitted to data to solve problems in the context of the data.

**MAFS.912.S-ID.2.6:**
- Use statistics appropriate to the shape of the data distribution to compare center (median, mean) and spread (interquartile range, standard deviation) of two or more different data sets.

**MAFS.912.S-ID.2.5:**
- Represent data with plots on the real number line (dot plots, histograms, and box plots).
- Summarize categorical data for two categories in two-way frequency tables. Interpret relative frequencies in the context of the data (including joint, marginal, and conditional relative frequencies).

**MAFS.912.S-ID.1.4:**
- Use the mean and standard deviation of a data set to fit it to a normal distribution and to estimate population percentages. Recognize that there are data sets for which such a procedure is not appropriate. Use calculators, spreadsheets, and tables to estimate areas under the normal curve.

**MAFS.912.S-ID.2.1:**
- Use statistics appropriate to the shape of the data distribution to compare center (median, mean) and spread (interquartile range, standard deviation) of two or more different data sets.

**MAFS.912.S-ID.1.2:**
- Interpret differences in shape, center, and spread in the context of the data sets, accounting for possible effects of extreme data points (outliers).

**MAFS.912.S-ID.1.3:**
- Use statistics appropriate to the shape of the data distribution to compare center (median, mean) and spread (interquartile range, standard deviation) of two or more different data sets.

**MAFS.912.S-ID.1.4:**
- Use statistics appropriate to the shape of the data distribution to compare center (median, mean) and spread (interquartile range, standard deviation) of two or more different data sets.

**MAFS.912.S-ID.1.5:**
- Represent data on two quantitative variables on a scatter plot, and describe how the variables are related.
  - a. Fit a function to the data; use functions fitted to data to solve problems in the context of the data.
  - b. Informally assess the fit of a function by plotting and analyzing residuals.
  - c. Fit a linear function for a scatter plot that suggests a linear association.

**MAFS.912.S-ID.2.6:**
- Students take a more sophisticated look at using a linear function to model the relationship between two numerical variables. In addition to fitting a line to data, students assess how well the model fits by analyzing residuals.

### Make sense of problems and persevere in solving them.

**MAFS.K12.MP.1.1:**
- Mathematically proficient students start by explaining to themselves the meaning of a problem and looking for entry points to its solution. They analyze givens, constraints, relationships, and goals. They make conjectures about the form and meaning of the solution and plan a solution pathway rather than simply jumping into a solution attempt. They consider analogous problems, and try special cases and simpler forms of the original problem in order to gain insight into its solution. They monitor and evaluate their progress and change course if necessary. Older students might, depending on the context of the problem, transform algebraic expressions or change the viewing window on their graphing calculator to get the information they need.
- Mathematically proficient students can explain correspondences between equations, verbal descriptions, tables, and graphs or draw diagrams of important features and relationships, graph data, and search for regularity or trends. Younger students might rely on using concrete objects or pictures to help conceptualize and solve a problem.
- Mathematically proficient students check their answers to problems using a different method, and they continually ask themselves, “Does this make sense?” They can understand the approaches of others to solving complex problems and identify correspondences between different approaches.

**MAFS.K12.MP.2.1:**
- Mathematically proficient students make sense of quantities and their relationships in problem situations. They bring two complementary abilities to bear on problems involving quantitative relationships: the ability to decontextualize—to abstract a given situation and represent it symbolically and manipulate the representing symbols as if they have a life of their own, without necessarily attending to their referents—and the ability to contextualize, to pause as needed during the manipulation process in order to probe into the referents for the symbols involved. Quantitative reasoning entails habits of creating a coherent representation of the problem at hand; considering the units involved; attending to the meaning of quantities, not just how to compute them; and knowing and flexibly using different properties of operations and objects.

### Reason abstractly and quantitatively.

**MAFS.K12.MP.2.1:**
- Mathematically proficient students construct viable arguments and critique the reasoning of others.
- Mathematically proficient students understand and use stated assumptions, definitions, and previously established results in constructing arguments. They make conjectures and build a logical progression of statements to explore the truth of their conjectures. They are able to analyze...
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<th>Supportive Practices</th>
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<tbody>
<tr>
<td>MAFS.K12.MP.3.1:</td>
<td>Situations by breaking them into cases, and can recognize and use counterexamples. They justify their conclusions, communicate them to others, and respond to the arguments of others. They reason inductively about data, making plausible arguments that take into account the context from which the data arose. Mathematically proficient students are also able to compare the effectiveness of two plausible arguments, distinguish correct logic or reasoning from that which is flawed, and—if there is a flaw in an argument—explain what it is. Elementary students can construct arguments using concrete referents such as objects, drawings, diagrams, and actions. Such arguments can make sense and be correct, even though they are not generalized or made formal until later grades. Later, students learn to determine domains to which an argument applies. Students at all grades can listen or read the arguments of others, decide whether they make sense, and ask useful questions to clarify or improve the arguments.</td>
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<tr>
<td>MAFS.K12.MP.4.1:</td>
<td><strong>Model with mathematics.</strong> Mathematically proficient students can apply the mathematics they know to solve problems arising in everyday life, society, and the workplace. In early grades, this might be as simple as writing an addition equation to describe a situation. In middle grades, a student might apply proportional reasoning to plan a school event or analyze a problem in the community. By high school, a student might use geometry to solve a design problem or use a function to describe how one quantity of interest depends on another. Mathematically proficient students who can apply what they know are comfortable making assumptions and approximations to simplify a complicated situation, realizing that these may need revision later. They are able to identify important quantities in a practical situation and map their relationships using such tools as diagrams, two-way tables, graphs, flowcharts and formulas. They can analyze those relationships mathematically to draw conclusions. They routinely interpret their mathematical results in the context of the situation and reflect on whether the results make sense, possibly improving the model if it has not served its purpose.</td>
</tr>
<tr>
<td>MAFS.K12.MP.5.1:</td>
<td><strong>Use appropriate tools strategically.</strong> Mathematically proficient students consider the available tools when solving a mathematical problem. These tools might include pencil and paper, concrete models, a ruler, a protractor, a calculator, a spreadsheet, a computer algebra system, a statistical package, or dynamic geometry software. Proficient students are sufficiently familiar with tools appropriate for their grade or course to make sound decisions about when each of these tools might be helpful, recognizing both the insight to be gained and their limitations. For example, mathematically proficient high school students analyze graphs of functions and solutions generated using a graphing calculator. They detect possible errors by strategically using estimation and other mathematical knowledge. When making mathematical models, they know that technology can enable them to visualize the results of varying assumptions, explore consequences, and compare predictions with data. Mathematically proficient students at various grade levels are able to identify relevant external mathematical resources, such as digital content located on a website, and use them to pose or solve problems. They are able to use technological tools to explore and deepen their understanding of concepts.</td>
</tr>
<tr>
<td>MAFS.K12.MP.6.1:</td>
<td><strong>Attend to precision.</strong> Mathematically proficient students try to communicate precisely to others. They try to use clear definitions in discussion with others and in their own reasoning. They state the meaning of the symbols they choose, including using the equal sign consistently and appropriately. They are careful about specifying units of measure, and labeling axes to clarify the correspondence with quantities in a problem. They calculate accurately and efficiently, express numerical answers with a degree of precision appropriate for the problem context. In the elementary grades, students give carefully formulated explanations to each other. By the time they reach high school they have learned to examine claims and make explicit use of definitions.</td>
</tr>
<tr>
<td>MAFS.K12.MP.7.1:</td>
<td><strong>Look for and make use of structure.</strong> Mathematically proficient students look closely to discern a pattern or structure. Young students, for example, might notice that three and seven more is the same amount as seven and three more, or they may sort a collection of shapes according to how many sides the shapes have. Later, students will see 7 × 8 equals the well remembered 7 × 5 + 7, in preparation for learning about the distributive property. In the expression x² + 9x + 14, older students can see the 14 as 2 × 7 and the 9 as 2 + 7. They recognize the significance of an existing line in a geometric figure and can use the strategy of drawing an auxiliary line for solving problems. They also can step back for an overview and shift perspective. They can see complicated things, such as some algebraic expressions, as single objects or as being composed of several objects. For example, they can see 5 – 3(x – y²) as 5 minus a positive number times a square and use that to realize that its value cannot be more than 5 for any real numbers x and y.</td>
</tr>
<tr>
<td>MAFS.K12.MP.8.1:</td>
<td><strong>Look for and express regularity in repeated reasoning.</strong> Mathematically proficient students notice if calculations are repeated, and look both for general methods and for shortcuts. Upper elementary students might notice when dividing 25 by 11 that they are repeating the same calculations over and over again, and conclude they have a repeating decimal. By paying attention to the calculation of slope as they repeatedly check whether points are on the line through (1, 2) with slope 3, middle school students might abstract the equation (y – 2)/(x – 1) = 3. Noticing the regularity in the way terms cancel when expanding the numerator 3(x – 1)²(x + 1), (x – 1)²(x² + x + 1), and (x – 1)(x² + x + 1) might lead them to the general formula for the sum of a geometric series. As they work to solve a problem, mathematically proficient students maintain oversight of the process, while attending to the details. They continually evaluate the reasonableness of their intermediate results.</td>
</tr>
<tr>
<td>ELD.K12.ELL.SC.1:</td>
<td>English language learners communicate information, ideas and concepts necessary for academic success in the content area of Science.</td>
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<td>English language learners communicate for social and instructional purposes within the school setting.</td>
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Special Notes:

Instructional Practices
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1. Ensuring wide reading from complex text that varies in length.
2. Making close reading and re-reading of texts central to lessons.
3. Emphasizing text-specific complex questions, and cognitively complex tasks, reinforce focus on the text and cultivate independence.
4. Emphasizing students supporting answers based upon evidence from the text.
5. Providing extensive research and writing opportunities (claims and evidence).

- Asking questions (for science) and defining problems (for engineering).
- Developing and using models.
- Planning and carrying out investigations.
- Analyzing and interpreting data.
- Using mathematics, information and computer technology, and computational thinking.
- Constructing explanations (for science) and designing solutions (for engineering).
- Engaging in argument from evidence.
- Obtaining, evaluating, and communicating information.

Literacy Standards in Science
Secondary science courses include reading standards for literacy in science and technical subjects 6-12 and writing standards for literacy in history/social studies, science, and technical subjects 6-12. The courses also include speaking and listening standards. For a complete list of standards required for this course click on the blue tile labeled course standards. You may also download the complete course including all required standards and notes sections using the export function located at the top of this page.

Additional Instructional Resources:
A.V.E. for Success Collection is provided by the Florida Association of School Administrators: http://www.fasa.net/4DCGI/cms/review.html?Action=CMS-document&DocID=139. Please be aware that these resources have not been reviewed by CPALMS and there may be a charge for the use of some of them in this collection.

GENERAL INFORMATION

Course Number: 2003340

Course Path: Sections: Grades PreK to 12 Education
Courses > Grade Group: Grades 9 to 12 and Adult Education Courses > Subject: Science > SubSubject: Chemistry >
Abbreviated Title: CHEM 1
Course Length: Year (Y)
Course Level: 2

Number of Credits: One (1) credit
Course Type: Core Academic Course
Course Status: Course Approved
Grade Level(s): 9,10,11,12
Graduation Requirement: Equally Rigorous Science

Educator Certifications
Science (Secondary Grades 7-12)
Chemistry (Grades 6-12)

Equivalent Courses
2003350-Chemistry 1 Honors
2003800-Florida's Preinternational Baccalaureate Chemistry 1
Explain how scientific knowledge and reasoning provide an empirically-based perspective to inform society's decision making.

Relate temperature to the average molecular kinetic energy.

Create and interpret potential energy diagrams, for example: chemical

Characterize types of chemical reactions, for example: redox,

Describe the quantization of energy at the atomic level.

Explore the scientific theory of atoms (also known as atomic theory) by

Apply the mole concept and the law of conservation of mass to calculate quantities of chemicals participating in reactions.

Describe how scientific inferences are drawn from scientific observations and provide examples from the content being studied.

Explore the theory of electromagnetism by comparing and contrasting the different parts of the electromagnetic spectrum in terms of wavelength, frequency, and energy, and relate them to phenomena and applications.

Recognize the role of creativity in constructing scientific questions, methods and explanations.

Differentiate between chemical and nuclear reactions.

Describe the function of models in science, and identify the wide range of models used in science.

Relate properties of atoms and their position in the periodic table to the arrangement of their electrons.

Interpret the behavior of ideal gases in terms of kinetic molecular theory.

SC.912.L.18.12: Discuss the special properties of water that contribute to Earth's suitability as an environment for life: cohesive behavior, ability to moderate temperature, expansion upon freezing, and versatility as a solvent.

SC.912.N.11: Define a problem based on a specific body of knowledge, for example: biology, chemistry, physics, and earth/space science, and do the following:

1. Pose questions about the natural world, (Articulate the purpose of the investigation and identify the relevant scientific concepts).

2. Conduct systematic observations, (Write procedures that are clear and replicable. Identify observables and examine relationships between test (independent) variable and outcome (dependent) variable. Employ appropriate methods for accurate and consistent observations; conduct and record measurements at appropriate levels of precision. Follow safety guidelines).

3. Examine books and other sources of information to see what is already known,

4. Review what is known in light of empirical evidence, (Examine whether available empirical evidence can be interpreted in terms of existing knowledge and models, and if not, modify or develop new models).

5. Plan investigations, (Design and evaluate a scientific investigation).

6. Use tools to gather, analyze, and interpret data (this includes the use of measurement in metric and other systems, and also the generation and interpretation of graphical representations of data, including data tables and graphs), (Collect data or evidence in an organized way. Properly use instruments, equipment, and materials (e.g., scales, probeware, meter sticks, microscopes, computers) including set-up, calibration, technique, maintenance, and storage).

7. Pose answers, explanations, or descriptions of events,

8. Generate explanations that explicate or describe natural phenomena (inferences),

9. Use appropriate evidence and reasoning to justify these explanations to others,

10. Communicate results of scientific investigations, and

11. Evaluate the merits of the explanations produced by others.

SC.912.N.1.2: Describe and explain what characterizes science and its methods.

SC.912.N.1.4: Identify sources of information and assess their reliability according to the strict standards of scientific investigation.

SC.912.N.1.5: Describe and provide examples of how similar investigations conducted in many parts of the world result in the same outcome.

SC.912.N.1.6: Describe how scientific inferences are drawn from scientific observations and provide examples from the content being studied.

SC.912.N.1.7: Recognize the role of creativity in constructing scientific questions, methods and explanations.

SC.912.N.2.2: Identify which questions can be answered through science and which questions are outside the boundaries of scientific investigation, such as questions addressed by other ways of knowing, such as art, philosophy, and religion.

SC.912.N.2.4: Explain that scientific knowledge is both durable and robust and open to change. Scientific knowledge can change because it is often examined and re-examined by new investigations and scientific argumentation. Because of these frequent examinations, scientific knowledge becomes stronger, leading to its durability.

SC.912.N.2.5: Describe instances in which scientists' varied backgrounds, talents, interests, and goals influence the inferences and thus the explanations that they make about observations of natural phenomena and describe that competing interpretations (explanations) of scientists are a strength of science as they are a resource of new, testable ideas that have the potential to add new evidence to support one or another of the explanations.

SC.912.N.3.2: Describe the role consensus plays in the historical development of a theory in any one of the disciplines of science.

SC.912.N.3.3: Explain that scientific laws are descriptions of specific relationships under given conditions in nature, but do not offer explanations for those relationships.

SC.912.N.3.5: Describe the function of models in science, and identify the wide range of models used in science.

SC.912.N.4.1: Explain how scientific knowledge and reasoning provide an empirically-based perspective to inform society's decision making.

SC.912.P.8.1: Differentiate among the four states of matter.

SC.912.P.8.2: Differentiate between physical and chemical properties and physical and chemical changes of matter.

SC.912.P.8.3: Explore the scientific theory of atoms (also known as atomic theory) by describing changes in the atomic model over time and why those changes were necessitated by experimental evidence.

SC.912.P.8.4: Explore the scientific theory of atoms (also known as atomic theory) by describing the structure of atoms in terms of protons, neutrons and electrons, and differentiate among these particles in terms of their mass, electrical charges and locations within the atom.

SC.912.P.8.5: Relate properties of atoms and their position in the periodic table to the arrangement of their electrons.

SC.912.P.8.6: Distinguish between bonding forces holding compounds together and other attractive forces, including hydrogen bonding and van der Waals forces.

SC.912.P.8.7: Interpret formula representations of molecules and compounds in terms of composition and structure.

SC.912.P.8.8: Characterize types of chemical reactions, for example: redox, acid-base, synthesis, and single and double replacement reactions.

SC.912.P.8.9: Apply the mole concept and the law of conservation of mass to calculate quantities of chemicals participating in reactions.

SC.912.P.8.11: Relate acidity and basicity to hydronium and hydroxyl ion concentration and pH.

SC.912.P.10.1: Differentiate among the various forms of energy and recognize that they can be transformed from one form to others.

SC.912.P.10.5: Relate temperature to the average molecular kinetic energy.

SC.912.P.10.6: Create and interpret potential energy diagrams, for example: chemical reactions, orbits around a central body, motion of a pendulum.

SC.912.P.10.7: Distinguish between endothermic and exothermic chemical processes.

SC.912.P.10.9: Describe the quantization of energy at the atomic level.

SC.912.P.10.12: Differentiate between chemical and nuclear reactions.

SC.912.P.10.18: Explore the theory of electromagnetism by comparing and contrasting the different parts of the electromagnetic spectrum in terms of wavelength, frequency, and energy, and relate them to phenomena and applications.

SC.912.P.12.10: Interpret the behavior of ideal gases in terms of kinetic molecular theory.

SC.912.P.12.11: Describe phase transitions in terms of kinetic molecular theory.
SC.912.P.12.12: Explain how various factors, such as concentration, temperature, and presence of a catalyst affect the rate of a chemical reaction.
SC.912.P.12.13: Explain the concept of dynamic equilibrium in terms of reversible processes occurring at the same rates.

Mathematicians who participate in effortful learning both individually and with others:
- Analyze the problem in a way that makes sense given the task.
- Ask questions that will help with solving the task.
- Build perseverance by modifying methods as needed while solving a challenging task.
- Stay engaged and maintain a positive mindset when working to solve tasks.
- Help and support each other when attempting a new method or approach.

**Clarifications:**
Teachers who encourage students to participate actively in effortful learning both individually and with others:
- Cultivate a community of growth mindset learners.
- Foster perseverance in students by choosing tasks that are challenging.
- Develop students’ ability to analyze and problem solve.
- Recognize students’ effort when solving challenging problems.

Demonstrate understanding by representing problems in multiple ways.
Mathematicians who demonstrate understanding by representing problems in multiple ways:
- Build understanding through modeling and using manipulatives.
- Represent solutions to problems in multiple ways using objects, drawings, tables, graphs and equations.
- Progress from modeling problems with objects and drawings to using algorithms and equations.
- Express connections between concepts and representations.
- Choose a representation based on the given context or purpose.

**Clarifications:**
Teachers who encourage students to demonstrate understanding by representing problems in multiple ways:
- Help students make connections between concepts and representations.
- Provide opportunities for students to use manipulatives when investigating concepts.
- Guide students from concrete to pictorial to abstract representations as understanding progresses.
- Show students that various representations can have different purposes and can be useful in different situations.

Complete tasks with mathematical fluency.
Mathematicians who complete tasks with mathematical fluency:
- Select efficient and appropriate methods for solving problems within the given context.
- Maintain flexibility and accuracy while performing procedures and mental calculations.
- Complete tasks accurately and with confidence.
- Adapt procedures to apply them to a new context.
- Use feedback to improve efficiency when performing calculations.

**Clarifications:**
Teachers who encourage students to complete tasks with mathematical fluency:
- Provide students with the flexibility to solve problems by selecting a procedure that allows them to solve efficiently and accurately.
- Offer multiple opportunities for students to practice efficient and generalizable methods.
- Provide opportunities for students to reflect on the method they used and determine if a more efficient method could have been used.

Engage in discussions that reflect on the mathematical thinking of self and others.
Mathematicians who engage in discussions that reflect on the mathematical thinking of self and others:
- Communicate mathematical ideas, vocabulary and methods effectively.
- Analyze the mathematical thinking of others.
- Compare the efficiency of a method to those expressed by others.
- Recognize errors and suggest how to correctly solve the task.
- Justify results by explaining methods and processes.
- Construct possible arguments based on evidence.

**Clarifications:**
Teachers who encourage students to engage in discussions that reflect on the mathematical thinking of self and others:
- Establish a culture in which students ask questions of the teacher and their peers, and error is an opportunity for learning.
- Create opportunities for students to discuss their thinking with peers.
- Select, sequence and present student work to advance and deepen understanding of correct and increasingly efficient methods.
- Develop students’ ability to justify methods and compare their responses to the responses of their peers.

Use patterns and structure to help understand and connect mathematical concepts.
Mathematicians who use patterns and structure to help understand and connect mathematical concepts:
- Focus on relevant details within a problem.
- Create plans and procedures to logically order events, steps or ideas to solve problems.
- Decompose a complex problem into manageable parts.
- Relate previously learned concepts to new concepts.
- Look for similarities among problems.
- Connect solutions to problems to more complicated large-scale situations.

**Clarifications:**
Teachers who encourage students to use patterns and structure to help understand and connect mathematical concepts:
- Help students recognize the patterns in the world around them and connect these patterns to mathematical concepts.
- Support students to develop generalizations based on the similarities found among problems.
- Provide opportunities for students to create plans and procedures to solve problems.
Develop students' ability to construct relationships between their current understanding and more sophisticated ways of thinking.

Assess the reasonableness of solutions.
Mathematicians who assess the reasonableness of solutions:
- Estimate to discover possible solutions.
- Use benchmark quantities to determine if a solution makes sense.
- Check calculations when solving problems.
- Verify possible solutions by explaining the methods used.
- Evaluate results based on the given context.

**Clarifications:**
Teachers who encourage students to assess the reasonableness of solutions:
- Have students estimate or predict solutions prior to solving.
- Prompt students to continually ask, "Does this solution make sense? How do you know?"
- Reinforce that students check their work as they progress within and after a task.
- Strengthen students' ability to verify solutions through justifications.

Apply mathematics to real-world contexts.
Mathematicians who apply mathematics to real-world contexts:
- Connect mathematical concepts to everyday experiences.
- Use models and methods to understand, represent and solve problems.
- Perform investigations to gather data or determine if a method is appropriate. • Redesign models and methods to improve accuracy or efficiency.

**Clarifications:**
Teachers who encourage students to apply mathematics to real-world contexts:
- Provide opportunities for students to create models, both concrete and abstract, and perform investigations.
- Challenge students to question the accuracy of their models and methods.
- Support students as they validate conclusions by comparing them to the given situation.
- Indicate how various concepts can be applied to other disciplines.

Cite evidence to explain and justify reasoning.

**Clarifications:**
K-1 Students include textual evidence in their oral communication with guidance and support from adults. The evidence can consist of details from the text without naming the text. During 1st grade, students learn how to incorporate the evidence in their writing. 2-3 Students include relevant textual evidence in their written and oral communication. Students should name the text when they refer to it. In 3rd grade, students should use a combination of direct and indirect citations.

4-5 Students continue with previous skills and reference comments made by speakers and peers. Students cite texts that they've directly quoted, paraphrased, or used for information. When writing, students will use the form of citation dictated by the instructor or the style guide referenced by the instructor.

6-8 Students continue with previous skills and use a style guide to create a proper citation.

9-12 Students continue with previous skills and should be aware of existing style guides and the ways in which they differ.

Read and comprehend grade-level complex texts proficiently.

**Clarifications:**
See Text Complexity for grade-level complexity bands and a text complexity rubric.

Make inferences to support comprehension.

**Clarifications:**
Students will make inferences before the words infer or inference are introduced. Kindergarten students will answer questions like "Why is the girl smiling?" or make predictions about what will happen based on the title page. Students will use the terms and apply them in 2nd grade and beyond.

Use appropriate collaborative techniques and active listening skills when engaging in discussions in a variety of situations.

**Clarifications:**
In kindergarten, students learn to listen to one another respectfully. In grades 1-2, students build upon these skills by justifying what they are thinking. For example, "I think _____ because _____." The collaborative conversations are becoming academic conversations.

In grades 3-12, students engage in academic conversations discussing claims and justifying their reasoning, refining and applying skills. Students build on ideas, propel the conversation, and support claims and counterclaims with evidence.

Use the accepted rules governing a specific format to create quality work.

**Clarifications:**
Students will incorporate skills learned into work products to produce quality work. For students to incorporate these skills appropriately, they must receive instruction. A 3rd grade student creating a poster board display must have instruction in how to effectively present information to do quality work.

Use appropriate voice and tone when speaking or writing.

**Clarifications:**
In kindergarten and 1st grade, students learn the difference between formal and informal language. For example, the way we talk to our friends differs from the way we speak to adults. In 2nd grade and beyond, students practice appropriate social and academic language to discuss texts.

**ELD.K12.ELL.SC.1:** English language learners communicate information, ideas and concepts necessary for academic success in the content area of Science.

**ELD.K12.ELL.SI.1:** English language learners communicate for social and instructional purposes within the school setting.
General Course Information and Notes

### GENERAL INFORMATION

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#### Educator Certifications

| Science (Secondary Grades 7-12) |
| Chemistry (Grades 6-12) |

### GENERAL NOTES

Laboratory investigations that include the use of scientific inquiry, research, measurement, problem solving, laboratory apparatus and technologies, experimental procedures, and safety procedures are an integral part of this course. The National Science Teachers Association (NSTA) recommends that at the high school level, all students should be in the science lab or field, collecting data every week. School laboratory investigations (labs) are defined by the National Research Council (NRC) as an experience in the laboratory, classroom, or the field that provides students with opportunities to interact directly with natural phenomena or with data collected by others using tools, materials, data collection techniques, and models (NRC, 2006, p. 3). Laboratory investigations in the high school classroom should help all students develop a growing understanding of the complexity and ambiguity of empirical work, as well as the skills to calibrate and troubleshoot equipment used to make observations. Learners should understand measurement error; and have the skills to aggregate, interpret, and present the resulting data (National Research Council, 2006, p.77; NSTA, 2007).

**Special Notes:**

**Instructional Practices**

Teaching from a range of complex text is optimized when teachers in all subject areas implement the following strategies on a routine basis:

1. Ensuring wide reading from complex text that varies in length.
2. Making close reading and rereading of texts central to lessons.
3. Emphasizing text-specific complex questions, and cognitively complex tasks, reinforce focus on the text and cultivate independence.
4. Emphasizing students supporting answers based upon evidence from the text.
5. Providing extensive research and writing opportunities (claims and evidence).

**Science and Engineering Practices** (NRC Framework for K-12 Science Education, 2010)

- Asking questions (for science) and defining problems (for engineering).
- Developing and using models.
- Planning and carrying out investigations.
- Analyzing and interpreting data.
- Using mathematics, information and computer technology, and computational thinking.
- Constructing explanations (for science) and designing solutions (for engineering).
- Engaging in argument from evidence.
- Obtaining, evaluating, and communicating information.

**Florida’s Benchmarks for Excellent Student Thinking (B.E.S.T.) Standards**

This course includes Florida’s B.E.S.T. ELA Expectations (EE) and Mathematical Thinking and Reasoning Standards (MTRs) for students. Florida educators should intentionally embed these standards within the content and their instruction as applicable. For guidance on the implementation of the EEs and MTRs, please visit https://www.cpalms.org/Standards/BEST_Standards.aspx and select the appropriate B.E.S.T. Standards package.

**English Language Development ELD Standards Special Notes Section:**

Teachers are required to provide listening, speaking, reading and writing instruction that allows English language learners (ELL) to communicate information, ideas and concepts for academic success in the content area of Science. For the given level of English language proficiency and with visual, graphic, or interactive support, students will interact with grade level words, expressions, sentences and discourse to process or produce language necessary for academic success. The ELD standard should specify a relevant content area concept or topic of study chosen by curriculum developers and teachers which maximizes an ELL’s need for communication and social skills. To access an ELL supporting document which delineates performance definitions and descriptors, please click on the following link: https://cpalmsmediaprod.blob.core.windows.net/uploads/docs/standards/eld/sc.pdf

**Additional Instructional Resources:**

A.V.E. for Success Collection is provided by the Florida Association of School Administrators: http://www.fasa.net/4DCGI/cms/review.html?Action=iCMS_Document&DocID=439. Please be aware that these resources have not been reviewed by CPALMS and there may be a charge for the use of some of them in this collection.
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### Course Standards

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SC.912.P.12.12: Explain how various factors, such as concentration, temperature, and presence of a catalyst affect the rate of a chemical reaction.

SC.912.P.12.13: Cite specific textual evidence to support analysis of science and technical texts, attending to important distinctions the author makes and to any gaps or inconsistencies in the account.

LAFS.1112.RST.1.2: Determine the central ideas or conclusions of a text; summarize complex concepts, processes, or information presented in a text by paraphrasing them in simpler but still accurate terms.

LAFS.1112.RST.1.3: Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks; analyze the specific results based on explanations in the text.

LAFS.1112.RST.2.4: Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 11–12 texts and topics.

LAFS.1112.RST.2.5: Analyze how the text structures information or ideas into categories or hierarchies, demonstrating understanding of the information or ideas.

LAFS.1112.RST.2.6: Analyze the author’s purpose in providing an explanation, describing a procedure, or discussing an experiment in a text; identifying important issues that remain unresolved.

LAFS.1112.RST.3.7: Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g., quantitative data, video, multimedia) in order to address a question or solve a problem.

LAFS.1112.RST.3.8: Evaluate the hypotheses, data, analysis, and conclusions in a science or technical text, verifying the data when possible and corroborating or challenging conclusions with other sources of information.

LAFS.1112.RST.3.9: Synthesize information from a range of sources (e.g., texts, experiments, simulations) into a coherent understanding of a process, phenomenon, or concept, resolving conflicting information when possible.

LAFS.1112.RST.4.10: By the end of grade 12, read and comprehend science/technical texts in the grades 11–12 text complexity band independently and proficiently,
Mathematically proficient students start by explaining to themselves the meaning of a problem and looking for entry points to its solution. They analyze givens, constraints, relationships, and goals. They make conjectures about the form and meaning of the solution and plan a solution pathway rather than simply jumping into a solution attempt. They consider analogous problems, and try special cases and simpler forms of the original problem in order to gain insight into its solution. They monitor and evaluate their progress and change course if necessary. Older students might, depending on the context of the problem, transform algebraic expressions or change the viewing window on their graphing calculator to get information they need. Mathematically proficient students can explain correspondences between equations, verbal descriptions, tables, and graphs or draw diagrams of important features and relationships, graph data, and search for regularity or trends. Younger students might rely on using concrete objects or pictures to help conceptualize and solve a problem. Mathematically proficient students check their answers to problems using a different method, and they continually ask themselves, “Does this make sense?” They can understand the approaches of others to solving complex problems and identify correspondences between different approaches.

**Reason abstractly and quantitatively.**

Mathematically proficient students make sense of quantities and their relationships in problem situations. They bring two complementary abilities to bear on problems involving quantitative relationships: the ability to decontextualize—to abstract a given situation and represent it symbolically and manipulate the representing symbols as if they have a life of their own, without necessarily attending to their referents—and the ability to contextualize, to pause as needed during the manipulation process in order to probe into the referents for the symbols involved. Quantitative reasoning entails habits of creating a coherent representation of the problem at hand; considering the units involved; attending to the meaning of quantities, not just how to compute them; and knowing and flexibly using different properties of objects and operations and objects.

**Make sense of problems and persevere in solving them.**

Mathematically proficient students take a more sophisticated look at using a linear function to model the relationship between two numerical variables. In addition to fitting a line to data, students assess how well the model fits by analyzing residuals.

**Reason abstractly and quantitatively.**

Mathematically proficient students make sense of quantities and their relationships in problem situations. They bring two complementary abilities to bear on problems involving quantitative relationships: the ability to decontextualize—to abstract a given situation and represent it symbolically and manipulate the representing symbols as if they have a life of their own, without necessarily attending to their referents—and the ability to contextualize, to pause as needed during the manipulation process in order to probe into the referents for the symbols involved. Quantitative reasoning entails habits of creating a coherent representation of the problem at hand; considering the units involved; attending to the meaning of quantities, not just how to compute them; and knowing and flexibly using different properties of objects and operations and objects.

**Construct viable arguments and critique the reasoning of others.**

Mathematically proficient students understand and use stated assumptions, definitions, and previously established results in constructing arguments. They make conjectures and build a logical progression of statements to explore the truth of their conjectures. They are able to analyze...
English language learners communicate information, ideas and concepts for social and instructional purposes within the school setting.

Mathematically proficient students can apply the mathematics they know to solve problems arising in everyday life, society, and the workplace. In early grades, this might be as simple as writing an addition equation to describe a situation. In middle grades, a student might apply proportional reasoning to plan a school event or analyze a problem in the community. By high school, a student might use geometry to solve a design problem or use a function to describe how one quantity of interest depends on another. Mathematically proficient students who can apply what they know are comfortable making approximations and approximations to simplify a complicated situation, realizing that these may need revision later. They are able to identify important quantities in a practical situation and map their relationships using such tools as diagrams, two-way tables, graphs, flowcharts and formulas. They can analyze those relationships mathematically to draw conclusions. They routinely interpret their mathematical results in the context of the situation and reflect on whether the results make sense, possibly improving the model if it has not served its purpose.

Mathematically proficient students consider the available tools when solving a mathematical problem. These tools might include pencil and paper, concrete models, a ruler, a protractor, a calculator, a spreadsheet, a computer algebra system, a statistical package, or dynamic geometry software. Proficient students are sufficiently familiar with tools appropriate for their grade or course to make sound decisions about when each of these tools might be helpful, recognizing both the insight to be gained and their limitations. For example, mathematically proficient high school students analyze graphs of functions and solutions generated using a graphing calculator. They detect possible errors by strategically using estimation and other mathematical knowledge. When making mathematical models, they know that technology can enable them to visualize the results of varying assumptions, explore consequences, and compare predictions with data. Mathematically proficient students at various grade levels are able to identify relevant external mathematical resources, such as digital content located on a website, and use them to pose or solve problems. They are able to use technological tools to explore and deepen their understanding of concepts.

Mathematically proficient students try to communicate precisely to others. They try to use clear definitions in discussion with others and in their own reasoning. They state the meaning of the symbols they choose, including using the equal sign consistently and appropriately. They are careful about specifying units of measure, and labeling axes to clarify the correspondence with quantities in a problem. They calculate accurately and efficiently, express numerical answers with a degree of precision appropriate for the problem context. In the elementary grades, students give carefully formulated explanations to each other. By the time they reach high school they have learned to examine claims and make explicit use of definitions.

Mathematically proficient students look closely to discern a pattern or structure. Young students, for example, might notice that three and seven more is the same amount as seven and three more, or they may sort a collection of shapes according to how many sides the shapes have. Later, students will see 7 × 8 equals the well remembered 7 × 5 + 7 × 3, in preparation for learning about the distributive property. In the expression x² + 9x + 14, older students can see the 14 as 2 × 7 and the 9 as 2 + 7. They recognize the significance of an existing line in a geometric figure and can use the strategy of drawing an auxiliary line for solving problems. They also can step back for an overview and shift perspective. They can see complicated things, such as some algebraic expressions, as single objects or as being composed of several objects. For example, they can see 5 – 3(x – y)² as 5 minus a positive number times a square and use that to realize that its value cannot be more than 5 for any real numbers x and y.

Mathematically proficient students notice if calculations are repeated, and look both for general methods and for shortcuts. Upper elementary students might notice when dividing 25 by 11 that they are repeating the same calculations over and over again, and conclude they have a repeating decimal. By paying attention to the calculation of slope as they repeatedly check whether points are on the line through (1, 2) with slope 3, middle school students might abstract the equation (y – 2)/(x – 1) = 3. Noticing the regularity in the way terms cancel when expanding (x – 1)((x + 1), (x – 1)x² + x + 1), and (x – 1)x² + x + 1) might lead them to the general formula for the sum of a geometric series. As they work to solve a problem, mathematically proficient students maintain oversight of the process, while attending to the details. They continually evaluate the reasonableness of their intermediate results.

General Course Information and Notes

**GENERAL NOTES**

Laboratory investigations that include the use of scientific inquiry, research, measurement, problem solving, laboratory apparatus and technologies, experimental procedures, and safety procedures are an integral part of this course. The National Science Teachers Association (NSTA) recommends that at the high school level, all students should be in the science lab or field, collecting data every week. School laboratory investigations (labs) are defined by the National Research Council (NRC) as an experience in the laboratory, classroom, or the field that provides students with opportunities to interact directly with natural phenomena or with data collected by others.
Special Notes: Credit Recovery courses are credit bearing courses with specific content requirements defined by Next Generation Sunshine State Standards and/or Florida Standards. Students enrolled in a Credit Recovery course must have previously attempted the corresponding course (and/or End-of-Course assessment) since the course requirements for the Credit Recovery course are exactly the same as the previously attempted corresponding course. For example, Geometry (1206310) and Geometry for Credit Recovery (1206315) have identical content requirements. It is important to note that Credit Recovery courses are not bound by Section 1003.436(1)(a), Florida Statutes, requiring a minimum of 135 hours of bona fide instruction (120 hours in a school/district implementing block scheduling) in a designed course of study that contains student performance standards, since the students have previously attempted successful completion of the corresponding course. Additionally, Credit Recovery courses should ONLY be used for credit recovery, grade forgiveness, or remediation for students needing to prepare for an End-of-Course assessment retake.

Instructional Practices
Teaching from a range of complex text is optimized when teachers in all subject areas implement the following strategies on a routine basis:

1. Ensuring wide reading from complex text that varies in length.
2. Making close reading and rereading of texts central to lessons.
3. Emphasizing text-specific complex questions, and cognitively complex tasks, reinforce focus on the text and cultivate independence.
4. Emphasizing students supporting answers based upon evidence from the text.
5. Providing extensive research and writing opportunities (claims and evidence).

- Asking questions (for science) and defining problems (for engineering).
- Developing and using models.
- Planning and carrying out investigations.
- Analyzing and interpreting data.
- Using mathematics, information and computer technology, and computational thinking.
- Constructing explanations (for science) and designing solutions (for engineering).
- Engaging in argument from evidence.
- Obtaining, evaluating, and communicating information.

Literacy Standards in Science
Secondary science courses include reading standards for literacy in science and technical subjects 6-12 and writing standards for literacy in history/social studies, science, and technical subjects 6-12. The courses also include speaking and listening standards. For a complete list of standards required for this course click on the blue tile labeled Section 1003.436(1)(a), Florida Statutes requiring a minimum of 135 hours of bona fide instruction (120 hours in a school/district implementing block scheduling) in a designed course of study that contains student performance standards, since the students have previously attempted successful completion of the corresponding course. Additionally, Credit Recovery courses should ONLY be used for credit recovery, grade forgiveness, or remediation for students needing to prepare for an End-of-Course assessment retake.

English Language Development ELD Standards Special Notes Section:
Teachers are required to provide listening, speaking, reading and writing instruction that allows English language learners (ELL) to communicate information, ideas and concepts for academic success in the content area of Science. For the given level of English language proficiency and with visual, graphic, or interactive support, students will interact with grade level words, expressions, sentences and discourse to process or produce language necessary for academic success. The ELD standard should specify a relevant content area concept or topic of study chosen by curriculum developers and teachers which maximizes an ELL’s need for communication and social skills. To access an ELL supporting document which delineates performance definitions and descriptors, please click on the following link: https://cpalmsmediaprod.blob.core.windows.net/uploads/docs/standards/eld/sc.pdf
Explore the theory of electromagnetism by comparing and contrasting the different parts of the electromagnetic spectrum in terms of wavelength, frequency, and energy, and relate them to phenomena and applications.

Discuss the quantization of energy at the atomic level.

Explore the scientific theory of atoms (also known as atomic theory) by describing changes in the atomic model over time and why those changes were necessitated by experimental evidence.

Identify which questions can be answered through science and which questions are outside the boundaries of scientific investigation, such as questions addressed by other ways of knowing, such as art, philosophy, and religion.

Relate acidity and basicity to hydronium and hydroxyl ion concentration and pH.

Explore the function of models in science, and identify the wide range of models used in science.

Describe the role consensus plays in the historical development of a theory in any one of the disciplines of science.

Describe the special properties of water that contribute to Earth's suitability as an environment for life: cohesive behavior, ability to moderate temperature, expansion upon freezing, and versatility as a solvent.

Define a problem based on a specific body of knowledge, for example: biology, chemistry, physics, and earth/space science, and do the following:

1. Pose questions about the natural world. (Articulate the purpose of the investigation and identify the relevant scientific concepts).
2. Conduct systematic observations. (Write procedures that are clear and replicable. Identify observables and examine relationships between test (independent) variable and outcome (dependent) variable. Employ appropriate methods for accurate and consistent observations; conduct and record measurements at appropriate levels of precision. Follow safety guidelines).
3. Examine books and other sources of information to see what is already known.
4. Review what is known in light of empirical evidence. (Examine whether available empirical evidence can be interpreted in terms of existing knowledge and models, and if not, modify or develop new models).
5. Plan investigations. (Design and evaluate a scientific investigation).
6. Use tools to gather, analyze, and interpret data (this includes the use of measurement in metric and other systems, and also the generation and interpretation of graphical representations of data, including data tables and graphs). (Collect data or evidence in an organized way. Properly use instruments, equipment, and materials (e.g., scales, probeware, meter sticks, microscopes, computers) including set-up, calibration, technique, maintenance, and storage).
7. Pose answers, explanations, or descriptions of events.
8. Generate explanations that explicate or describe natural phenomena (inferences).
9. Use appropriate evidence and reasoning to justify these explanations to others.
10. Communicate results of scientific investigations, and
11. Evaluate the merits of the explanations produced by others.

Differentiate among the various forms of energy and recognize that they can be transformed from one form to others.

Characterize types of chemical reactions, for example: redox, acid-base, synthesis, and single and double replacement reactions.

Using a problem set, systematic observations, and generated hypotheses, predict the outcomes of the reaction and then conduct the reaction using data collection and data analysis. Write up the results, graph the data, and write a summary of the investigation.

Relate temperature to the average molecular kinetic energy.

Interpret formula representations of molecules and compounds in terms of composition and structure.

Examine books and other sources of information to see what is already known.

Describe instances in which scientists' varied backgrounds, talents, interests, and goals influence the inferences and thus the explanations that they make about observations of natural phenomena and describe that competing interpretations (explanations) of scientists are a strength of science as they are a source of new, testable ideas that have the potential to add new evidence to support one or another of the explanations.

Describe the special properties of water that contribute to Earth's suitability as an environment for life: cohesive behavior, ability to moderate temperature, expansion upon freezing, and versatility as a solvent.

Define a problem based on a specific body of knowledge, for example: biology, chemistry, physics, and earth/space science, and do the following:

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7. Pose answers, explanations, or descriptions of events.
8. Generate explanations that explicate or describe natural phenomena (inferences).
9. Use appropriate evidence and reasoning to justify these explanations to others.
10. Communicate results of scientific investigations, and
11. Evaluate the merits of the explanations produced by others.

Because of these frequent examinations, scientific knowledge becomes stronger, leading to its durability.
SC.912.P.12.12: Explain how various factors, such as concentration, temperature, and presence of a catalyst affect the rate of a chemical reaction.

SC.912.P.12.13: Explain the concept of dynamic equilibrium in terms of reversible processes occurring at the same rates.

Mathematicians who participate in effortful learning both individually and with others:
- Analyze the problem in a way that makes sense given the task.
- Ask questions that will help with solving the task.
- Build perseverance by modifying methods as needed while solving a challenging task.
- Stay engaged and maintain a positive mindset when working to solve tasks.
- Help and support each other when attempting a new method or approach.

**Clarifications:**
Teachers who encourage students to participate actively in effortful learning both individually and with others:
- Cultivate a community of growth mindset learners.
- Foster perseverance in students by choosing tasks that are challenging.
- Develop students' ability to analyze and problem solve.
- Recognize students' effort when solving challenging problems.

Demonstrate understanding by representing problems in multiple ways. Mathematically who demonstrate understanding by representing problems in multiple ways:
- Build understanding through modeling and using manipulatives.
- Represent solutions to problems in multiple ways using objects, drawings, tables, graphs and equations.
- Progress from modeling problems with objects and drawings to using algorithms and equations.
- Express connections between concepts and representations.
- Choose a representation based on the given context or purpose.

**Clarifications:**
Teachers who encourage students to demonstrate understanding by representing problems in multiple ways:
- Help students make connections between concepts and representations.
- Provide opportunities for students to use manipulatives when investigating concepts.
- Guide students from concrete to pictorial to abstract representations as understanding progresses.
- Show students that various representations can have different purposes and can be useful in different situations.

Complete tasks with mathematical fluency. Mathematically who complete tasks with mathematical fluency:
- Select efficient and appropriate methods for solving problems within the given context.
- Maintain flexibility and accuracy while performing procedures and mental calculations.
- Complete tasks accurately and with confidence.
- Adapt procedures to apply them to a new context.
- Use feedback to improve efficiency when performing calculations.

**Clarifications:**
Teachers who encourage students to complete tasks with mathematical fluency:
- Provide students with the flexibility to solve problems by selecting a procedure that allows them to solve efficiently and accurately.
- Offer multiple opportunities for students to practice efficient and generalizable methods.
- Provide opportunities for students to reflect on the method they used and determine if a more efficient method could have been used.

Engage in discussions that reflect on the mathematical thinking of self and others. Mathematically who engage in discussions that reflect on the mathematical thinking of self and others:
- Communicate mathematical ideas, vocabulary and methods effectively.
- Analyze the mathematical thinking of others.
- Compare the efficiency of a method to those expressed by others.
- Recognize errors and suggest how to correctly solve the task.
- Justify results by explaining methods and processes.
- Construct possible arguments based on evidence.

**Clarifications:**
Teachers who encourage students to engage in discussions that reflect on the mathematical thinking of self and others:
- Establish a culture in which students ask questions of the teacher and their peers, and error is an opportunity for learning.
- Create opportunities for students to discuss their thinking with peers.
- Select, sequence and present student work to advance and deepen understanding of correct and increasingly efficient methods.
- Develop students' ability to justify methods and compare their responses to the responses of their peers.

Use patterns and structure to help understand and connect mathematical concepts. Mathematically who use patterns and structure to help understand and connect mathematical concepts:
- Focus on relevant details within a problem.
- Create plans and procedures to logically order events, steps or ideas to solve problems.
- Decompose a complex problem into manageable parts.
- Relate previously learned concepts to new concepts.
- Look for similarities among problems.
- Connect solutions to problems to more complicated large-scale situations.

**Clarifications:**
Teachers who encourage students to use patterns and structure to help understand and connect mathematical concepts:
- Help students recognize the patterns in the world around them and connect these patterns to mathematical concepts.
- Support students to develop generalizations based on the similarities found among problems.
- Provide opportunities for students to create plans and procedures to solve problems.
- Develop students' ability to construct relationships between their current understanding and more sophisticated ways of thinking.

Assess the reasonableness of solutions.
Mathematicians who assess the reasonableness of solutions:
- Estimate to discover possible solutions.
- Use benchmark quantities to determine if a solution makes sense.
- Check calculations when solving problems.
- Verify possible solutions by explaining the methods used.
- Evaluate results based on the given context.

**CLARIFICATIONS:**
Teachers who encourage students to assess the reasonableness of solutions:
- Have students estimate or predict solutions prior to solving.
- Prompt students to continually ask, "Does this solution make sense? How do you know?"
- Reinforce that students check their work as they progress within and after a task.
- Strengthen students' ability to verify solutions through justifications.

Apply mathematics to real-world contexts.
Mathematicians who apply mathematics to real-world contexts:
- Connect mathematical concepts to everyday experiences.
- Use models and methods to understand, represent, and solve problems.
- Perform investigations to gather data or determine if a method is appropriate. • Redesign models and methods to improve accuracy or efficiency.

**CLARIFICATIONS:**
Teachers who encourage students to apply mathematics to real-world contexts:
- Provide opportunities for students to create models, both concrete and abstract, and perform investigations.
- Challenge students to question the accuracy of their models and methods.
- Support students as they validate conclusions by comparing them to the given situation.
- Indicate how various concepts can be applied to other disciplines.

Cite evidence to explain and justify reasoning.

**CLARIFICATIONS:**
K-1 Students include textual evidence in their oral communication with guidance and support from adults. The evidence can consist of details from the text without naming the text. During 1st grade, students learn how to incorporate the evidence in their writing.
2-3 Students include relevant textual evidence in their written and oral communication. Students should name the text when they refer to it. In 3rd grade, students should use a combination of direct and indirect citations.
4-5 Students continue with previous skills and reference comments made by speakers and peers. Students cite texts that they've directly quoted, paraphrased, or used for information. When writing, students will use the form of citation dictated by the instructor or the style guide referenced by the instructor.
6-8 Students continue with previous skills and use a style guide to create a proper citation.
9-12 Students continue with previous skills and should be aware of existing style guides and the ways in which they differ.

Read and comprehend grade-level complex texts proficiently.

**CLARIFICATIONS:**
See Text Complexity for grade-level complexity bands and a text complexity rubric.

Make inferences to support comprehension.

**CLARIFICATIONS:**
Students will make inferences before the words infer or inference are introduced. Kindergarten students will answer questions like "Why is the girl smiling?" or make predictions about what will happen based on the title page. Students will use the terms and apply them in 2nd grade and beyond.

Use appropriate collaborative techniques and active listening skills when engaging in discussions in a variety of situations.

**CLARIFICATIONS:**
In kindergarten, students learn to listen to one another respectfully.
In grades 1-2, students build upon these skills by justifying what they are thinking. For example: "I think _____ because _____." The collaborative conversations are becoming academic conversations.
In grades 3-12, students engage in academic conversations discussing claims and justifying their reasoning, refining and applying skills. Students build on ideas, propel the conversation, and support claims and counterclaims with evidence.

Use the accepted rules governing a specific format to create quality work.

**CLARIFICATIONS:**
Students will incorporate skills learned into work products to produce quality work. For students to incorporate these skills appropriately, they must receive instruction. A 3rd grade student creating a poster board display must have instruction in how to effectively present information to do quality work.

Use appropriate voice and tone when speaking or writing.

**CLARIFICATIONS:**
In kindergarten and 1st grade, students learn the difference between formal and informal language. For example, the way we talk to our friends differs from the way we speak to adults. In 2nd grade and beyond, students practice appropriate social and academic language to discuss texts.

**ELD.K12.ELL.SC.1:** English language learners communicate information, ideas and concepts necessary for academic success in the content area of Science.
**ELD.K12.ELL.SI.1:** English language learners communicate for social and instructional purposes within the school setting.
Laboratory investigations that include the use of scientific inquiry, research, measurement, problem solving, laboratory apparatus and technologies, experimental procedures, and safety procedures are an integral part of this course. The National Science Teachers Association (NSTA) recommends that at the high school level, all students should be in the science lab or field, collecting data every week. School laboratory investigations (labs) are defined by the National Research Council (NRC) as an experience in the laboratory, classroom, or the field that provides students with opportunities to interact directly with natural phenomena or with data collected by others using tools, materials, data collection techniques, and models (NRC, 2006, p. 3). Laboratory investigations in the high school classroom should help all students develop a growing understanding of the complexity and ambiguity of empirical work, as well as the skills to calibrate and troubleshoot equipment used to make observations. Learners should understand measurement error; and have the skills to aggregate, interpret, and present the resulting data (National Research Council, 2006, p.77; NSTA, 2007).

**Special Notes:** Credit Recovery courses are credit bearing courses with specific content requirements defined by Next Generation Sunshine State Standards and/or Florida Standards. Students enrolled in a Credit Recovery course must have previously attempted the corresponding course (and/or End-of-Course assessment) since the course requirements for the Credit Recovery course are exactly the same as the previously attempted corresponding course. For example, Geometry (1206310) and Geometry for Credit Recovery (1206315) have identical content requirements. It is important to note that Credit Recovery courses are not bound by Section 1003.436(1)(a), Florida Statutes, requiring a minimum of 135 hours of bona fide instruction (120 hours in a school/district implementing block scheduling) in a designed course of study that contains student performance standards, since the students have previously attempted successful completion of the corresponding course. Additionally, Credit Recovery courses should ONLY be used for credit recovery, grade forgiveness, or remediation for students needing to prepare for an End-of-Course assessment retake.

### Instructional Practices
Teaching from a range of complex text is optimized when teachers in all subject areas implement the following strategies on a routine basis:

1. Ensuring wide reading from complex text that varies in length.
2. Making close reading and rereading of texts central to lessons.
3. Emphasizing text-specific complex questions, and cognitively complex tasks, reinforce focus on the text and cultivate independence.
4. Emphasizing students supporting answers based upon evidence from the text.
5. Providing extensive research and writing opportunities (claims and evidence).

- Asking questions (for science) and defining problems (for engineering).
- Developing and using models.
- Planning and carrying out investigations.
- Analyzing and interpreting data.
- Using mathematics, information and computer technology, and computational thinking.
- Constructing explanations (for science) and designing solutions (for engineering).
- Engaging in argument from evidence.
- Obtaining, evaluating, and communicating information.

### Florida's Benchmarks for Excellent Student Thinking (B.E.S.T.) Standards
This course includes Florida's B.E.S.T. ELA Expectations (EE) and Mathematical Thinking and Reasoning Standards (MTRs) for students. Florida educators should intentionally embed these standards within the content and their instruction as applicable. For guidance on the implementation of the EEs and MTRs, please visit https://www.cpalms.org/Standards/BEST_Standards.aspx and select the appropriate B.E.S.T. Standards package.

### English Language Development ELD Standards Special Notes Section:
Teachers are required to provide listening, speaking, reading and writing instruction that allows English language learners (ELL) to communicate information, ideas and concepts for academic success in the content area of Science. For the given level of English language proficiency and with visual, graphic, or interactive support, students will interact with grade level words, expressions, sentences and discourse to process or produce language necessary for academic success. The ELD standard should specify a relevant content area concept or topic of study chosen by curriculum developers and teachers which maximizes an ELL's need for communication and social skills. To access an ELL supporting document which delineates performance definitions and descriptors, please click on the following link: https://cpalmsmediaprod.blob.core.windows.net/uploads/docs/standards/eld/sc.pdf
### Course Standards

<table>
<thead>
<tr>
<th>Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>SC.912.L.17.15</td>
<td>Discuss the effects of technology on environmental quality.</td>
</tr>
<tr>
<td>SC.912.L.17.19</td>
<td>Describe how different natural resources are produced and how their rates of use and renewal limit availability.</td>
</tr>
<tr>
<td>SC.912.L.18.12</td>
<td>Discuss the special properties of water that contribute to Earth's suitability as an environment for life: cohesive behavior, ability to moderate temperature, expansion upon freezing, and versatility as a solvent.</td>
</tr>
<tr>
<td>SC.912.N.1.1.</td>
<td>Define a problem based on a specific body of knowledge, for example: biology, chemistry, physics, and earth/space science, and do the following:</td>
</tr>
<tr>
<td>1. Pose questions about the nature of the world.</td>
<td>(Articulate the purpose of the investigation and identify the relevant scientific concepts).</td>
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<td>2. Conduct systematic observations.</td>
<td>(Write procedures that are clear and replicable. Identify observables and examine relationships between test (independent) variable and outcome (dependent) variable. Employ appropriate methods for accurate and consistent observations; conduct and record measurements at appropriate levels of precision. Follow safety guidelines).</td>
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<td>3. Examine books and other sources of information to see what is already known.</td>
<td>(Examine whether available empirical evidence can be interpreted in terms of existing knowledge and models, and if not, modify or develop new models).</td>
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<td>4. Review what is known in light of empirical evidence.</td>
<td>(Examine whether available empirical evidence can be interpreted in terms of existing knowledge and models, and if not, modify or develop new models).</td>
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<td>5. Plan investigations.</td>
<td>(Design and evaluate a scientific investigation).</td>
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<td>6. Use tools to gather, analyze, and interpret data (this includes the use of measurement in metric and other systems, and also the generation and interpretation of graphical representations of data, including data tables and graphs).</td>
<td>(Collect data or evidence in an organized way. Properly use instruments, equipment, and materials (e.g., scales, probeware, meter sticks, microscopes, computers) including set-up, calibration, technique, maintenance, and storage).</td>
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<td>7. Pose answers, explanations, or descriptions of events.</td>
<td>(Explain the most powerful explanation scientists have to offer).</td>
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<tr>
<td>8. Generate explanations that explicate or describe natural phenomena (inferences).</td>
<td>(Examine books and other sources of information to see what is already known).</td>
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<td>9. Use appropriate evidence and reasoning to justify these explanations to others.</td>
<td>(Examine the special properties of water that contribute to Earth's suitability as an environment for life: cohesive behavior, ability to moderate temperature, expansion upon freezing, and versatility as a solvent).</td>
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<tr>
<td>10. Communicate results of scientific investigations, and</td>
<td>(Explain that scientific knowledge is both durable and robust and open to change. Scientific knowledge can change because it is often examined and re-examined by new investigations and scientific argumentation).</td>
</tr>
<tr>
<td>11. Evaluate the merits of the explanations produced by others.</td>
<td>(Examine the special properties of water that contribute to Earth's suitability as an environment for life: cohesive behavior, ability to moderate temperature, expansion upon freezing, and versatility as a solvent).</td>
</tr>
<tr>
<td>SC.912.N.1.2</td>
<td>Describe and explain what characterizes science and its methods.</td>
</tr>
<tr>
<td>SC.912.N.1.4</td>
<td>Identify sources of information and assess their reliability according to the strict standards of scientific investigation.</td>
</tr>
<tr>
<td>SC.912.N.1.5</td>
<td>Describe and provide examples of how similar investigations conducted in many parts of the world result in the same outcome.</td>
</tr>
<tr>
<td>SC.912.N.1.6</td>
<td>Describe how scientific inferences are drawn from scientific observations and provide examples from the content being studied.</td>
</tr>
<tr>
<td>SC.912.N.1.7</td>
<td>Recognize the role of creativity in constructing scientific questions, methods and explanations.</td>
</tr>
<tr>
<td>SC.912.N.2.2</td>
<td>Identify which questions can be answered through science and which questions are outside the boundaries of scientific investigation, such as questions addressed by other ways of knowing, such as art, philosophy, and religion.</td>
</tr>
<tr>
<td>SC.912.N.2.3</td>
<td>Identify examples of pseudoscience (such as astrology, phrenology) in society.</td>
</tr>
<tr>
<td>SC.912.N.2.4</td>
<td>Explain that scientific knowledge is both durable and robust and open to change. Scientific knowledge can change because it is often examined and re-examined by new investigations and scientific argumentation.</td>
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<td>SC.912.N.2.5</td>
<td>Describe instances in which scientists' varied backgrounds, talents, interests, and goals influence the inferences and thus the explanations that they make about observations of natural phenomena and describe that competing interpretations (explanations) of scientists are a strength of science as they are a source of new, testable ideas that have the potential to add new evidence to support one or another of the explanations.</td>
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<td>SC.912.N.3.1</td>
<td>Explain that a scientific theory is the culmination of many scientific investigations drawing together all the current evidence concerning a substantial range of phenomena; thus, a scientific theory represents the most powerful explanation scientists have to offer.</td>
</tr>
<tr>
<td>SC.912.N.3.2</td>
<td>Describe the role consensus plays in the historical development of a theory in any one of the disciplines of science.</td>
</tr>
<tr>
<td>SC.912.N.3.3</td>
<td>Explain that scientific laws are descriptions of specific relationships under given conditions in nature, but do not offer explanations for those relationships.</td>
</tr>
<tr>
<td>SC.912.N.3.5</td>
<td>Describe the function of models in science, and identify the wide range of models used in science.</td>
</tr>
<tr>
<td>SC.912.N.4.1</td>
<td>Explain how scientific knowledge and reasoning provide an empirically-based perspective to inform society's decision making.</td>
</tr>
<tr>
<td>SC.912.N.4.2</td>
<td>Weigh the merits of alternative strategies for solving a specific societal problem by comparing a number of different costs and benefits, such as human, economic, and environmental.</td>
</tr>
<tr>
<td>SC.912.P.8.1</td>
<td>Differentiate among the four states of matter.</td>
</tr>
<tr>
<td>SC.912.P.8.2</td>
<td>Differentiate between physical and chemical properties and physical and chemical changes of matter.</td>
</tr>
<tr>
<td>SC.912.P.8.3</td>
<td>Explore the scientific theory of atoms (also known as atomic theory) by describing changes in the atomic model over time and why those changes were necessitated by experimental evidence.</td>
</tr>
<tr>
<td>SC.912.P.8.4</td>
<td>Explore the scientific theory of atoms (also known as atomic theory) by describing the structure of atoms in terms of protons, neutrons and electrons, and differentiate among these particles in terms of their mass, electrical charges and locations within the atom.</td>
</tr>
<tr>
<td>SC.912.P.8.5</td>
<td>Relate properties of atoms and their position in the periodic table to the arrangement of their electrons.</td>
</tr>
<tr>
<td>SC.912.P.8.6</td>
<td>Distinguish between bonding forces holding compounds together and other attractive forces, including hydrogen bonding and van der Waals forces.</td>
</tr>
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<td>SC.912.P.8.7</td>
<td>Interpret formula representations of molecules and compounds in terms of composition and structure.</td>
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<tr>
<td>SC.912.P.8.8</td>
<td>Characterize types of chemical reactions, for example: redox, acid-base, synthesis, and single and double replacement reactions.</td>
</tr>
<tr>
<td>SC.912.P.8.9</td>
<td>Apply the mole concept and the law of conservation of mass to calculate quantities of chemicals participating in reactions.</td>
</tr>
<tr>
<td>SC.912.P.8.10</td>
<td>Describe oxidation-reduction reactions in living and non-living systems.</td>
</tr>
<tr>
<td>SC.912.P.8.11</td>
<td>Relate acidity and basicity to hydronium and hydroxyl ion concentration and pH.</td>
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<tr>
<td>SC.912.P.8.12</td>
<td>Describe the properties of the carbon atom that make the diversity of carbon compounds possible.</td>
</tr>
<tr>
<td>SC.912.P.8.13</td>
<td>Identify selected functional groups and relate how they contribute to properties of carbon compounds.</td>
</tr>
</tbody>
</table>
Differentiate among the various forms of energy and recognize that they can be transformed from one form to others.

Describe the quantization of energy at the atomic level.

Compare the magnitude and range of the four fundamental forces (gravitational, electromagnetic, weak nuclear, strong nuclear).

Relate temperature to the average molecular kinetic energy.

Explain and compare nuclear reactions (radioactive decay, fission and fusion), the energy changes associated with them and their associated safety issues.

Differentiate between chemical and nuclear reactions.

Explore the theory of electromagnetism by comparing and contrasting the different parts of the electromagnetic spectrum in terms of wavelength, frequency, and energy, and relate them to phenomena and applications.

Interpret the behavior of ideal gases in terms of kinetic molecular theory.

Describe phase transitions in terms of kinetic molecular theory.

Compare how various factors, such as concentration, temperature, and presence of a catalyst affect the rate of a chemical reaction.

Explain the concept of dynamic equilibrium in terms of reversible processes occurring at the same rates.

Cite specific textual evidence to support analysis of science and technical texts, attending to the precise details of explanations or descriptions.

Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks, attending to special cases or exceptions defined in the text.

Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 9–10 texts and topics.

Analyze the structure of the relationships among concepts in a text, including relationships among key terms (e.g., force, friction, reaction force, energy).

Analyze the author's purpose in providing an explanation, describing a procedure, or discussing an experiment in a text, defining the question the author seeks to address.

Translate quantitative or technical information expressed in words into visual form (e.g., a table or chart) and translate information expressed visually or mathematically (e.g., in an equation) into words.

Assess the extent to which the reasoning and evidence in a text support the author's claim or a recommendation for solving a scientific or technical problem.

Compare and contrast findings presented in a text to those from other sources (including their own experiments), noting when the findings support or contradict previous explanations or accounts.

By the end of grade 10, read and comprehend science/technical texts in the grades 9–10 text complexity band independently and proficiently.

Initiate and participate effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grades 9–10 topics, texts, and issues, building on others' ideas and expressing their own clearly and persuasively.

Integrate multiple sources of information presented in diverse media or formats (e.g., visually, quantitatively, orally) evaluating the credibility and accuracy of each source.

Evaluate a speaker's point of view, reasoning, and use of evidence and rhetoric, identifying any fallacious reasoning or exaggerated or distorted evidence.

Integrate information, findings, and supporting evidence clearly, concisely, and logically such that listeners can follow the line of reasoning and the organization, development, substance, and style are appropriate to purpose, audience, and task.

Make strategic use of digital media (e.g., textual, graphical, audio, visual, and interactive elements) in presentations to enhance understanding of findings, reasoning, and evidence and to add interest.

Write arguments focused on discipline-specific content.

Introduce precise claim(s), distinguish the claim(s) from alternate or opposing claims, and create an organization that establishes clear relationships among the claim(s), counterclaims, reasons, and evidence.

Introduce a topic and organize ideas, concepts, and information to make important connections and distinctions; include formatting (e.g., headings), graphics (e.g., figures, tables), and multimedia when useful to aiding comprehension.

Develop claim(s) and counterclaims fairly, supplying data and evidence for each while pointing out the strengths and limitations of both claim(s) and counterclaims in a discipline-appropriate form and in a manner that anticipates the audience's knowledge level and concerns.

Develop the topic with well-chosen, relevant, and sufficient facts, extended definitions, concrete details, quotations, or other information and examples appropriate to the audience's knowledge of the topic.

Use varied transitions and sentence structures to link the major sections of the text, create cohesion, and clarify the relationships among ideas and concepts.
| LAFS.910.WHST.2.4: | Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience. |
| LAFS.910.WHST.2.5: | Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience. |
| LAFS.910.WHST.2.6: | Use technology, including the Internet, to produce, publish, and update individual or shared writing products, taking advantage of technology's capacity to link to other information and to display information flexibly and dynamically. |
| LAFS.910.WHST.3.7: | Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation. |
| LAFS.910.WHST.3.8: | Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the usefulness of each source in answering the research question; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and following a standard format for citation. |
| LAFS.910.WHST.3.9: | Draw evidence from informational texts to support analysis, reflection, and research. |
| LAFS.910.WHST.4.10: | Write routinely over extended time frames (time for reflection and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences. |
| MAFS.912.F-IF.2.4: | For a function that models a relationship between two quantities, interpret key features of graphs and tables in terms of the quantities, and sketch graphs showing key features given a verbal description of the relationship. Key features include: intercepts; intervals where the function is increasing, decreasing, positive, or negative; relative maximums and minimums; symmetries; end behavior; and periodicity. ★ |
| MAFS.912.F-IF.3.7: | ★ Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases. ★ |
| MAFS.912.G-MG.1.2: | Apply concepts of density based on area and volume in modeling situations (e.g., persons per square mile, BTUs per cubic foot). ★ |
| MAFS.912.N-Q.1.1: | Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays. ★ |
| MAFS.912.N-Q.1.3: | Choose a level of accuracy appropriate to limitations on measurement when reporting quantities. ★ |
| MAFS.912.S-ID.1.1: | ★ Represent data with plots on the real number line (dot plots, histograms, and box plots). ★ |
| MAFS.912.S-ID.1.2: | ★ Use statistics appropriate to the shape of the data distribution to compare center (median, mean) and spread (interquartile range, standard deviation) of two or more different data sets. ★ |
| MAFS.912.S-ID.1.3: | ★ Interpret differences in shape, center, and spread in the context of the data sets, accounting for possible effects of extreme data points (outliers). ★ |
| MAFS.912.S-ID.1.4: | ★ Use the mean and standard deviation of a data set to fit it to a normal distribution and to estimate population percentages. Recognize that there are data sets for which such a procedure is not appropriate. Use calculators, spreadsheets, and tables to estimate areas under the normal curve. ★ |
| MAFS.912.S-ID.2.5: | ★ Summarize categorical data for two categories in two-way frequency tables. Interpret relative frequencies in the context of the data (including joint, marginal, and conditional relative frequencies). Recognize possible associations and trends in the data. ★ |
| MAFS.912.S-ID.2.6: | ★ Represent data on two quantitative variables on a scatter plot, and describe how the variables are related. ★
|  | a. Fit a function to the data; use functions fitted to data to solve problems in the context of the data. Use given functions or choose a function suggested by the context. Emphasize linear, and exponential models. ★
|  | b. Informally assess the fit of a function by plotting and analyzing residuals. ★
|  | c. Fit a linear function for a scatter plot that suggests a linear association. ★

**Make sense of problems and persevere in solving them.**

Mathematically proficient students start by explaining to themselves the meaning of a problem and looking for entry points to its solution. They analyze givens, constraints, relationships, and goals. They make conjectures about the form and meaning of the solution and plan a solution pathway rather than simply jumping into a solution attempt. They consider analogous problems, and try special cases and simpler forms of the original problem in order to gain insight into its solution. They monitor and evaluate their progress and change course if necessary. Older students might, depending on the context of the problem, transform algebraic expressions or change the viewing window on their graphing calculator to get the information they need. Mathematically proficient students can explain correspondences between equations, verbal descriptions, tables, and
graphs or draw diagrams of important features and relationships, graph data, and search for regularity or trends. Younger students might rely on using concrete objects or pictures to help conceptualize and solve a problem. Mathematically proficient students check their answers to problems using a different method, and they continually ask themselves, “Does this make sense?” They can understand the approaches of others to solving complex problems and identify correspondences between different approaches.

**Standard Relation to Course: Supporting**

**Reason abstractly and quantitatively.**

Mathematically proficient students make sense of quantities and their relationships in problem situations. They bring two complementary abilities to bear on problems involving quantitative relationships: the ability to decontextualize—to abstract a given situation and represent it symbolically—and the ability to contextualize, to pause as needed during the manipulation process in order to probe into the referents for the symbols involved. Quantitative reasoning entails habits of creating a coherent representation of the problem at hand; considering the units involved; attending to the meaning of quantities, not just how to compute them; and knowing and flexibly using different properties of operations and objects.

**Standard Relation to Course: Supporting**

**Construct viable arguments and critique the reasoning of others.**

Mathematically proficient students understand and use stated assumptions, definitions, and previously established results in constructing arguments. They make conjectures and build a logical progression of statements to explore the truth of their conjectures. They are able to analyze situations by breaking them into pieces, and can recognize and use counterexamples. They justify their conclusions, communicate them to others, and respond to the arguments of others. They reason inductively about data, making plausible arguments that take into account the context from which the data arose. Mathematically proficient students are also able to compare the effectiveness of two plausible arguments, distinguish correct logic or reasoning from that which is flawed, and—if there is a flaw in an argument—explain what it is. Elementary students can construct arguments using concrete referents such as objects, drawings, diagrams, and actions. Such arguments can make sense and be correct, even though they are not generalized or made formal until later grades. Later, students learn to determine domains to which an argument applies. Students at all grades can listen or read the arguments of others, decide whether they make sense, and ask useful questions to clarify or improve the arguments.

**Standard Relation to Course: Supporting**

**Model with mathematics.**

Mathematically proficient students can apply the mathematics they know to solve problems arising in everyday life, society, and the workplace. In early grades, this might be as simple as writing an addition equation to describe a situation. In middle grades, a student might apply proportional reasoning to plan a school event or analyze a problem in the community. By high school, a student might use geometry, algebra, and statistics to analyze and solve a complex task such as designing and building a machine or investigating a scientific idea. Mathematically proficient students who apply mathematics in our society will both use mathematics in their work and have the opportunity to learn about it directly in school. They bring two complementary abilities to the application of mathematics: they can accomplish calculations and they can recognize when certain calculations are needed. Proficient students use approximations appropriate to the resources available to them, understand how different methods and tools are connected, and make strategic use of different tools.

**Standard Relation to Course: Supporting**

**Use appropriate tools strategically.**

Mathematically proficient students consider the available tools when solving a mathematical problem. These tools might include pencil and paper, concrete models, a ruler, a protractor, a calculator, a spreadsheet, a computer algebra system, a statistical package, or dynamic geometry software. Proficient students are sufficiently familiar with tools appropriate for their grade or course to make sound decisions about when each of these tools might be helpful, recognizing both the insight to be gained and their limitations. For example, mathematically proficient high school students analyze graphs of functions and solutions generated using a graphical calculator. They detect possible errors by strategically using estimation and other mathematical knowledge. When making mathematical models, they know that technology can enable them to visualize the results of varying assumptions, explore consequences, and compare predictions with data. Mathematically proficient students at various grade levels are able to identify relevant external mathematical resources, such as digital content located on a website, and use them to pose or solve problems. They are able to use technological tools to explore and deepen their understanding of concepts.

**Standard Relation to Course: Supporting**

**Attend to precision.**

Mathematically proficient students try to communicate precisely to others. They try to use clear definitions in discussion with others and in their own reasoning. They state the meaning of the symbols they choose, including using the equal sign consistently and appropriately. They are careful about specifying units of measure and labeling axes to clarify the correspondence with quantities in a problem. They calculate accurately and efficiently, express numerical answers with a degree of precision appropriate for the problem context. In the elementary grades, students give carefully formulated explanations to each other. By the time they reach high school they have learned to examine claims and make explicit use of definitions.

**Standard Relation to Course: Supporting**

**Look for and make use of structure.**

Mathematically proficient students look closely to discern a pattern or structure. Young students, for example, might notice that three and seven more is the same amount as seven and three more, or they may sort a collection of shapes according to how many sides the shapes have. Later, students will see 7 x 8 equals the well remembered 7 x 5 + 7 x 3, in preparation for learning about the distributive property. In the expression x^2 + 9x + 14, older students can see the 14 as 2 x 7 and the 9 as 2 + 7. They recognize the significance of an existing line in a geometric figure and can use the strategy of drawing an auxiliary line for solving problems. They also can step back for an overview and shift perspective. They can see complicated things, such as some algebraic expressions, as single objects or as being composed of several objects. For example, they can see 5 - 3(x - y)^2 as 5 minus a positive number times a square and use that to realize that its value cannot be more than 5 for any real numbers x and y.

**Standard Relation to Course: Supporting**

**Look for and express regularity in repeated reasoning.**

Mathematically proficient students notice if calculations are repeated, and look both for general methods and for shortcuts. Upper elementary students might notice when dividing 25 by 11 that they are repeating the same calculations over and over again, and conclude they have a repeating decimal. By paying attention to the calculation of slope as they repeatedly check whether points are on the line through (1, 2) with slope 3, middle school students might abstract the equation (y - 2)/(x - 1) = 3. Noticing the regularity in the way terms cancel when expanding (x - 1)(x + 1), (x - 1)(x^2 + x + 1), and (x - 1)(x^3 + x^2 + x + 1) might lead them to the general formula for the sum of a geometric series. As they work to solve a
problem, mathematically proficient students maintain oversight of the process, while attending to the details. They continually evaluate the reasonableness of their intermediate results.

Standard Relation to Course: Supporting

**ELD.K12.ELL.SI.1:** English language learners communicate information, ideas and concepts necessary for academic success in the content area of Science.

**ELD.K12.ELL.SC.1:** English language learners communicate for social and instructional purposes within the school setting.

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**General Course Information and Notes**

**GENERAL NOTES**

While the content focus of this course is consistent with the Chemistry I course, students will explore these concepts in greater depth. In general, the academic pace and rigor will be greatly increased for honors level course work. Laboratory investigations that include the use of scientific inquiry, research, measurement, problem solving, laboratory apparatus and technologies, experimental procedures, and safety procedures are an integral part of this course. The National Science Teachers Association (NSTA) recommends that at the high school level, all students should be in the science lab or field, collecting data every week. School laboratory investigations (labs) are defined by the National Research Council (NRC) as an experience in the laboratory, classroom, or the field that provides students with opportunities to interact directly with natural phenomena or with data collected by others using tools, materials, data collection techniques, and models (NRC, 2006, p. 3). Laboratory investigations in the high school classroom should help all students develop a growing understanding of the complexity and ambiguity of empirical work, as well as the skills to calibrate and troubleshoot equipment used to make observations. Learners should understand measurement error; and have the skills to aggregate, interpret, and present the resulting data (National Research Council, 2006, p. 77; NSTA, 2007).

**Special Notes:**

Instructional Practices:
Teaching from a range of complex text is optimized when teachers in all subject areas implement the following strategies on a routine basis:

1. Ensuring wide reading from complex text that varies in length.
2. Making close reading and rereading of texts central to lessons.
3. Emphasizing text-specific complex questions, and cognitively complex tasks, reinforce focus on the text and cultivate independence.
4. Emphasizing students supporting answers based upon evidence from the text.
5. Providing extensive research and writing opportunities (claims and evidence).

**Science and Engineering Practices** (NRC Framework for K-12 Science Education, 2010)

- Asking questions (for science) and defining problems (for engineering).
- Developing and using models.
- Planning and carrying out investigations.
- Analyzing and interpreting data.
- Using mathematics, information and computer technology, and computational thinking.
- Constructing explanations (for science) and designing solutions (for engineering).
- Engaging in argument from evidence.
- Obtaining, evaluating, and communicating information.

**Honors and Advanced Level Course Note:** Advanced courses require a greater demand on students through increased academic rigor. Academic rigor is obtained through the application, analysis, evaluation, and creation of complex ideas that are often abstract and multi-faceted. Students are challenged to think and collaborate critically on the content they are learning. Honors level rigor will be achieved by increasing text complexity through text selection, focus on high-level qualitative measures, and complexity of task. Instruction will be structured to give students a deeper understanding of conceptual themes and organization within and across disciplines. Academic rigor is more than simply assigning to students a greater quantity of work.

**Literacy Standards in Science**

Secondary science courses include reading standards for literacy in science and technical subjects 6-12 and writing standards for literacy in history/social studies, science, and technical subjects 6-12. The courses also include speaking and listening standards. For a complete list of standards required for this course click on the blue tile labeled course standards. You may also download the complete course including all required standards and notes sections using the export function located at the top of this page.

**English Language Development ELD Standards Special Notes Section:**

Teachers are required to provide listening, speaking, reading and writing instruction that allows English language learners (ELL) to communicate information, ideas and concepts for academic success in the content area of Science. For the given level of English language proficiency and with visual, graphic, or interactive support, students will interact with grade level words, expressions, sentences and discourse to process or produce language necessary for academic success. The ELD standard should specify a relevant content area concept or topic of study chosen by curriculum developers and teachers which maximizes an ELL's need for communication and social skills. To access an ELL supporting document which delineates performance definitions and descriptors, please click on the following link:


**Additional Instructional Resources:**

A.V.E. for Success Collection is provided by the Florida Association of School Administrators: http://www.fasa.net/4DCGI/cms/review.html?Action=cMS_Document&DocID=439. Please be aware that these resources have not been reviewed by CPALMS and there may be a charge for the use of some of them in this collection.

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**General Information**

Course Number: 2003350
Course Path: Sections: Grades PreK to 12 Education
Courses > Grade Group: Grades 9 to 12 and Adult Education Courses > Subject: Science > SubSubject: Chemistry >
<table>
<thead>
<tr>
<th>Educator Certifications</th>
<th>Equivalent Courses</th>
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<tbody>
<tr>
<td>Science (Secondary Grades 7-12)</td>
<td>2003340-Chemistry 1</td>
</tr>
<tr>
<td>Chemistry (Grades 6-12)</td>
<td>2003800-Florida's Preinternational Baccalaureate Chemistry 1</td>
</tr>
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**Number of Credits:** One (1) credit

**Course Type:** Core Academic Course

**Course Status:** Course Approved

**Course Level:** 3

**Course Attributes:**
- Honors

**Course Length:** Year (Y)

**Graduation Requirement:** Equally Rigorous Science

**Courses**

<table>
<thead>
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<tr>
<td>2003340</td>
<td>Chemistry 1</td>
</tr>
<tr>
<td>2003800</td>
<td>Florida's Preinternational Baccalaureate Chemistry 1</td>
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</table>
### Course Standards

<table>
<thead>
<tr>
<th>Name</th>
<th>Description</th>
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<tbody>
<tr>
<td>SC.912.L.17.15</td>
<td>Discuss the effects of technology on environmental quality.</td>
</tr>
<tr>
<td>SC.912.L.17.19</td>
<td>Discuss how different natural resources are produced and how their rates of use and renewal limit availability.</td>
</tr>
<tr>
<td>SC.912.L.18.12</td>
<td>Discuss the special properties of water that contribute to Earth’s suitability as an environment for life: cohesive behavior, ability to moderate temperature, expansion upon freezing, and versatility as a solvent.</td>
</tr>
</tbody>
</table>
| SC.912.N.1.1.               | Define a problem based on a specific body of knowledge, for example: biology, chemistry, physics, and earth/space science, and do the following:  
1. Pose questions about the natural world. (Articulate the purpose of the investigation and identify the relevant scientific concepts).  
2. Conduct systematic observations. (Write procedures that are clear and replicable. Identify observables and examine relationships between test (independent) variable and outcome (dependent) variable. Employ appropriate methods for accurate and consistent observations; conduct and record measurements at appropriate levels of precision. Follow safety guidelines).  
3. Examine books and other sources of information to see what is already known,  
4. Review what is known in light of empirical evidence. (Examine whether available empirical evidence can be interpreted in terms of existing knowledge and models, and if not, modify or develop new models).  
5. Plan investigations. (Design and evaluate a scientific investigation).  
6. Use tools to gather, analyze, and interpret data (this includes the use of measurement in metric and other systems, and also the generation and interpretation of graphical representations of data, including data tables and graphs). (Collect data or evidence in an organized way. Properly use instruments, equipment, and materials (e.g., scales, probeware, meter sticks, microscopes, computers) including set-up, calibration, technique, maintenance, and storage).  
7. Pose answers, explanations, or descriptions of events,  
8. Generate explanations that explicate or describe natural phenomena (inferences),  
9. Use appropriate evidence and reasoning to justify these explanations to others,  
10. Communicate results of scientific investigations, and  
11. Evaluate the merits of the explanations produced by others. |
| SC.912.N.1.2.               | Describe and explain what characterizes science and its methods.             |
| SC.912.N.1.4.               | Identify sources of information and assess their reliability according to the strict standards of scientific investigation. |
| SC.912.N.1.5.               | Describe and provide examples of how similar investigations conducted in many parts of the world result in the same outcome. |
| SC.912.N.1.6.               | Describe how scientific inferences are drawn from scientific observations and provide examples from the content being studied. |
| SC.912.N.1.7.               | Recognize the role of creativity in constructing scientific questions, methods and explanations. |
| SC.912.N.2.2.               | Identify which questions can be answered through science and which questions are outside the boundaries of scientific investigation, such as questions addressed by other ways of knowing, such as art, philosophy, and religion. |
| SC.912.N.2.3.               | Identify examples of pseudoscience (such as astrology, phrenology) in society. |
| SC.912.N.2.4.               | Explain that scientific knowledge is both durable and robust and open to change. Scientific knowledge can change because it is often examined and re-examined by new investigations and scientific argumentation. Because of these frequent examinations, scientific knowledge becomes stronger, leading to its durability. |
| SC.912.N.2.5.               | Describe instances in which scientists’ varied backgrounds, talents, interests, and goals influence the inferences and thus the explanations that they make about observations of natural phenomena and describe that competing interpretations (explanations) of scientists are a strength of science as they are a source of new, testable ideas that have the potential to add new evidence to support one or another of the explanations. |
| SC.912.N.3.1.               | Explain that a scientific theory is the culmination of many scientific investigations drawing together all the current evidence concerning a substantial range of phenomena; thus, a scientific theory represents the most powerful explanation scientists have to offer. |
| SC.912.N.3.2.               | Describe the role consensus plays in the historical development of a theory in any one of the disciplines of science. |
| SC.912.N.3.3.               | Explain that scientific laws are descriptions of specific relationships under given conditions in nature, but do not offer explanations for those relationships. |
| SC.912.N.3.5.               | Describe the function of models in science, and identify the wide range of models used in science. |
| SC.912.N.4.1.               | Explain how scientific knowledge and reasoning provide an empirically-based perspective to inform society’s decision making. |
| SC.912.N.4.2.               | Weigh the merits of alternative strategies for solving a specific societal problem by comparing a number of different costs and benefits, such as human, economic, and environmental. |
| SC.912.P.8.2.               | Differentiate between physical and chemical properties and physical and chemical changes of matter. |
| SC.912.P.8.3.               | Explore the scientific theory of atoms (also known as atomic theory) by describing changes in the atomic model over time and why those changes were necessitated by experimental evidence. |
| SC.912.P.8.4.               | Explore the scientific theory of atoms (also known as atomic theory) by describing the structure of atoms in terms of protons, neutrons and electrons, and differentiate among these particles in terms of their mass, electrical charges and locations within the atom. |
| SC.912.P.8.5.               | Relate properties of atoms and their position in the periodic table to the arrangement of their electrons. |
| SC.912.P.8.6.               | Distinguish between bonding forces holding compounds together and other attractive forces, including hydrogen bonding and van der Waals forces. |
| SC.912.P.8.7.               | Interpret formula representations of molecules and compounds in terms of composition and structure. |
| SC.912.P.8.8.               | Characterize types of chemical reactions, for example: redox, acid-base, synthesis, and single and double replacement reactions. |
| SC.912.P.8.9.               | Apply the mole concept and the law of conservation of mass to calculate quantities of chemicals participating in reactions. |
| SC.912.P.8.11.              | Relate acidity and basicity to hydronium and hydroxyl ion concentration and pH. |
| SC.912.P.8.12.              | Describe the properties of the carbon atom that make the diversity of carbon compounds possible. |
| SC.912.P.8.13.              | Identify selected functional groups and relate how they contribute to properties of carbon compounds. |
Differentiate among the various forms of energy and recognize that they can be transformed from one form to others.

SC.912.P.10.2: Explore the Law of Conservation of Energy by differentiating among open, closed, and isolated systems and explain that the total energy in an isolated system is a conserved quantity.

SC.912.P.10.5: Relate temperature to the average molecular kinetic energy.

SC.912.P.10.6: Create and interpret potential energy diagrams, for example: chemical reactions, orbits around a central body, motion of a pendulum.

SC.912.P.10.7: Distinguish between endothermic and exothermic chemical processes.

SC.912.P.10.8: Explain entropy's role in determining the efficiency of processes that convert energy to work.

SC.912.P.10.9: Describe the quantization of energy at the atomic level.

SC.912.P.10.10: Compare the magnitude and range of the four fundamental forces (gravitational, electromagnetic, weak nuclear, strong nuclear).

SC.912.P.10.11: Explain and compare nuclear reactions (radioactive decay, fission and fusion), the energy changes associated with them and their associated safety issues.

SC.912.P.10.12: Differentiate between chemical and nuclear reactions.

SC.912.P.10.13: Interpret the behavior of ideal gases in terms of kinetic molecular theory.

SC.912.P.10.14: Describe phase transitions in terms of kinetic molecular theory.

SC.912.P.10.15: Explain how various factors, such as concentration, temperature, and presence of a catalyst affect the rate of a chemical reaction.

SC.912.P.10.16: Explain the concept of dynamic equilibrium in terms of reversible processes occurring at the same rates.

Mathematicians who participate in effortful learning both individually and with others:
- Analyze the problem in a way that makes sense given the task.
- Ask questions that will help with solving the task.
- Build perseverance by modifying methods as needed while solving a challenging task.
- Stay engaged and maintain a positive mindset when working to solve tasks.
- Help and support each other when attempting a new method or approach.

Mathematicians who demonstrate understanding by representing problems in multiple ways:
- Build understanding through modeling and using manipulatives.
- Represent solutions to problems in multiple ways using objects, drawings, tables, graphs and equations.
- Progress from modeling problems with objects and drawings to using algorithms and equations.
- Express connections between concepts and representations.
- Choose a representation based on the given context or purpose.

Mathematicians who complete tasks with mathematical fluency:
- Select efficient and appropriate methods for solving problems within the given context.
- Maintain flexibility and accuracy while performing procedures and mental calculations.
- Complete tasks accurately and with confidence.
- Adapt procedures to apply them to a new context.
- Use feedback to improve efficiency when performing calculations.

Mathematicians who engage in discussions that reflect on the mathematical thinking of self and others:
- Communicate mathematical ideas, vocabulary and methods effectively.
- Analyze the mathematical thinking of others.
- Compare the efficiency of a method to those expressed by others.
- Recognize errors and suggest how to correctly solve the task.
- Justify results by explaining methods and processes.
- Construct possible arguments based on evidence.

Teachers who encourage students to participate actively in effortful learning both individually and with others:
- Cultivate a community of growth mindset learners.
- Foster perseverance in students by choosing tasks that are challenging.
- Develop students' ability to analyze and problem solve.
- Recognize students' effort when solving challenging problems.

Teachers who encourage students to demonstrate understanding by representing problems in multiple ways:
- Help students make connections between concepts and representations.
- Provide opportunities for students to use manipulatives when investigating concepts.
- Guide students from concrete to pictorial to abstract representations as understanding progresses.
- Show students that various representations can have different purposes and can be useful in different situations.

Teachers who encourage students to complete tasks with mathematical fluency:
- Provide students with the flexibility to solve problems by selecting a procedure that allows them to solve efficiently and accurately.
- Offer multiple opportunities for students to practice efficient and generalizable methods.
- Provide opportunities for students to reflect on the method they used and determine if a more efficient method could have been used.

Teachers who encourage students to engage in discussions that reflect on the mathematical thinking of self and others:
- Establish a culture in which students ask questions of the teacher and their peers, and error is an opportunity for learning.
- Create opportunities for students to discuss their thinking with peers.
- Select, sequence and present student work to advance and deepen understanding of correct and increasingly efficient methods.
- Develop students' ability to justify methods and compare their responses to the responses of their peers.

**MA.K12.MTR.5.1:**
Use patterns and structure to help understand and connect mathematical concepts.
Mathematicians who use patterns and structure to help understand and connect mathematical concepts:
- Focus on relevant details within a problem.
- Create plans and procedures to logically order events, steps or ideas to solve problems.
- Decompose a complex problem into manageable parts.
- Relate previously learned concepts to new concepts.
- Look for similarities among problems.
- Connect solutions of problems to more complicated large-scale situations.

**Clarifications:**
Teachers who encourage students to use patterns and structure to help understand and connect mathematical concepts:
- Help students recognize the patterns in the world around them and connect these patterns to mathematical concepts.
- Support students to develop generalizations based on the similarities found among problems.
- Provide opportunities for students to create plans and procedures to solve problems.
- Develop students' ability to construct relationships between their current understanding and more sophisticated ways of thinking.

**Assess the reasonableness of solutions.**
Mathematicians who assess the reasonableness of solutions:
- Estimate to discover possible solutions.
- Use benchmark quantities to determine if a solution makes sense.
- Check calculations when solving problems.
- Verify possible solutions by explaining the methods used.
- Evaluate results based on the given context.

**MA.K12.MTR.6.1:**
**Clarifications:**
Teachers who encourage students to assess the reasonableness of solutions:
- Have students estimate or predict solutions prior to solving.
- Prompt students to continually ask, "Does this solution make sense? How do you know?"
- Reinforce that students check their work as they progress within and after a task.
- Strengthen students' ability to verify solutions through justifications.

**Apply mathematics to real-world contexts.**
Mathematicians who apply mathematics to real-world contexts:
- Connect mathematical concepts to everyday experiences.
- Use models and methods to understand, represent and solve problems.
- Perform investigations to gather data or determine if a method is appropriate. • Redesign models and methods to improve accuracy or efficiency.

**Clarifications:**
Teachers who encourage students to apply mathematics to real-world contexts:
- Provide opportunities for students to create models, both concrete and abstract, and perform investigations.
- Challenge students to question the accuracy of their models and methods.
- Support students as they validate conclusions by comparing them to the given situation.
- Indicate how various concepts can be applied to other disciplines.

**Cite evidence to explain and justify reasoning.**

**K-1:**
Students include textual evidence in their oral communication with guidance and support from adults. The evidence can consist of details from the text without naming the text. During 1st grade, students learn how to incorporate the evidence in their writing.

**2-3:**
Students include relevant textual evidence in their written and oral communication. Students should name the text when they refer to it. In 3rd grade, students should use a combination of direct and indirect citations.

**4-5:**
Students continue with previous skills and reference comments made by speakers and peers. Students cite texts that they've directly quoted, paraphrased, or used for information. When writing, students will use the form of citation dictated by the instructor or the style guide referenced by the instructor.

**6-8:**
Students continue with previous skills and use a style guide to create a proper citation.

**9-12:**
Students continue with previous skills and should be aware of existing style guides and the ways in which they differ.

**Read and comprehend grade-level complex texts proficiently.**

**Clarifications:**
See Text Complexity for grade-level complexity bands and a text complexity rubric.

**Make inferences to support comprehension.**

**Clarifications:**
Students will make inferences before the words infer or inference are introduced. Kindergarten students will answer questions like “Why is the girl smiling?” or make predictions about what will happen based on the title page. Students will use the terms and apply them in 2nd grade and beyond.

**Use appropriate collaborative techniques and active listening skills when engaging in discussions in a variety of situations.**

**Clarifications:**
In kindergarten, students learn to listen to one another respectfully.
ELA.K12.EE.4.1: In grades 1-2, students build upon these skills by justifying what they are thinking. For example: “I think _______ because _______. The collaborative conversations are becoming academic conversations.
In grades 3-12, students engage in academic conversations discussing claims and justifying their reasoning, refining and applying skills. Students build on ideas, propel the conversation, and support claims and counterclaims with evidence.

Use the accepted rules governing a specific format to create quality work.

ELA.K12.EE.5.1: Clarifications:
Students will incorporate skills learned into work products to produce quality work. For students to incorporate these skills appropriately, they must receive instruction. A 3rd grade student creating a poster board display must have instruction in how to effectively present information to do quality work.

ELA.K12.EE.6.1: Clarifications:
In kindergarten and 1st grade, students learn the difference between formal and informal language. For example, the way we talk to our friends differs from the way we speak to adults. In 2nd grade and beyond, students practice appropriate social and academic language to discuss texts.

Use appropriate voice and tone when speaking or writing.

ELD.K12.ELL.SC.1: English language learners communicate information, ideas and concepts necessary for academic success in the content area of Science.

ELD.K12.ELL.SI.1: English language learners communicate for social and instructional purposes within the school setting.

General Course Information and Notes

GENERAL NOTES

While the content focus of this course is consistent with the Chemistry I course, students will explore these concepts in greater depth. In general, the academic pace and rigor will be greatly increased for honors level course work. Laboratory investigations that include the use of scientific inquiry, research, measurement, problem solving, laboratory apparatus and technologies, experimental procedures, and safety procedures are an integral part of this course. The National Science Teachers Association (NSTA) recommends that at the high school level, all students should be in the science lab or field, collecting data every week. School laboratory investigations (labs) are defined by the National Research Council (NRC) as an experience in the laboratory, classroom, or the field that provides students with opportunities to interact directly with natural phenomena or with data collected by others using tools, materials, data collection techniques, and models (NRC, 2006, p. 3). Laboratory investigations in the high school classroom should help all students develop a growing understanding of the complexity and ambiguity of empirical work, as well as the skills to calibrate and troubleshoot equipment used to make observations. Learners should understand measurement error; and have the skills to aggregate, interpret, and present the resulting data (National Research Council, 2006, p. 77; NSTA, 2007).

Special Notes:

Instructional Practices:
Teaching from a range of complex text is optimized when teachers in all subject areas implement the following strategies on a routine basis:

1. Ensuring wide reading from complex text that varies in length.
2. Making close reading and rereading of texts central to lessons.
3. Emphasizing text-specific complex questions, and cognitively complex tasks, reinforce focus on the text and cultivate independence.
4. Emphasizing students supporting answers based upon evidence from the text.
5. Providing extensive research and writing opportunities (claims and evidence).


- Asking questions (for science) and defining problems (for engineering).
- Developing and using models.
- Planning and carrying out investigations.
- Analyzing and interpreting data.
- Using mathematics, information and computer technology, and computational thinking.
- Constructing explanations (for science) and designing solutions (for engineering).
- Engaging in argument from evidence.
- Obtaining, evaluating, and communicating information.

Honors and Advanced Level Course Note: Advanced courses require a greater demand on students through increased academic rigor. Academic rigor is obtained through the application, analysis, evaluation, and creation of complex ideas that are often abstract and multi-faceted. Students are challenged to think and collaborate critically on the content they are learning. Honors level rigor will be achieved by increasing text complexity through text selection, focus on high-level qualitative measures, and complexity of task. Instruction will be structured to give students a deeper understanding of conceptual themes and organization within and across disciplines. Academic rigor is more than simply assigning to students a greater quantity of work.

Florida's Benchmarks for Excellent Student Thinking (B.E.S.T.) Standards

This course includes Florida's B.E.S.T. ELA Expectations (EE) and Mathematical Thinking and Reasoning Standards (MTRs) for students. Florida educators should intentionally embed these standards within the content and their instruction as applicable. For guidance on the implementation of the EEs and MTRs, please visit https://www.cpalms.org/Standards/BEST_Standards.aspx and select the appropriate B.E.S.T. Standards package.

English Language Development ELD Standards Special Notes Section:

Teachers are required to provide listening, speaking, reading and writing instruction that allows English language learners (ELL) to communicate information, ideas and concepts for academic success in the content area of Science. The given level of English language proficiency and with visual, graphic, or interactive support, students will interact with grade level words, expressions, sentences and discourse to process or produce language necessary for academic success. The ELD standard should specify a relevant content area concept or topic of study chosen by curriculum developers and teachers which maximizes an ELL’s need for communication and social skills.

To access an ELL supporting document which delineates performance definitions and descriptors, please click on the following link:
https://cpalmsmediaprod.blob.core.windows.net/uploads/docs/standards/eld/sc.pdf

Additional Instructional Resources:
A.V.E. for Success Collection is provided by the Florida Association of School Administrators: http://www.fasa.net/4D CGI/cms/review.html?
GENERAL INFORMATION

Course Number: 2003350

Number of Credits: One (1) credit

Course Type: Core Academic Course
Course Status: State Board Approved
Grade Level(s): 9,10,11,12
Graduation Requirement: Equally Rigorous Science

Educator Certifications

| Science (Secondary Grades 7-12) |
| Chemistry (Grades 6-12) |

Equivalent Courses

| 2003340-Chemistry 1 |
| 2003800-Florida's Preinternational Baccalaureate Chemistry 1 |
Course Standards

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<td>Explain the role of enzymes as catalysts that lower the activation energy of biochemical reactions. Identify factors, such as pH and temperature, and their effect on enzyme activity.</td>
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<td>SC.912.L.18.12</td>
<td>Discuss the special properties of water that contribute to Earth’s suitability as an environment for life: cohesive behavior, ability to moderate temperature, expansion upon freezing, and versatility as a solvent.</td>
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<td>Define a problem based on a specific body of knowledge, for example: biology, chemistry, physics, and earth/space science, and do the following: 1. Pose questions about the natural world, (Articulate the purpose of the investigation and identify the relevant scientific concepts). 2. Conduct systematic observations, (Write procedures that are clear and replicable. Identify observables and examine relationships between test (independent) variable and outcome (dependent) variable. Employ appropriate methods for accurate and consistent observations; conduct and record measurements at appropriate levels of precision. Follow safety guidelines). 3. Examine books and other sources of information to see what is already known, 4. Review what is known in light of empirical evidence, (Examine whether available empirical evidence can be interpreted in terms of existing knowledge and models, and if not, modify or develop new models). 5. Plan investigations, (Design and evaluate a scientific investigation). 6. Use tools to gather, analyze, and interpret data (this includes the use of measurement in metric and other systems, and also the generation and interpretation of graphical representations of data, including data tables and graphs), (Collect data or evidence in an organized way. Properly use instruments, equipment, and materials (e.g., scales, probeware, meter sticks, microscopes, computers) including set-up, calibration, technique, maintenance, and storage). 7. Pose answers, explanations, or descriptions of events, 8. Generate explanations that explicate or describe natural phenomena (inferences), 9. Use appropriate evidence and reasoning to justify these explanations to others, 10. Communicate results of scientific investigations, and 11. Evaluate the merits of the explanations produced by others).</td>
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<td>SC.912.N.1.2</td>
<td>Describe and explain what characterizes science and its methods.</td>
</tr>
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<td>Recognize that the strength or usefulness of a scientific claim is evaluated through scientific argumentation, which depends on critical and logical thinking, and the active consideration of alternative scientific explanations to explain the data presented.</td>
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<td>SC.912.N.1.4</td>
<td>Identify sources of information and assess their reliability according to the strict standards of scientific investigation.</td>
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<td>Describe and provide examples of how similar investigations conducted in many parts of the world result in the same outcome.</td>
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<td>SC.912.N.1.6</td>
<td>Describe how scientific inferences are drawn from scientific observations and provide examples from the content being studied.</td>
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<td>Recognize the role in creativity in constructing scientific questions, methods and explanations.</td>
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<td>SC.912.N.1.21</td>
<td>Identify what is science, what clearly is not science, and what superficially resembles science (but fails to meet the criteria for science).</td>
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<td>SC.912.N.2.2</td>
<td>Identify which questions can be answered through science and which questions are outside the boundaries of scientific investigation, such as questions addressed by other ways of knowing, such as art, philosophy, and religion.</td>
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<td>SC.912.N.2.3</td>
<td>Identify examples of pseudoscience (such as astrology, phrenology) in society.</td>
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<td>SC.912.N.2.4</td>
<td>Explain that scientific knowledge is both durable and robust and open to change. Scientific knowledge can change because it is often examined and re-examined by new investigations and scientific argumentation. Because of these frequent examinations, scientific knowledge becomes stronger, leading to its durability.</td>
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<td>SC.912.N.2.5</td>
<td>Describe instances in which scientists’ varied backgrounds, talents, interests, and goals influence the inferences and thus the explanations that they make about observations of natural phenomena and describe that competing interpretations (explanations) of scientists are a strength of science as they are a source of new, testable ideas that have the potential to add new evidence to support one or another of the explanations.</td>
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<td>Weigh the merits of alternative strategies for solving a specific societal problem by comparing a number of different costs and benefits, such as human, economic, and environmental.</td>
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<tr>
<td>SC.912.P.8.10</td>
<td>Describe oxidation-reduction reactions in living and non-living systems.</td>
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Chemistry 2 Honors (#2003360) 2015 - 2022 (current)
Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the strengths and limitations of each source in terms of the specific task, purpose, and audience; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and overreliance on any one source and following a standard format for citation.

Write routinely over extended time frames (time for reflection and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences.

For a function that models a relationship between two quantities, interpret key features of graphs and tables in terms of the quantities, and sketch graphs showing key features given a verbal description of the relationship. Key features include: intercepts; intervals where the function is increasing, decreasing, positive, or negative; relative maximums and minimums; symmetries; end behavior; and periodicity. ★

Graph functions expressed symbolically and show key features of the graph, by hand in simple cases.

- a. Graph linear and quadratic functions and show intercepts, maxima, and minima.
- b. Graph square root, cube root, and piecewise-defined functions, including step functions and absolute value functions.
- c. Graph polynomial functions, identifying zeros when suitable factorizations are available, and showing end behavior.
- d. Graph rational functions, identifying zeros and asymptotes when suitable factorizations are available, and showing end behavior.
- e. Graph exponential and logarithmic functions, showing intercepts and end behavior, and trigonometric functions, showing period, midline, and amplitude, and using phase shift.

Apply concepts of density based on area and volume in modeling situations (e.g., persons per square mile, BTUs per cubic foot). ★

Mathematically proficient students can explain correspondences between equations, verbal descriptions, tables, and graphs or draw diagrams of important features and relationships, graph data, and search for regularity or trends. Younger students might rely on using concrete objects or pictures to help conceptualize and solve a problem. Mathematically proficient students check their answers to problems using a different method, and they continually ask themselves, “Does this make sense?” They can understand the approaches of others to solving complex problems and identify correspondences between different approaches.

Students take a more sophisticated look at using a linear function to model the relationship between two numerical variables. In addition to fitting a line to data, students assess how well the model fits by analyzing residuals.
Mathematically proficient students understand and use stated assumptions, definitions, and previously established results in constructing arguments. They make conjectures and build a logical progression of statements to explore the truth of their conjectures. They are able to analyze situations by breaking them into cases, and can recognize and use counterexamples. They justify their conclusions, communicate them to others, and respond to the arguments of others. They reason inductively about data, making plausible arguments that take into account the context from which the data arose. Mathematically proficient students are also able to compare the effectiveness of two plausible arguments, distinguish correct logic or reasoning from that which is flawed, and— if there is a flaw in an argument—explain what it is. Elementary students can construct arguments using concrete referents such as objects, drawings, diagrams, and actions. Such arguments can make sense and be correct, even though they are not generalized or made formal until later grades. Later, students learn to determine domains to which an argument applies. Students at all grades can listen or read the arguments of others, decide whether they make sense, and ask useful questions to clarify or improve the arguments.

Use appropriate tools strategically.

Proficient students consider the available tools when solving a mathematical problem. These tools might include pencil and paper, concrete models, a ruler, a protractor, a calculator, a spreadsheet, a computer algebra system, a statistical package, or dynamic geometry software. Proficient students are sufficiently familiar with tools appropriate for their grade or course to make sound decisions about when each of these tools might be helpful, recognizing both the insight to be gained and their limitations. For example, mathematically proficient high school students analyze graphs of functions and solutions generated using a graphing calculator. They detect possible errors by strategically using estimation and other mathematical knowledge. When making mathematical models, they know that technology can enable them to visualize the results of varying assumptions, explore consequences, and compare predictions with data. Mathematically proficient students at various grade levels are able to identify relevant external mathematical resources, such as digital content located on a website, and use them to pose or solve problems. They are able to use technological tools to explore and deepen their understanding of concepts.

Look for and express regularity in repeated reasoning.

Proficient students notice if calculations are repeated, and look both for general methods and for shortcuts. Upper elementary students might notice when dividing 25 by 11 that they are repeating the same calculations over and over again, and conclude they have a repeating decimal. By paying attention to the calculation of slope as they repeatedly check whether points are on the line through (1, 2) with slope 3, students will see 7 × 8 equals the well remembered 7 × 5 + 7 × 3, in preparation for learning about the distributive property. In the expression x² + 9x + 14, older students can see the 14 as 2 × 7 and recognize the significance of an existing line in a geometric figure and can use the strategy of drawing an auxiliary line for solving problems. They also can step back for an overview and shift perspective. They can see complicated things, such as some algebraic expressions, as single objects or as being composed of several objects. For example, they can see 5 – (x – y)² as 5 minus a positive number times a square and use that to realize that its value cannot be more than 5 for any real numbers x and y.

Mathematically proficient students communicate information, ideas and concepts necessary for academic success in the content area of Science.

ELD.K12.ELL.SL.1: English language learners communicate for social and instructional purposes within the school setting.
Laboratory investigations that include the use of scientific inquiry, research, measurement, problem solving, laboratory apparatus and technologies, experimental procedures, and safety procedures are an integral part of this course. The National Science Teachers Association (NSTA) recommends that at the high school level, all students be in the science lab or field, collecting data every week. School laboratory investigations (labs) are defined by the National Research Council (NRC) as an experience in the laboratory, classroom, or the field that provides students with opportunities to interact directly with natural phenomena or with data collected by others using tools, materials, data collection techniques, and models (NRC, 2006, p. 3). Laboratory investigations in the high school classroom should help all students develop a growing understanding of the complexity and ambiguity of empirical work, as well as the skills to calibrate and troubleshoot equipment used to make observations. Learners should understand measurement error; and have the skills to aggregate, interpret, and present the resulting data (National Research Council, 2006, p.77; NSTA, 2007).

Special Notes:

Instructional Practices: Teaching from a range of complex text is optimized when teachers in all subject areas implement the following strategies on a routine basis:

1. Ensuring wide reading from complex text that varies in length.
2. Making close reading and rereading of texts central to lessons.
3. Emphasizing text-specific complex questions, and cognitively complex tasks, reinforce focus on the text and cultivate independence.
4. Emphasizing students supporting answers based upon evidence from the text.
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- Asking questions (for science) and defining problems (for engineering).
- Developing and using models.
- Planning and carrying out investigations.
- Analyzing and interpreting data.
- Using mathematics, information and computer technology, and computational thinking.
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- Engaging in argument from evidence.
- Obtaining, evaluating, and communicating information.

Honors and Advanced Level Course Note: Advanced courses require a greater demand on students through increased academic rigor. Academic rigor is obtained through the application, analysis, evaluation, and creation of complex ideas that are often abstract and multi-faceted. Students are challenged to think and collaborate critically on the content they are learning. Honors level rigor will be achieved by increasing text complexity through text selection, focus on high-level qualitative measures, and complexity of task. Instruction will be structured to give students a deeper understanding of conceptual themes and organization within and across disciplines. Academic rigor is more than simply assigning to students a greater quantity of work.

Literacy Standards in Science

Secondary science courses include reading standards for literacy in science and technical subjects 6-12 and writing standards for literacy in history/social studies, science, and technical subjects 6-12. The courses also include speaking and listening standards. For a complete list of standards required for this course click on the blue tile labeled course standards. You may also download the complete course including all required standards and notes sections using the export function located at the top of this page.

English Language Development ELD Standards Special Notes Section:

Teachers are required to provide listening, speaking, reading and writing instruction that allows English language learners (ELL) to communicate information, ideas and concepts for academic success in the content area of Science. For the given level of English language proficiency and with visual, graphic, or interactive support, students will interact with grade level words, expressions, sentences and discourse to process or produce language necessary for academic success. The ELD standard should specify a relevant content area concept or topic of study chosen by curriculum developers and teachers which maximizes an ELL's need for communication and social skills. To access an ELL supporting document which delineates performance definitions and descriptors, please click on the following link: https://cpalmsmediaprod.blob.core.windows.net/uploads/docs/standards/eld/sc.pdf

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   Courses > Grade Group: Grades 9 to 12 and Adult Education Courses > Subject: Science > SubSubject: Chemistry |
| **Abbreviated Title:** CHEM 2 HON |
| **Number of Credits:** One (1) credit |
| **Course Length:** Year (Y) |
| **Course Attributes:**  
   • Honors |
| **Course Type:** Core Academic Course |
| **Course Status:** Course Approved |
| **Grade Level(s):** 9,10,11,12 |
| **Graduation Requirement:** Equally Rigorous Science |

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**Educator Certifications**

| Science (Secondary Grades 7-12)  
Chemistry (Grades 6-12) |

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**Equivalent Courses**
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</table>
Describe the properties of the carbon atom that make the diversity of carbon compounds possible.

Identify selected functional groups and relate how they contribute to properties of carbon compounds.

Explain entropy's role in determining the efficiency of processes that convert energy to work.

Mathematicians who participate in effortful learning both individually and with others:
- Analyze the problem in a way that makes sense given the task.
- Ask questions that will help with solving the task.
- Build perseverance by modifying methods as needed while solving a challenging task.
- Stay engaged and maintain a positive mindset when working to solve tasks.
- Help and support each other when attempting a new method or approach.

Clarifications:
Teachers who encourage students to participate actively in effortful learning both individually and with others:
- Cultivate a community of growth mindset learners.
- Foster perseverance in students by choosing tasks that are challenging.
- Develop students' ability to analyze and problem solve.
- Recognize students' effort when solving challenging problems.

Demonstrate understanding by representing problems in multiple ways.
Mathematicians who demonstrate understanding by representing problems in multiple ways:
- Build understanding through modeling and using manipulatives.
- Represent solutions to problems in multiple ways using objects, drawings, tables, graphs and equations.
- Progress from modeling problems with objects and drawings to using algorithms and equations.
- Express connections between concepts and representations.
- Choose a representation based on the given context or purpose.

Clarifications:
Teachers who encourage students to demonstrate understanding by representing problems in multiple ways:
- Help students make connections between concepts and representations.
- Provide opportunities for students to use manipulatives when investigating concepts.
- Guide students from concrete to pictorial to abstract representations as understanding progresses.
- Show students that various representations can have different purposes and can be useful in different situations.

Complete tasks with mathematical fluency.
Mathematicians who complete tasks with mathematical fluency:
- Select efficient and appropriate methods for solving problems within the given context.
- Maintain flexibility and accuracy while performing procedures and mental calculations.
- Complete tasks accurately and with confidence.
- Adapt procedures to apply them to a new context.
- Use feedback to improve efficiency when performing calculations.

Clarifications:
Teachers who encourage students to complete tasks with mathematical fluency:
- Provide students with the flexibility to solve problems by selecting a procedure that allows them to solve efficiently and accurately.
- Offer multiple opportunities for students to practice efficient and generalizable methods.
- Provide opportunities for students to reflect on the method they used and determine if a more efficient method could have been used.

Engage in discussions that reflect on the mathematical thinking of self and others.
Mathematicians who engage in discussions that reflect on the mathematical thinking of self and others:
- Communicate mathematical ideas, vocabulary and methods effectively.
- Analyze the mathematical thinking of others.
- Compare the efficiency of a method to those expressed by others.
- Recognize errors and suggest how to correctly solve the task.
- Justify results by explaining methods and processes.
- Construct possible arguments based on evidence.

Clarifications:
Teachers who encourage students to engage in discussions that reflect on the mathematical thinking of self and others:
- Establish a culture in which students ask questions of the teacher and their peers, and error is an opportunity for learning.
- Create opportunities for students to discuss their thinking with peers.
- Select, sequence and present student work to advance and deepen understanding of correct and increasingly efficient methods.
- Develop students' ability to justify methods and compare their responses to the responses of their peers.

Use patterns and structure to help understand and connect mathematical concepts.
Mathematicians who use patterns and structure to help understand and connect mathematical concepts:
- Focus on relevant details within a problem.
- Create plans and procedures to logically order events, steps or ideas to solve problems.
- Decompose a complex problem into manageable parts.
- Relate previously learned concepts to new concepts.
- Look for similarities among problems.
- Connect solutions of problems to more complicated large-scale situations.

Clarifications:
Teachers who encourage students to use patterns and structure to help understand and connect mathematical concepts:
- Help students recognize the patterns in the world around them and connect these patterns to mathematical concepts.
Assess the reasonableness of solutions.
Mathematicians who assess the reasonableness of solutions:
- Estimate to discover possible solutions.
- Use benchmark quantities to determine if a solution makes sense.
- Check calculations when solving problems.
- Verify possible solutions by explaining the methods used.
- Evaluate results based on the given context.

**Clarifications:**
Teachers who encourage students to assess the reasonableness of solutions:
- Have students estimate or predict solutions prior to solving.
- Prompt students to continually ask, “Does this solution make sense? How do you know?”
- Reinforce that students check their work as they progress within and after a task.
- Strengthen students’ ability to verify solutions through justifications.

Apply mathematics to real-world contexts.
Mathematicians who apply mathematics to real-world contexts:
- Connect mathematical concepts to everyday experiences.
- Use models and methods to understand, represent and solve problems.
- Perform investigations to gather data or determine if a method is appropriate.
- Redesign models and methods to improve accuracy or efficiency.

**Clarifications:**
Teachers who encourage students to apply mathematics to real-world contexts:
- Provide opportunities for students to create models, both concrete and abstract, and perform investigations.
- Challenge students to question the accuracy of their models and methods.
- Support students as they validate conclusions by comparing them to the given situation.
- Indicate how various concepts can be applied to other disciplines.

Cite evidence to explain and justify reasoning.

**Clarifications:**
K-1 Students include textual evidence in their oral communication with guidance and support from adults. The evidence can consist of details from the text without naming the text. During 1st grade, students learn how to incorporate the evidence in their writing.
2-3 Students include relevant textual evidence in their written and oral communication. Students should name the text when they refer to it. In 3rd grade, students should use a combination of direct and indirect citations.
4-5 Students continue with previous skills and reference comments made by speakers and peers. Students cite texts that they’ve directly quoted, paraphrased, or used for information. When writing, students will use the form of citation dictated by the instructor or the style guide referenced by the instructor.
6-8 Students continue with previous skills and use a style guide to create a proper citation.
9-12 Students continue with previous skills and should be aware of existing style guides and the ways in which they differ.

Read and comprehend grade-level complex texts proficiently.

**Clarifications:**
See Text Complexity for grade-level complexity bands and a text complexity rubric.

Make inferences to support comprehension.

**Clarifications:**
Students will make inferences before the words infer or inference are introduced. Kindergarten students will answer questions like “Why is the girl smiling?” or make predictions about what will happen based on the title page. Students will use the terms and apply them in 2nd grade and beyond.

Use appropriate collaborative techniques and active listening skills when engaging in discussions in a variety of situations.

**Clarifications:**
In kindergarten, students learn to listen to one another respectfully.
In grades 1-2, students build upon these skills by justifying what they are thinking. For example: “I think _______ because _______.” The collaborative conversations are becoming academic conversations.
In grades 3-12, students engage in academic conversations discussing claims and justifying their reasoning, refining and applying skills. Students build on ideas, propel the conversation, and support claims and counterclaims with evidence.

Use the accepted rules governing a specific format to create quality work.

**Clarifications:**
Students will incorporate skills learned into work products to produce quality work. For students to incorporate these skills appropriately, they must receive instruction. A 3rd grade student creating a poster board display must have instruction in how to effectively present information to do quality work.

Use appropriate voice and tone when speaking or writing.

**Clarifications:**
In kindergarten and 1st grade, students learn the difference between formal and informal language. For example, the way we talk to our friends differs from the way we speak to adults. In 2nd grade and beyond, students practice appropriate social and academic language to discuss texts.

English language learners communicate information, ideas and concepts necessary for academic success in the content area of Science.
General Course Information and Notes

GENERAL NOTES

Laboratory investigations that include the use of scientific inquiry, research, measurement, problem solving, laboratory apparatus and technologies, experimental procedures, and safety procedures are an integral part of this course. The National Science Teachers Association (NSTA) recommends that at the high school level, all students should be in the science lab or field, collecting data every week. School laboratory investigations (labs) are defined by the National Research Council (NRC) as an experience in the laboratory, classroom, or the field that provides students with opportunities to interact directly with natural phenomena or with data collected by others using tools, materials, data collection techniques, and models (NRC, 2006, p. 3). Laboratory investigations in the high school classroom should help all students develop a growing understanding of the complexity and ambiguity of empirical work, as well as the skills to calibrate and troubleshoot equipment used to make observations. Learners should understand measurement error; and have the skills to aggregate, interpret, and present the resulting data (National Research Council, 2006, p.77; NSTA, 2007).

Special Notes:

Instructional Practices: Teaching from a range of complex text is optimized when teachers in all subject areas implement the following strategies on a routine basis:

1. Ensuring wide reading from complex text that varies in length.
2. Making close reading and rereading of texts central to lessons.
3. Emphasizing text-specific complex questions, and cognitively complex tasks, reinforce focus on the text and cultivate independence.
4. Emphasizing students supporting answers based upon evidence from the text.
5. Providing extensive research and writing opportunities (claims and evidence).


- Asking questions (for science) and defining problems (for engineering).
- Developing and using models.
- Planning and carrying out investigations.
- Analyzing and interpreting data.
- Using mathematics, information and computer technology, and computational thinking.
- Constructing explanations (for science) and designing solutions (for engineering).
- Engaging in argument from evidence.
- Obtaining, evaluating, and communicating information.

Honors and Advanced Level Course Note: Advanced courses require a greater demand on students through increased academic rigor. Academic rigor is obtained through the application, analysis, evaluation, and creation of complex ideas that are often abstract and multi-faceted. Students are challenged to think and collaborate critically on the content they are learning. Honors level rigor will be achieved by increasing text complexity through text selection, focus on high-level qualitative measures, and complexity of task. Instruction will be structured to give students a deeper understanding of conceptual themes and organization within and across disciplines. Academic rigor is more than simply assigning to students a greater quantity of work.

Florida's Benchmarks for Excellent Student Thinking (B.E.S.T.) Standards

This course includes Florida's B.E.S.T. ELA Expectations (EE) and Mathematical Thinking and Reasoning Standards (MTRs) for students. Florida educators should intentionally embed these standards within the content and their instruction as applicable. For guidance on the implementation of the EEs and MTRs, please visit https://www.cpalms.org/Standards/BEST_Standards.aspx and select the appropriate B.E.S.T. Standards package.

English Language Development ELD Standards Special Notes Section:

Teachers are required to provide listening, speaking, reading and writing instruction that allows English language learners (ELL) to communicate information, ideas and concepts for academic success in the content area of Science. For the given level of English language proficiency and with visual, graphic, or interactive support, students will interact with grade level words, expressions, sentences and discourse to process or produce language necessary for academic success. The ELD standard should specify a relevant content area concept or topic of study chosen by curriculum developers and teachers which maximizes an ELL's need for communication and social skills. To access an ELL supporting document which delineates performance definitions and descriptors, please click on the following link: https://cpalmsmediaprod.blob.core.windows.net/uploads/docs/standards/eld/sc.pdf

GENERAL INFORMATION

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<thead>
<tr>
<th>Course Number:</th>
<th>2003360</th>
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<tbody>
<tr>
<td>Number of Credits:</td>
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<tr>
<td>Course Type:</td>
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<td>Course Status:</td>
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<td>Grade Levels:</td>
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<tr>
<td>Graduation Requirement:</td>
<td>Equally Rigorous Science</td>
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### Educator Certifications

<table>
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<tr>
<th>Science (Secondary Grades 7-12)</th>
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<tbody>
<tr>
<td>Chemistry (Grades 6-12)</td>
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</tbody>
</table>

### Equivalent Courses

| 2003820-Chemistry 3-International Baccalaureate |
General Course Information and Notes

GENERAL NOTES

The course description for this Pre-Advanced Placement (Pre-AP) course is located on the College Board site at https://pre-ap.collegeboard.org/courses.

GENERAL INFORMATION

- **Course Number:** 2003365
- **Number of Credits:** One (1) credit
- **Course Type:** Elective Course
- **Course Status:** Course Approved
- **Grade Level(s):** 9

**Course Path:** Section: Grades PreK to 12 Education Courses > Grade Group: Grades 9 to 12 and Adult Education Courses > Subject: Science > SubSubject: Chemistry

**Abbreviated Title:** PRE-AP CHEMISTRY

**Course Length:** Year (Y)

**Course Attributes:**
- Advanced Placement (AP)

**Course Level:** 3

Educator Certifications

- Chemistry (Grades 6-12)
- Science (Secondary Grades 7-12)
Advanced Placement Chemistry (#2003370) 2014 - And Beyond

(current)

General Course Information and Notes

GENERAL NOTES

The course description for this Advanced Placement courses is located on the College Board site at http://apcentral.collegeboard.com/apc/public/courses/teachers_corner/index.html.

GENERAL INFORMATION

Course Number: 2003370
Number of Credits: One (1) credit
Course Type: Core Academic Course
Course Status: Course Approved
Grade Level(s): 9,10,11,12
Graduation Requirement: Equally Rigorous Science

Educator Certifications

Science (Secondary Grades 7-12)
Chemistry (Grades 6-12)

Equivalent Courses

2003371-Cambridge AICE Chemistry 1 AS Level
General Course Information and Notes

GENERAL NOTES

For more information about this Cambridge course, visit http://www.cie.org.uk/programmes-and-qualifications/cambridge-advanced/cambridge-international-as-and-a-levels/curriculum/.

GENERAL INFORMATION

Course Number: 2003371

Number of Credits: One (1) credit

Course Type: Core Academic Course

Course Status: Course Approved

Grade Level(s): 9, 10, 11, 12

Graduation Requirement: Equally Rigorous Science

Educator Certifications

Science (Secondary Grades 7-12)
Chemistry (Grades 6-12)

Equivalent Courses

2003370-Advanced Placement Chemistry
General Course Information and Notes

GENERAL NOTES


GENERAL INFORMATION

Course Number: 2003372

Course Path: Section: Grades PreK to 12 Education
Courses > Grade Group: Grades 9 to 12 and Adult Education Courses > Subject: Science > SubSubject: Chemistry

Abbreviated Title: PRE-AICE CHEM IG

Number of Credits: One (1) credit

Course Length: Year (Y)

Course Attributes:
- Advanced International Certificate of Education (AICE)

Course Level: 3

Course Status: Course Approved

Grade Level(s): 9, 10, 11, 12

Graduation Requirement: Equally Rigorous Science

Educator Certifications

Science (Secondary Grades 7-12)
Chemistry (Grades 6-12)
Cambridge AICE Chemistry 2 A Level (#2003373) 2014 - And Beyond (current)

General Course Information and Notes

**GENERAL NOTES**


**GENERAL INFORMATION**

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<td>Graduation Requirement:</td>
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<td>Abbreviated Title:</td>
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<td>Course Path:</td>
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### Course Standards

<table>
<thead>
<tr>
<th>Name</th>
<th>Description</th>
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<tbody>
<tr>
<td>SC.912.E.5.2:</td>
<td>Identify patterns in the organization and distribution of matter in the universe and the forces that determine them.</td>
</tr>
<tr>
<td>SC.912.E.5.6:</td>
<td>Develop logical connections through physical principles, including Kepler's and Newton's Laws about the relationships and the effects of Earth, Moon, and Sun on each other.</td>
</tr>
<tr>
<td>SC.912.N.1.1:</td>
<td>Define a problem based on a specific body of knowledge, for example: biology, chemistry, physics, and earth/space science, and do the following:</td>
</tr>
<tr>
<td></td>
<td>1. Pose questions about the natural world. (Articulate the purpose of the investigation and identify the relevant scientific concepts).</td>
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<tr>
<td></td>
<td>2. Conduct systematic observations. (Write procedures that are clear and replicable. Identify observables and examine relationships between test (independent) variable and outcome (dependent) variable. Employ appropriate methods for accurate and consistent observations; conduct and record measurements at appropriate levels of precision. Follow safety guidelines).</td>
</tr>
<tr>
<td></td>
<td>3. Examine books and other sources of information to see what is already known,</td>
</tr>
<tr>
<td></td>
<td>4. Review what is known in light of empirical evidence. (Examine whether available empirical evidence can be interpreted in terms of existing knowledge and models, and if not, modify or develop new models).</td>
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<tr>
<td></td>
<td>5. Plan investigations. (Design and evaluate a scientific investigation).</td>
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<td></td>
<td>6. Use tools to gather, analyze, and interpret data (this includes the use of measurement in metric and other systems, and also the generation and interpretation of graphical representations of data, including data tables and graphs).</td>
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<tr>
<td></td>
<td>7. Pose answers, explanations, or descriptions of events,</td>
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<td></td>
<td>8. Generate explanations that explicate or describe natural phenomena (inferences),</td>
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<td></td>
<td>9. Use appropriate evidence and reasoning to justify these explanations to others,</td>
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<tr>
<td></td>
<td>10. Communicate results of scientific investigations, and</td>
</tr>
<tr>
<td></td>
<td>11. Evaluate the merits of the explanations produced by others.</td>
</tr>
<tr>
<td>SC.912.N.1.2:</td>
<td>Describe and explain what characterizes science and its methods.</td>
</tr>
<tr>
<td>SC.912.N.1.5:</td>
<td>Describe and provide examples of how similar investigations conducted in many parts of the world result in the same outcome.</td>
</tr>
<tr>
<td>SC.912.N.1.6:</td>
<td>Describe how scientific inferences are drawn from scientific observations and provide examples from the content being studied.</td>
</tr>
<tr>
<td>SC.912.N.1.7:</td>
<td>Recognize the role of creativity in constructing scientific questions, methods and explanations.</td>
</tr>
<tr>
<td>SC.912.N.2.2:</td>
<td>Identify which questions can be answered through science and which questions are outside the boundaries of scientific investigation, such as questions addressed by other ways of knowing, such as art, philosophy, and religion.</td>
</tr>
<tr>
<td>SC.912.N.2.4:</td>
<td>Explain that scientific knowledge is both durable and robust and open to change. Scientific knowledge can change because it is often examined and re-examined by new investigations and scientific argumentation. Because of these frequent examinations, scientific knowledge becomes stronger, leading to its durability.</td>
</tr>
<tr>
<td>SC.912.N.2.5:</td>
<td>Describe instances in which scientists' varied backgrounds, talents, interests, and goals influence the inferences and thus the explanations that they make about observations of natural phenomena and describe that competing interpretations (explanations) of scientists are a strength of science as they are a source of new, testable ideas that have the potential to add new evidence to support one or another of the explanations.</td>
</tr>
<tr>
<td>SC.912.N.3.2:</td>
<td>Describe the role consensus plays in the historical development of a theory in any one of the disciplines of science.</td>
</tr>
<tr>
<td>SC.912.N.3.3:</td>
<td>Explain that scientific laws are descriptions of specific relationships under given conditions in nature, but do not offer explanations for those relationships.</td>
</tr>
<tr>
<td>SC.912.N.3.4:</td>
<td>Recognize that theories do not become laws, nor do laws become theories; theories are well supported explanations and laws are well supported descriptions.</td>
</tr>
<tr>
<td>SC.912.N.3.5:</td>
<td>Describe the function of models in science, and identify the wide range of models used in science.</td>
</tr>
<tr>
<td>SC.912.N.4.1:</td>
<td>Explain how scientific knowledge and reasoning provide an empirically-based perspective to inform society's decision making.</td>
</tr>
<tr>
<td>SC.912.P.8.1:</td>
<td>Differentiate among the four states of matter.</td>
</tr>
<tr>
<td>SC.912.P.8.3:</td>
<td>Explore the scientific theory of atoms (also known as atomic theory) by describing changes in the atomic model over time and why those changes were necessitated by experimental evidence.</td>
</tr>
<tr>
<td>SC.912.P.10.1:</td>
<td>Differentiate among the various forms of energy and recognize that they can be transformed from one form to others.</td>
</tr>
<tr>
<td>SC.912.P.10.2:</td>
<td>Explore the Law of Conservation of Energy by differentiating among open, closed, and isolated systems and explain that the total energy in an isolated system is a conserved quantity.</td>
</tr>
<tr>
<td>SC.912.P.10.3:</td>
<td>Compare and contrast work and power qualitatively and quantitatively.</td>
</tr>
<tr>
<td>SC.912.P.10.4:</td>
<td>Describe heat as the energy transferred by convection, conduction, and radiation, and explain the connection of heat to change in temperature or states of matter.</td>
</tr>
<tr>
<td>SC.912.P.10.5:</td>
<td>Relate temperature to the average molecular kinetic energy.</td>
</tr>
<tr>
<td>SC.912.P.10.10:</td>
<td>Compare the magnitude and range of the four fundamental forces (gravitational, electromagnetic, weak nuclear, strong nuclear).</td>
</tr>
<tr>
<td>SC.912.P.10.13:</td>
<td>Relate the configuration of static charges to the electric field, electric force, electric potential, and electric potential energy.</td>
</tr>
<tr>
<td>SC.912.P.10.15:</td>
<td>Investigate and explain the relationships among current, voltage, resistance, and power.</td>
</tr>
<tr>
<td>SC.912.P.10.18:</td>
<td>Explore the theory of electromagnetism by comparing and contrasting the different parts of the electromagnetic spectrum in terms of wavelength, frequency, and energy, and relate them to phenomena and applications.</td>
</tr>
<tr>
<td>SC.912.P.10.20:</td>
<td>Describe the measurable properties of waves and explain the relationships among them and how these properties change when the wave moves from one medium to another.</td>
</tr>
<tr>
<td>SC.912.P.10.21:</td>
<td>Qualitatively describe the shift in frequency in sound or electromagnetic waves due to the relative motion of a source or a receiver.</td>
</tr>
<tr>
<td>SC.912.P.10.22:</td>
<td>Construct ray diagrams and use thin lens and mirror equations to locate the images formed by lenses and mirrors.</td>
</tr>
</tbody>
</table>
Distinguish between scalar and vector quantities and assess which should be used to describe an event.

Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience.

Recognize that time, length, and energy depend on the frame of reference.

Recognize that nothing travels faster than the speed of light in vacuum which is the same for all observers no matter how they or the light source are moving.

Determine the central ideas or conclusions of a text; summarize complex ideas, concepts, and information presented in a text by paraphrasing them in simpler but still accurate terms.

Integrate and evaluate multiple sources of information presented in diverse formats and media, including digital media, in order to address a question or solve a problem.

Integrate multiple sources of information presented in diverse formats and media (e.g., quantitative data, video, multimedia) in order to address a question or solve a problem.

Evaluate the hypotheses, data, analysis, and conclusions in a science or technical text, verifying the data when possible and corroborating or challenging conclusions with other information when possible.

Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g., quantitative data, video, multimedia) in order to address a question or solve a problem.

Distinguish between scalar and vector quantities and assess which should be used to describe an event.

Interpret and apply Newton's three laws of motion.

Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 11–12 texts and topics.

Analyze how the text structures information or ideas into categories or hierarchies, demonstrating understanding of the information or ideas.

Analyze the author's purpose in providing an explanation, describing a procedure, or discussing an experiment in a text; identifying important issues that remain unresolved.

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Conclusion: 

By the end of grade 12, read and comprehend science/technical texts in grades 11–12 topics, texts, and issues, building on others' ideas and expressing their own clearly and persuasively.

Introduce claim(s) and counterclaim(s) when useful to aiding comprehension.

Propel conversations by posing and responding to questions that probe reasoning and evidence; ensure a hearing for a full range of positions on a topic or issue; clarify, verify, or challenge ideas and conclusions; and promote divergent and creative perspectives.

Respond thoughtfully to diverse perspectives; synthesize comments, claims, and evidence made on all sides of an issue; resolve contradictions when possible; and determine what additional information or research is required to deepen the investigation or complete the task.

Integrate multiple sources of information presented in diverse formats and media (e.g., quantitative data, video, multimedia) in order to address a question or solve a problem.

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Integrate multiple sources of information presented in diverse formats and media (e.g., quantitative data, video, multimedia) in order to address a question or solve a problem.
Use technology, including the Internet, to produce, publish, and update individual or shared writing products in response to ongoing feedback, including new arguments or information.

Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation.

Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the strengths and limitations of each source in terms of the specific task, purpose, and audience; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and overrelevance on any one source and following a standard format for citation.

Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays.

For a function that models a relationship between two quantities, interpret key features of graphs and tables in terms of the quantities, and sketch graphs showing key features given a verbal description of the relationship. Key features include: intercepts; intervals where the function is increasing, decreasing, positive, or negative; relative maximums and minimums; symmetries; end behavior; and periodicity.

Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases.

Graph linear and quadratic functions, identifying zeros when suitable factorizations are available, and showing end behavior.

Graph rational functions, identifying zeros and asymptotes when suitable factorizations are available, and showing end behavior.

Graph exponential and logarithmic functions, showing intercepts and end behavior, and trigonometric functions, showing period, midline, and amplitude, and using phase shift.

Apply concepts of density based on area and volume in modeling situations (e.g., persons per square mile, BTUs per cubic foot).

Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays.

Choose a level of accuracy appropriate to limitations on measurement when reporting quantities.

Solve problems involving velocity and other quantities that can be represented by vectors.

Represent data with plots on the real number line (dot plots, histograms, and box plots).

Use statistics appropriate to the shape of the data distribution to compare center (median, mean) and spread (interquartile range, standard deviation) of two or more different data sets.

In grades 6 – 8, students describe center and spread in a data distribution. Here they choose a summary statistic appropriate to the characteristics of the data distribution, such as the shape of the distribution or the existence of extreme data points.

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Use the mean and standard deviation of a data set to fit it to a normal distribution and to estimate population percentages. Recognize that there are data sets for which such a procedure is not appropriate. Use calculators, spreadsheets, and tables to estimate areas under the normal curve.

Summarize categorical data for two categories in two-way frequency tables. Interpret relative frequencies in the context of the data (including joint, marginal, and conditional relative frequencies). Recognize possible associations and trends in the data.

Make sense of problems and persevere in solving them.

Mathematically proficient start by explaining to themselves the meaning of a problem and looking for entry points to its solution. They analyze givens, constraints, relationships, and goals. They make conjectures about the form and meaning of the solution and plan a solution pathway rather than simply jumping into a solution attempt. They consider analogous problems, and try special cases and simpler forms of the original problem in order to gain insight into its solution. They monitor and evaluate their progress and change course if necessary. Older students might, depending on the context of the problem, transform algebraic expressions or change the viewing window on their graphing calculator to get the information they need. Mathematically proficient students can explain correspondences between equations, verbal descriptions, tables, and graphs or draw diagrams of important features and relationships, graph data, and search for regularity in trends. Younger students might rely on using concrete objects or pictures to help conceptualize and solve a problem. Mathematically proficient students check their answers to problems using a different method, and they continually ask themselves, “Does this make sense?” They can understand the approaches of others to solving complex problems and identify correspondences between different approaches.

Reason abstractly and quantitatively.

Mathematically proficient students make sense of quantities and their relationships in problem situations. They bring two complementary abilities to bear on problems involving quantitative relationships: the ability to decontextualize—to abstract a given situation and represent it symbolically and manipulate the representing symbols as if they have a life of their own, without necessarily attending to their referents—and the ability to contextualize, to pause as needed during the manipulation process in order to probe into the referents for the symbols involved. Quantitative reasoning entails habits of creating a coherent representation of the problem at hand; considering the units involved; attending to the meaning of quantities, not just how to compute them; and knowing and flexibly using different properties of operations and relations.

Construct viable arguments and critique the reasoning of others.

Mathematically proficient students understand and use stated assumptions, definitions, and previously established results in constructing arguments. They make conjectures and build a logical progression of statements to explore the truth of their conjectures. They are able to analyze situations by breaking them into cases, and can recognize and use counterexamples. They justify their conclusions, communicate them to others, and respond to the arguments of others. They reason inductively about data, making plausible arguments that take into account the context from
which the data arose. Mathematically proficient students are also able to compare the effectiveness of two plausible arguments, distinguish correct logic or reasoning from that which is flawed, and—if there is a flaw in an argument—explain what it is. Elementary students can construct arguments using concrete referents such as objects, drawings, diagrams, and actions. Such arguments can make sense and be correct, even though they are not generalized or made formal until later grades. Later, students learn to determine domains to which an argument applies. Students at all grades can listen or read the arguments of others, decide whether they make sense, and ask useful questions to clarify or improve the arguments.

**Standard Relation to Course: Supporting**

**Model with mathematics.**

Mathematically proficient students can apply the mathematics they know to solve problems arising in everyday life, society, and the workplace. In early grades, this might be as simple as writing an addition equation to describe a situation. In middle grades, a student might apply proportional reasoning to plan a school event or analyze a problem in the community. By high school, a student might use geometry to solve a design problem or use a function to describe how one quantity of interest depends on another. Mathematically proficient students who can apply what they know are comfortable making assumptions and approximations to simplify a complicated situation, realizing that these may need revision later. They are able to identify important quantities in a practical situation and map their relationships using such tools as diagrams, two-way tables, graphs, flowcharts and formulas. They can analyze those relationships mathematically to draw conclusions. They routinely interpret their mathematical results in the context of the situation and reflect on whether the results make sense, possibly improving the model if it has not served its purpose.

**Use appropriate tools strategically.**

Mathematically proficient students consider the available tools when solving a mathematical problem. These tools might include pencil and paper, concrete models, a ruler, a protractor, a calculator, a spreadsheet, a computer algebra system, a statistical package, or dynamic geometry software. Proficient students are sufficiently familiar with tools appropriate for their grade or course to make sound decisions about when each of these tools might be helpful, recognizing both the insight to be gained and their limitations. For example, mathematically proficient high school students analyze graphs of functions and solutions generated using a graphing calculator. They detect possible errors by strategically using estimation and other mathematical knowledge. When making mathematical models, they know that technology can enable them to visualize the results of varying assumptions, explore consequences, and compare predictions with data. Mathematically proficient students at various grade levels are able to identify relevant external mathematical resources, such as digital content located on a website, and use them to pose or solve problems. They are able to use technological tools to explore and deepen their understanding of concepts.

**Attend to precision.**

Mathematically proficient students try to communicate precisely to others. They try to use clear definitions in discussion with others and in their own reasoning. They state the meaning of the symbols they choose, including using the equal sign consistently and appropriately. They are careful about specifying units of measure, and labeling axes to clarify the correspondence with quantities in a problem. They calculate accurately and efficiently, express numerical answers with a degree of precision appropriate for the problem context. In the elementary grades, students give carefully formulated explanations to each other. By the time they reach high school they have learned to examine claims and make explicit use of definitions.

**Look for and make use of structure.**

Mathematically proficient students look closely to discern a pattern or structure. Young students, for example, might notice that three and seven more is the same amount as seven and three more, or they may sort a collection of shapes according to how many sides the shapes have. Later, students will see 7 × 8 equals the well remembered 56 + 7 × 3, in preparation for learning about the distributive property. In the expression x² + 9x + 14, older students can see the 14 as 2 × 7. They recognize the significance of an existing line in a geometric figure and can use the strategy of drawing an auxiliary line for solving problems. They also can step back for an overview and shift perspective. They can see complicated things, such as some algebraic expressions, as single objects or as being composed of several objects. For example, they can see 5 – 3(x – y²) as 5 minus a positive number times a square and use that to realize that its value cannot be more than 5 for any real numbers x and y.

**Look for and express regularity in repeated reasoning.**

Mathematically proficient students notice if calculations are repeated, and look both for general methods and for shortcuts. Upper elementary students might notice when dividing 25 by 11 that they are repeating the same calculations over and over again, and conclude they have a repeating decimal. By paying attention to the calculation of slope as they repeatedly check whether points are on the line through (1, 2) with slope 3, middle school students might abstract the equation (y – 2)/(x – 1) = 3. Noticing the regularity in the way terms cancel when expanding (x – 1)(x + 1), (x – 1)(x² + x + 1), and (x – 1)(x³ + x² + x + 1) might lead them to the general formula for the sum of a geometric series. As they work to solve a problem, mathematically proficient students maintain oversight of the process, while attending to the details. They continually evaluate the reasonableness of their intermediate results.

**English language learners communicate information, ideas and concepts necessary for academic success in the content area of Science.**

**English language learners communicate for social and instructional purposes within the school setting.**

**GENERAL NOTES**

Laboratory investigations that include the use of scientific inquiry, research, measurement, problem solving, laboratory apparatus and technologies, experimental procedures, and safety procedures are an integral part of this course. The National Science Teachers Association (NSTA) recommends that at the high school level, all students should be in the science lab or field, collecting data every week. School laboratory investigations (labs) are defined by the National Research Council (NRC) as an experience in the laboratory, classroom, or the field that provides students with opportunities to interact directly with natural phenomena or with data collected by others using tools, materials, data collection techniques, and models (NRC, 2006, p. 3). Laboratory investigations in the high school classroom should help all students develop a growing understanding of the complexity and ambiguity of empirical work, as well as the skills to calibrate and troubleshoot equipment used to make observations. Learners
Special Notes:

Teaching from a range of complex text is optimized when teachers in all subject areas implement the following strategies on a routine basis:

1. Ensuring wide reading from complex text that varies in length.
2. Making close reading and rereading of texts central to lessons.
3. Emphasizing text-specific complex questions, and cognitively complex tasks, reinforce focus on the text and cultivate independence.
4. Emphasizing students supporting answers based upon evidence from the text.
5. Providing extensive research and writing opportunities (claims and evidence).


- Asking questions (for science) and defining problems (for engineering).
- Developing and using models.
- Planning and carrying out investigations.
- Analyzing and interpreting data.
- Using mathematics, information and computer technology, and computational thinking.
- Constructing explanations (for science) and designing solutions (for engineering).
- Engaging in argument from evidence.
- Obtaining, evaluating, and communicating information.

Literacy Standards in Science

Secondary science courses include reading standards for literacy in science and technical subjects 6-12 and writing standards for literacy in history/social studies, science, and technical subjects 6-12. The courses also include speaking and listening standards. For a complete list of standards required for this course click on the blue tile labeled course standards. You may also download the complete course including all required standards and notes sections using the export function located at the top of this page.

English Language Development ELD Standards Special Notes Section:

Teachers are required to provide listening, speaking, reading and writing instruction that allows English language learners (ELL) to communicate information, ideas and concepts for academic success in the content area of Science. For the given level of English language proficiency and with visual, graphic, or interactive support, students will interact with grade level words, expressions, sentences and discourse to process or produce language necessary for academic success. The ELD standard should specify a relevant content area concept or topic of study chosen by curriculum developers and teachers which maximizes an ELL's need for communication and social skills. To access an ELL supporting document which delineates performance definitions and descriptors, please click on the following link: https://cpalmsmediaprod.blob.core.windows.net/uploads/docs/standards/eld/sc.pdf

Additional Instructional Resources:

A.V.E. for Success Collection is provided by the Florida Association of School Administrators: http://www.fasa.net/4DCGI/cms/review.html?Action=CMS_Document&DocID=139. Please be aware that these resources have not been reviewed by CPALMS and there may be a charge for the use of some of them in this collection.

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**GENERAL INFORMATION**

**Course Number:** 2003380

**Course Path:** Section: Grades PreK to 12 Education
Courses > Grade Group: Grades 9 to 12 and Adult Education Courses > Subject: Science > SubSubject: Physical Sciences >

**Abbreviated Title:** PHYS 1

**Number of Credits:** One (1) credit

**Course Type:** Core Academic Course

**Course Status:** Course Approved

**Grade Level(s):** 9,10,11,12

**Graduation Requirement:** Equally Rigorous Science

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**Educator Certifications**

| Science (Secondary Grades 7-12) |
| Physics (Grades 6-12) |
Course Standards

<table>
<thead>
<tr>
<th>Name</th>
<th>Description</th>
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<tbody>
<tr>
<td>SC.912.E.5.2:</td>
<td>Identify patterns in the organization and distribution of matter in the universe and the forces that determine them.</td>
</tr>
<tr>
<td>SC.912.E.5.6:</td>
<td>Define a problem based on a specific body of knowledge, for example: biology, chemistry, physics, and earth/space science, and do the following:</td>
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<tr>
<td></td>
<td>1. Pose questions about the natural world, (Articulate the purpose of the investigation and identify the relevant scientific concepts).</td>
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<td></td>
<td>2. Conduct systematic observations, (Write procedures that are clear and replicable. Identify observables and examine relationships between</td>
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<td></td>
<td>test (independent) variable and outcome (dependent) variable. Employ appropriate methods for accurate and consistent observations;</td>
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<td></td>
<td>conduct and record measurements at appropriate levels of precision. Follow safety guidelines).</td>
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<td>3. Examine books and other sources of information to see what is already known,</td>
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<td></td>
<td>4. Review what is known in light of empirical evidence, (Examine whether available empirical evidence can be interpreted in terms of</td>
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<td>existing knowledge and models, and if not, modify or develop new models).</td>
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<td></td>
<td>5. Plan investigations, (Design and evaluate a scientific investigation).</td>
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<td></td>
<td>6. Use tools to gather, analyze, and interpret data (this includes the use of measurement in metric and other systems, and also the</td>
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<td>generation and interpretation of graphical representations of data, including data tables and graphs), (Collect data or evidence in an</td>
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<td></td>
<td>organized way. Properly use instruments, equipment, and materials (e.g., scales, probeware, meter sticks, microscopes, computers) including set-up, calibration, technique, maintenance, and storage).</td>
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<td></td>
<td>7. Pose answers, explanations, or descriptions of events,</td>
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<td></td>
<td>8. Generate explanations that explicate or describe natural phenomena (inferences),</td>
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<td></td>
<td>9. Use appropriate evidence and reasoning to justify these explanations to others,</td>
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<td></td>
<td>10. Communicate results of scientific investigations, and</td>
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<td></td>
<td>11. Evaluate the merits of the explanations produced by others.</td>
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<tr>
<td>SC.912.N.1.2:</td>
<td>Describe and explain what characterizes science and its methods.</td>
</tr>
<tr>
<td>SC.912.N.1.5:</td>
<td>Describe and provide examples of how similar investigations conducted in many parts of the world result in the same outcome.</td>
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<tr>
<td>SC.912.N.1.6:</td>
<td>Describe how scientific inferences are drawn from scientific observations and provide examples from the content being studied.</td>
</tr>
<tr>
<td>SC.912.N.1.7:</td>
<td>Recognize the role of creativity in constructing scientific questions, methods and explanations.</td>
</tr>
<tr>
<td>SC.912.N.2.2:</td>
<td>Identify which questions can be answered through science and which questions are outside the boundaries of scientific investigation, such as questions addressed by other ways of knowing, such as art, philosophy, and religion.</td>
</tr>
<tr>
<td>SC.912.N.2.4:</td>
<td>Explain that scientific knowledge is both durable and robust and open to change. Scientific knowledge can change because it is often examined and re-examined by new investigations and scientific argumentation. Because of these frequent examinations, scientific knowledge becomes stronger, leading to its durability.</td>
</tr>
<tr>
<td>SC.912.N.2.5:</td>
<td>Describe instances in which scientists' varied backgrounds, talents, interests, and goals influence the inferences and thus the explanations that they make about observations of natural phenomena and describe that competing interpretations (explanations) of scientists are a strength of science as they are a source of new, testable ideas that have the potential to add new evidence to support one or another of the explanations.</td>
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<tr>
<td>SC.912.N.3.2:</td>
<td>Describe the role consensus plays in the historical development of a theory in any one of the disciplines of science.</td>
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<tr>
<td>SC.912.N.3.3:</td>
<td>Explain that scientific laws are descriptions of specific relationships under given conditions in nature, but do not offer explanations for those relationships.</td>
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<tr>
<td>SC.912.N.3.4:</td>
<td>Recognize that theories do not become laws, nor do laws become theories; theories are well supported explanations and laws are well supported descriptions.</td>
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<tr>
<td>SC.912.N.3.5:</td>
<td>Describe the function of models in science, and identify the wide range of models used in science.</td>
</tr>
<tr>
<td>SC.912.N.4.1:</td>
<td>Explain how scientific knowledge and reasoning provide an empirically-based perspective to inform society's decision making.</td>
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<tr>
<td>SC.912.P.8.1:</td>
<td>Differentiate among the four states of matter.</td>
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<tr>
<td>SC.912.P.8.3:</td>
<td>Explore the scientific theory of atoms (also known as atomic theory) by describing changes in the atomic model over time and why those changes were necessitated by experimental evidence.</td>
</tr>
<tr>
<td>SC.912.P.10.1:</td>
<td>Differentiate among the various forms of energy and recognize that they can be transformed from one form to others.</td>
</tr>
<tr>
<td>SC.912.P.10.2:</td>
<td>Explore the Law of Conservation of Energy by differentiating among open, closed, and isolated systems and explain that the total energy in an isolated system is a conserved quantity.</td>
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<tr>
<td>SC.912.P.10.3:</td>
<td>Compare and contrast work and power qualitatively and quantitatively.</td>
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<tr>
<td>SC.912.P.10.4:</td>
<td>Describe heat as the energy transferred by convection, conduction, and radiation, and explain the connection of heat to change in temperature or states of matter.</td>
</tr>
<tr>
<td>SC.912.P.10.5:</td>
<td>Relate temperature to the average molecular kinetic energy.</td>
</tr>
<tr>
<td>SC.912.P.10.10:</td>
<td>Compare the magnitude and range of the four fundamental forces (gravitational, electromagnetic, weak nuclear, strong nuclear).</td>
</tr>
<tr>
<td>SC.912.P.10.13:</td>
<td>Relate the configuration of static charges to the electric field, electric force, electric potential, and electric potential energy.</td>
</tr>
<tr>
<td>SC.912.P.10.15:</td>
<td>Investigate and explain the relationships among current, voltage, resistance, and power.</td>
</tr>
<tr>
<td>SC.912.P.10.18:</td>
<td>Explore the theory of electromagnetism by comparing and contrasting the different parts of the electromagnetic spectrum in terms of wavelength, frequency, and energy, and relate them to phenomena and applications.</td>
</tr>
<tr>
<td>SC.912.P.10.20:</td>
<td>Describe the measurable properties of waves and explain the relationships among them and how these properties change when the wave moves from one medium to another.</td>
</tr>
<tr>
<td>SC.912.P.10.21:</td>
<td>Qualitatively describe the shift in frequency in sound or electromagnetic waves due to the relative motion of a source or a receiver.</td>
</tr>
<tr>
<td>SC.912.P.10.22:</td>
<td>Construct ray diagrams and use thin lens and mirror equations to locate the images formed by lenses and mirrors.</td>
</tr>
</tbody>
</table>
### SC.912.P.12.1: Distinguish between scalar and vector quantities and assess which should be used to describe an event.

- Analyze the problem in a way that makes sense given the task.
- Ask questions that will help with solving the task.
- Build perseverance by modifying methods as needed while solving a challenging task.
- Stay engaged and maintain a positive mindset when working to solve tasks.
- Help and support each other when attempting a new method or approach.

### MA.K12.MTR.1.1: Clarifications:

Teachers who encourage students to participate actively in effortful learning both individually and with others:

- Cultivate a community of growth mindset learners.
- Foster perseverance in students by choosing tasks that are challenging.
- Develop students' ability to analyze and problem solve.
- Recognize students' effort when solving challenging problems.

### MA.K12.MTR.2.1: Clarifications:

Teachers who encourage students to demonstrate understanding by representing problems in multiple ways:

- Build understanding through modeling and using manipulatives.
- Represent solutions to problems in multiple ways using objects, drawings, tables, graphs and equations.
- Progress from modeling problems with objects and drawings to using algorithms and equations.
- Express connections between concepts and representations.
- Choose a representation based on the given context or purpose.

### MA.K12.MTR.3.1: Clarifications:

Teachers who encourage students to complete tasks with mathematical fluency:

- Select efficient and appropriate methods for solving problems within the given context.
- Maintain flexibility and accuracy while performing procedures and mental calculations.
- Complete tasks accurately and with confidence.
- Adapt procedures to apply them to a new context.
- Use feedback to improve efficiency when performing calculations.

### MA.K12.MTR.4.1: Clarifications:

Teachers who encourage students to engage in discussions that reflect on the mathematical thinking of self and others:

- Establish a culture in which students ask questions of the teacher and their peers, and error is an opportunity for learning.
- Create opportunities for students to discuss their thinking with peers.
- Select, sequence and present student work to advance and deepen understanding of correct and increasingly efficient methods.
- Develop students' ability to justify methods and compare their responses to the responses of their peers.

### Use patterns and structure to help understand and connect mathematical concepts.

Mathematicians who use patterns and structure to help understand and connect mathematical concepts:

- Focus on relevant details within a problem.
- Create plans and procedures to logically order events, steps or ideas to solve problems.
- Decompose a complex problem into manageable parts.
- Relate previously learned concepts to new concepts.
### MA.K12.MTR.5.1:
- Look for similarities among problems.
- Connect solutions of problems to more complicated large-scale situations.

**Clarifications:**
- Teachers who encourage students to apply mathematics to real-world contexts:
  - Connect mathematical concepts to everyday experiences.
  - Use models and methods to understand, represent and solve problems.
  - Perform investigations to gather data or determine if a method is appropriate.
  - Redesign models and methods to improve accuracy or efficiency.
- Students who apply mathematics to real-world contexts:
  - Apply mathematics to real-world contexts.
  - Assess the reasonableness of solutions.
  - Estimate to discover possible solutions.
  - Use benchmark quantities to determine if a solution makes sense.
  - Check calculations when solving problems.
  - Verify possible solutions by explaining the methods used.
  - Evaluate results based on the given context.

### ELA.K12.EE.1.1:
- Use the accepted rules governing a specific format to create quality work.

### ELA.K12.EE.3.1:
- Perform investigations to gather data or determine if a method is appropriate.
- Reinforce that students check their work as they progress within and after a task.
- Assess the reasonableness of solutions.
- Estimate to discover possible solutions.
- Use benchmark quantities to determine if a solution makes sense.
- Check calculations when solving problems.
- Verify possible solutions by explaining the methods used.
- Evaluate results based on the given context.

**Clarifications:**
- Teachers who encourage students to apply mathematics to real-world contexts:
  - Provide opportunities for students to create models, both concrete and abstract, and perform investigations.
  - Support students as they validate conclusions by comparing them to the given situation.
  - Challenge students to question the accuracy of their models and methods.
  - Indicate how various concepts can be applied to other disciplines.
- Teachers who encourage students to assess the reasonableness of solutions:
  - Have students estimate or predict solutions prior to solving.
  - Reinforce that students check their work as they progress within and after a task.
  - Strengthen students' ability to verify solutions through justifications.

**Clarifications:**
- Students who apply mathematics to real-world contexts:
  - Connect mathematical concepts to everyday experiences.
  - Use models and methods to understand, represent and solve problems.
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  - Apply mathematics to real-world contexts.
  - Assess the reasonableness of solutions.
  - Estimate to discover possible solutions.
  - Use benchmark quantities to determine if a solution makes sense.
  - Check calculations when solving problems.
  - Verify possible solutions by explaining the methods used.
  - Evaluate results based on the given context.

### ELA.K12.EE.2.1:
- Read and comprehend grade-level complex texts proficiently.

**Clarifications:**
- See text complexity for grade-level complexity bands and a text complexity rubric.
- Teachers who encourage students to apply mathematics to real-world contexts:
  - Provide opportunities for students to create models, both concrete and abstract, and perform investigations.
  - Support students as they validate conclusions by comparing them to the given situation.
  - Challenge students to question the accuracy of their models and methods.
  - Indicate how various concepts can be applied to other disciplines.
- Teachers who encourage students to assess the reasonableness of solutions:
  - Have students estimate or predict solutions prior to solving.
  - Reinforce that students check their work as they progress within and after a task.
  - Strengthen students' ability to verify solutions through justifications.

### ELA.K12.EE.4.1:
- Use the accepted rules governing a specific format to create quality work.

**Clarifications:**
- Students who incorporate skills learned into work products to produce quality work. For students to incorporate these skills appropriately, they must receive instruction. A 3rd grade student creating a poster board display must have instruction in how to effectively present information to do quality work.
General Course Information and Notes

GENERAL NOTES

Laboratory investigations that include the use of scientific inquiry, research, measurement, problem solving, laboratory apparatus and technologies, experimental procedures, and safety procedures are an integral part of this course. The National Science Teachers Association (NSTA) recommends that at the high school level, all students should be in the science lab or field, collecting data every week. School laboratory investigations (labs) are defined by the National Research Council (NRC) as an experience in the laboratory, classroom, or the field that provides students with opportunities to interact directly with natural phenomena or with data collected by others using tools, materials, data collection techniques, and models (NRC, 2006, p. 3). Laboratory investigations in the high school classroom should help all students develop a growing understanding of the complexity and ambiguity of empirical work, as well as the skills to calibrate and troubleshoot equipment used to make observations. Learners should understand measurement error; and have the skills to aggregate, interpret, and present the resulting data (National Research Council, 2006, p. 77; NSTA, 2007).

Special Notes:

Instructional Practices:

Teaching from a range of complex text is optimized when teachers in all subject areas implement the following strategies on a routine basis:

1. Ensuring wide reading from complex text that varies in length.
2. Making close reading and rereading of texts central to lessons.
3. Emphasizing text-specific complex questions, and cognitively complex tasks, reinforce focus on the text and cultivate independence.
4. Emphasizing students supporting answers based upon evidence from the text.
5. Providing extensive research and writing opportunities (claims and evidence).


- Asking questions (for science) and defining problems (for engineering).
- Developing and using models.
- Planning and carrying out investigations.
- Analyzing and interpreting data.
- Using mathematics, information and computer technology, and computational thinking.
- Constructing explanations (for science) and designing solutions (for engineering).
- Engaging in argument from evidence.
- Obtaining, evaluating, and communicating information.

Florida's Benchmarks for Excellent Student Thinking (B.E.S.T.) Standards

This course includes Florida’s B.E.S.T. ELA Expectations (EE) and Mathematical Thinking and Reasoning Standards (MTRs) for students. Florida educators should intentionally embed these standards within the content and their instruction as applicable. For guidance on the implementation of the EEs and MTRs, please visit https://www.cpalms.org/Standards/BEST_Standards.aspx and select the appropriate B.E.S.T. Standards package.

English Language Development ELD Standards Special Notes Section:

Teachers are required to provide listening, speaking, reading and writing instruction that allows English language learners (ELL) to communicate information, ideas and concepts for academic success in the content area of Science. For the given level of English language proficiency and with visual, graphic, or interactive support, students will interact with grade level words, expressions, sentences and discourse to process or produce language necessary for academic success. The ELD standard should specify a relevant content area concept or topic of study chosen by curriculum developers and teachers which maximizes an ELL's need for communication and social skills. To access an ELL supporting document which delineates performance definitions and descriptors, please click on the following link: https://cpalmsmediaprod.blob.core.windows.net/uploads/docs/standards/eld/sc.pdf

Additional Instructional Resources:

A.V.E. for Success Collection is provided by the Florida Association of School Administrators: http://www.fasa.net/4DCGI/cms/review.html?Action=CMS_Document&DocID=439. Please be aware that these resources have not been reviewed by CPALMS and there may be a charge for the use of some of them in this collection.

GENERAL INFORMATION

Course Number: 2003380

Number of Credits: One (1) credit

Course Type: Core Academic Course

Course Status: State Board Approved

Grade Levels: 9,10,11,12

Course Path: Section: Grades PreK to 12 Education
Education Courses > Grade Group: Grades 9 to 12 and Adult
Education Courses > Subject: Science > SubSubject: Physical Sciences

Abbreviated Title: PHYS 1

Course Length: Year (Y)

Course Level: 2
**Educator Certifications**

<table>
<thead>
<tr>
<th>Certification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Science (Secondary Grades 7-12)</td>
</tr>
<tr>
<td>Physics (Grades 6-12)</td>
</tr>
</tbody>
</table>

Graduation Requirement: Equally Rigorous Science
**Course Standards**

<table>
<thead>
<tr>
<th>Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>SC.912.E.5.2</td>
<td>Identify patterns in the organization and distribution of matter in the universe and the forces that determine them.</td>
</tr>
<tr>
<td>SC.912.E.5.6</td>
<td>Develop logical connections through physical principles, including Kepler’s and Newton’s Laws about the relationships and the effects of Earth, Moon, and Sun on each other.</td>
</tr>
<tr>
<td>SC.912.E.5.8</td>
<td>Connect the concepts of radiation and the electromagnetic spectrum to the use of historical and newly-developed observational tools.</td>
</tr>
<tr>
<td>SC.912.L.18.12</td>
<td>Discuss the special properties of water that contribute to Earth’s suitability as an environment for life: cohesive behavior, ability to moderate temperature, expansion upon freezing, and versatility as a solvent.</td>
</tr>
<tr>
<td>SC.912.N.1.1</td>
<td>Define a problem based on a specific body of knowledge, for example: biology, chemistry, physics, and earth/ space science, and do the following: 1. Pose questions about the natural world, (Articulate the purpose of the investigation and identify the relevant scientific concepts). 2. Conduct systematic observations, (Write procedures that are clear and replicable. Identify observables and examine relationships between test (independent) variable and outcome (dependent) variable. Employ appropriate methods for accurate and consistent observations; conduct and record measurements at appropriate levels of precision. Follow safety guidelines). 3. Examine books and other sources of information to see what is already known, 4. Review what is known in light of empirical evidence, (Examine whether available empirical evidence can be interpreted in terms of existing knowledge and models, and if not, modify or develop new models). 5. Plan investigations, (Design and evaluate a scientific investigation). 6. Use tools to gather, analyze, and interpret data (this includes the use of measurement in metric and other systems, and also the generation and interpretation of graphical representations of data, including data tables and graphs), (Collect data or evidence in an organized way. Properly use instruments, equipment, and materials (e.g., scales, probeware, meter sticks, microscopes, computers) including set-up, calibration, technique, maintenance, and storage). 7. Pose answers, explanations, or descriptions of events, 8. Generate explanations that explicate or describe natural phenomena (inferences), 9. Use appropriate evidence and reasoning to justify these explanations to others, 10. Communicate results of scientific investigations, and 11. Evaluate the merits of the explanations produced by others.</td>
</tr>
<tr>
<td>SC.912.N.1.2</td>
<td>Describe and explain what characterizes science and its methods.</td>
</tr>
<tr>
<td>SC.912.N.1.5</td>
<td>Describe and provide examples of how similar investigations conducted in many parts of the world result in the same outcome.</td>
</tr>
<tr>
<td>SC.912.N.1.6</td>
<td>Describe how scientific inferences are drawn from scientific observations and provide examples from the content being studied.</td>
</tr>
<tr>
<td>SC.912.N.1.7</td>
<td>Recognize the role of creativity in constructing scientific questions, methods and explanations.</td>
</tr>
<tr>
<td>SC.912.N.2.2</td>
<td>Identify which questions can be answered through science and which questions are outside the boundaries of scientific investigation, such as questions addressed by other ways of knowing, such as art, philosophy, and religion.</td>
</tr>
<tr>
<td>SC.912.N.2.3</td>
<td>Identify examples of pseudoscience (such as astrology, phrenology) in society.</td>
</tr>
<tr>
<td>SC.912.N.2.4</td>
<td>Explain that scientific knowledge is both durable and robust and open to change. Scientific knowledge can change because it is often examined and re-examined by new investigations and scientific argumentation. Because of these frequent examinations, scientific knowledge becomes stronger, leading to its durability.</td>
</tr>
<tr>
<td>SC.912.N.2.5</td>
<td>Describe instances in which scientists’ varied backgrounds, talents, interests, and goals influence the inferences and thus the explanations that they make about observations of natural phenomena and describe that competing interpretations (explanations) of scientists are a strength of science as they are a source of new, testable ideas that have the potential to add new evidence to support one or another of the explanations.</td>
</tr>
<tr>
<td>SC.912.N.3.1</td>
<td>Explain that a scientific theory is the culmination of many scientific investigations drawing together all the current evidence concerning a substantial range of phenomena; thus, a scientific theory represents the most powerful explanation scientists have to offer.</td>
</tr>
<tr>
<td>SC.912.N.3.2</td>
<td>Describe the role consensus plays in the historical development of a theory in any one of the disciplines of science.</td>
</tr>
<tr>
<td>SC.912.N.3.3</td>
<td>Explain that scientific laws are descriptions of specific relationships under given conditions in nature, but do not offer explanations for those relationships.</td>
</tr>
<tr>
<td>SC.912.N.3.4</td>
<td>Recognize that theories do not become laws, nor do laws become theories; theories are well supported explanations and laws are well supported descriptions.</td>
</tr>
<tr>
<td>SC.912.N.3.5</td>
<td>Describe the function of models in science, and identify the wide range of models used in science.</td>
</tr>
<tr>
<td>SC.912.N.4.1</td>
<td>Explain how scientific knowledge and reasoning provide an empirically-based perspective to inform society’s decision making.</td>
</tr>
<tr>
<td>SC.912.P.8.1</td>
<td>Differentiate among the four states of matter.</td>
</tr>
<tr>
<td>SC.912.P.8.3</td>
<td>Explore the scientific theory of atoms (also known as atomic theory) by describing changes in the atomic model over time and why those changes were necessitated by experimental evidence.</td>
</tr>
<tr>
<td>SC.912.P.8.4</td>
<td>Explore the scientific theory of atoms (also known as atomic theory) by describing the structure of atoms in terms of protons, neutrons and electrons, and differentiate among these particles in terms of their mass, electrical charges and locations within the atom.</td>
</tr>
<tr>
<td>SC.912.P.10.1</td>
<td>Differentiate among the various forms of energy and recognize that they can be transformed from one form to others.</td>
</tr>
<tr>
<td>SC.912.P.10.2</td>
<td>Explore the Law of Conservation of Energy by differentiating among open, closed, and isolated systems and explain that the total energy in an isolated system is a conserved quantity.</td>
</tr>
<tr>
<td>SC.912.P.10.3</td>
<td>Compare and contrast work and power qualitatively and quantitatively.</td>
</tr>
<tr>
<td>SC.912.P.10.4</td>
<td>Describe heat as the energy transferred by convection, conduction, and radiation, and explain the connection of heat to change in temperature or states of matter.</td>
</tr>
<tr>
<td>SC.912.P.10.5</td>
<td>Relate temperature to the average molecular kinetic energy.</td>
</tr>
<tr>
<td>SC.912.P.10.6</td>
<td>Create and interpret potential energy diagrams, for example: chemical reactions, orbits around a central body, motion of a pendulum.</td>
</tr>
<tr>
<td>SC.912.P.10.7</td>
<td>Distinguish between endothermic and exothermic chemical processes.</td>
</tr>
<tr>
<td>SC.912.P.10.8</td>
<td>Explain entropy’s role in determining the efficiency of processes that convert energy to work.</td>
</tr>
</tbody>
</table>
Compare the magnitude and range of the four fundamental forces (gravitational, electromagnetic, weak nuclear, strong nuclear).

Relate the configuration of static charges to the electric field, electric force, electric potential, and electric potential energy.

Distinguish among conductors, semiconductors, and insulators.

Investigate and explain the relationships among current, voltage, resistance, and power.

Explain the relationship between moving charges and magnetic fields, as well as changing magnetic fields and electric fields, and their application to modern technologies.

Explore the theory of electromagnetism by explaining electromagnetic waves in terms of oscillating electric and magnetic fields.

Explore the theory of electromagnetism by comparing and contrasting the different parts of the electromagnetic spectrum in terms of wavelength, frequency, and energy, and relate them to phenomena and applications.

Describe the measurable properties of waves and explain the relationships among them and how these properties change when the wave moves from one medium to another.

Qualitatively describe the shift in frequency in sound or electromagnetic waves due to the relative motion of a source or a receiver.

Construct ray diagrams and use thin lens and mirror equations to locate the images formed by lenses and mirrors.

Distinguish between scalar and vector quantities and assess which should be used to describe an event.

Analyze the motion of an object in terms of its position, velocity, and acceleration (with respect to a frame of reference) as functions of time.

Interpret and apply Newton's three laws of motion.

Describe how the gravitational force between two objects depends on their masses and the distance between them.

Apply the law of conservation of linear momentum to interactions, such as collisions between objects.

Qualitatively apply the concept of angular momentum.

Recognize that nothing travels faster than the speed of light in vacuum which is the same for all observers no matter how they or the light source are moving.

Recognize that Newton's Laws are a limiting case of Einstein's Special Theory of Relativity at speeds that are much smaller than the speed of light.

Recognize that time, length, and energy depend on the frame of reference.

Choose a level of accuracy appropriate to limitations on measurement when reporting quantities.

Explain the relationship between moving charges and magnetic fields, as well as changing magnetic fields and electric fields, and their application to modern technologies.

Use given functions or choose a function to represent data. For example, rearrange Ohm's law V = IR to highlight resistance R.

Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases.

Graph linear and quadratic functions and show intercepts, maxima, and minima.

Graph square root, cube root, and piecewise-defined functions, including step functions and absolute value functions.

Graph polynomial functions, identifying zeros when suitable factorizations are available, and showing end behavior.

d. Graph rational functions, identifying zeros and asymptotes when suitable factorizations are available, and showing end behavior.

e. Graph exponential and logarithmic functions, showing intercepts and end behavior, and trigonometric functions, showing period, midline, and amplitude, and using phase shift.

Use volume formulas for cylinders, pyramids, cones, and spheres to solve problems.

Rearrange formulas to highlight a quantity of interest, using the same reasoning as in solving equations. For example, rearrange Ohm's law V = IR to highlight resistance R.

For a function that models a relationship between two quantities, interpret key features of graphs and tables in terms of the quantities, and sketch graphs showing key features given a verbal description of the relationship. Key features include: intercepts; intervals where the function is increasing, decreasing, positive, or negative; relative maximums and minimums; symmetries; end behavior; and periodicity.

Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases.

Use statistics appropriate to the shape of the data distribution to compare center (median, mean) and spread (interquartile range, standard deviation) of two or more different data sets.

In grades 6 – 8, students describe center and spread in a data distribution. Here they choose a summary statistic appropriate to the characteristics of the data distribution, such as the shape of the distribution or the existence of extreme data points.

Use statistics appropriate to the shape of the data distribution to compare center (median, mean) and spread (interquartile range, standard deviation) of two or more different data sets.

Interpret differences in shape, center, and spread in the context of the data sets, accounting for possible effects of extreme data points (outliers).

Use the mean and standard deviation of a data set to fit it to a normal distribution and to estimate population percentages. Recognize that there are data sets for which such a procedure is not appropriate. Use calculators, spreadsheets, and tables to estimate areas under the normal curve.

Summarize categorical data for two categories in two-way frequency tables. Interpret relative frequencies in the context of the data (including joint, marginal, and conditional relative frequencies). Recognize possible associations and trends in the data.

Represent data on two quantitative variables on a scatter plot, and describe how the variables are related.

a. Fit a function to the data; use functions fitted to data to solve problems in the context of the data. Use given functions or choose a function suggested by the context. Emphasize linear, and exponential models.

b. Informally assess the fit of a function by plotting and analyzing residuals.

c. Fit a linear function for a scatter plot that suggests a linear association.
Clarifications:
Students take a more sophisticated look at using a linear function to model the relationship between two numerical variables. In addition to fitting a line to data, students assess how well the model fits by analyzing residuals.

Make sense of problems and persevere in solving them.
Mathematically proficient students start by explaining to themselves the meaning of a problem and looking for entry points to its solution. They analyze givens, constraints, relationships, and goals. They make conjectures about the form and meaning of the solution and plan a solution pathway rather than simply jumping into a solution attempt. They consider analogous problems, and try special cases and simpler forms of the original problem in order to gain insight into its solution. They monitor and evaluate their progress and change course if necessary. Older students might, depending on the context of the problem, transform algebraic expressions or change the viewing window on their graphing calculator to get information they need. Mathematically proficient students can explain correspondences between equations, verbal descriptions, tables, and graphs or draw diagrams of important features and relationships, graph data, and search for regularity or trends. Younger students might rely on using concrete objects or pictures to help conceptualize and solve a problem. Mathematically proficient students check their answers to problems using a different method, and they continually ask themselves, “Does this make sense?” They can understand the approaches of others to solving complex problems and identify correspondences between different approaches.

Standard Relation to Course: Supporting

Reason abstractly and quantitatively.
Mathematically proficient students make sense of quantities and their relationships in problem situations. They bring two complementary abilities to bear on problems involving quantitative relationships: the ability to decontextualize—to abstract a given situation and represent it symbolically and manipulate the representing symbols as if they have a life of their own, without necessarily attending to their referents—and the ability to contextualize, to pause as needed during the manipulation process in order to probe into the referents for the symbols involved. Quantitative reasoning entails habits of creating a coherent representation of the problem at hand; considering the units involved; attending to the meaning of quantities, not just how to compute them; and knowing and flexibly using different properties of operations and objects.

Standard Relation to Course: Supporting

Construct viable arguments and critique the reasoning of others.
Mathematically proficient students understand and use stated assumptions, definitions, and previously established results in constructing arguments. They make conjectures and build a logical progression of statements to explore the truth of their conjectures. They are able to analyze situations by breaking them into cases, and can recognize and use counterexamples. They justify their conclusions, communicate them to others, and respond to the arguments of others. They reason inductively about data, making plausible arguments that consider the context from which the data arose. Mathematically proficient students are also able to compare the effectiveness of two plausible arguments, distinguish correct logic or reasoning from that which is flawed, and—if there is a flaw in an argument—explain what is. Elementary students can construct arguments using concrete referents such as objects, drawings, diagrams, and actions. Such arguments can make sense and be correct, even though they are not generalized or made formal until later grades. Later, students learn to determine domains to which an argument applies. Students at all grades can listen or read the arguments of others, decide whether they make sense, and ask useful questions to clarify or improve the arguments.

Standard Relation to Course: Supporting

Model with mathematics.
Mathematically proficient students can apply the mathematics they know to solve problems arising in everyday life, society, and the workplace. In early grades, this might be as simple as writing an addition equation to describe a situation. In middle grades, a student might apply proportional reasoning to plan a school event or analyze a problem in the community. By high school, a student might use geometry software to solve a design problem or use a function to describe how one quantity of interest depends on another. Mathematically proficient students who can apply what they know are comfortable making assumptions and approximations to simplify a complicated situation, realizing that these may need revision later. They are able to identify important quantities in a practical situation and map their relationships using such tools as diagrams, two-way tables, graphs, flowcharts and formulas. They can analyze those relationships mathematically to draw conclusions. They routinely interpret their mathematical results in the context of the situation and reflect on whether the results make sense, possibly improving the model if it has not served its purpose.

Standard Relation to Course: Supporting

Use appropriate tools strategically.
Mathematically proficient students consider the available tools when solving a mathematical problem. These tools might include pencil and paper, concrete models, a ruler, a protractor, a calculator, a spreadsheet, a computer algebra system, a statistical package, or dynamic geometry software. Proficient students are sufficiently familiar with tools appropriate for their grade or course to make sound decisions about when each of these tools might be helpful, recognizing both the insight to be gained and their limitations. For example, mathematically proficient high school students analyze graphs of functions and solutions generated using a graphing calculator. They detect possible errors by strategically using estimation and other mathematical knowledge. When making mathematical models, they know that technology can enable them to visualize the results of varying assumptions, explore consequences, and compare predictions with data. Mathematically proficient students at various grade levels are able to identify relevant external mathematical resources, such as digital content located on a website, and use them to pose or solve problems. They are able to use technological tools to explore and deepen their understanding of concepts.

Standard Relation to Course: Supporting

Attend to precision.
Mathematically proficient students try to communicate precisely to others. They try to use clear definitions in discussion with others and in their own reasoning. They state the meaning of the symbols they choose, including using the equal sign consistently and appropriately. They are careful about specifying units of measure, and labeling axes to clarify the correspondence with quantities in a problem. They calculate accurately and efficiently, express numerical answers with a degree of precision appropriate for the problem context. In the elementary grades, students give carefully formulated explanations to each other. By the time they reach high school they have learned to examine claims and make explicit use of definitions.

Standard Relation to Course: Supporting

Look for and make use of structure.
Mathematically proficient students look closely to discern a pattern or structure. Young students, for example, might notice that three and seven more is the same amount as seven and three more, or they may sort a collection of shapes according to how many sides the shapes have. Later,
students will see 7 × 8 equals the well remembered 7 × 5 + 7 × 3, in preparation for learning about the distributive property. In the expression x² + 9x + 14, older students can see the 14 as 2 × 7 and the 9 as 2 + 7. They recognize the significance of an existing line in a geometric figure and can use the strategy of drawing an auxiliary line for solving problems. They also can step back for an overview and shift perspective. They can see complicated things, such as some algebraic expressions, as single objects or as being composed of several objects. For example, they can see 5 – 3(x – y²) as 5 minus a positive number times a square and use that to realize that its magnitude cannot be more than 5 for any real numbers x and y.

Standard Relation to Course: Supporting

Look for and express regularity in repeated reasoning.

Mathematically proficient students notice if calculations are repeated, and look both for general methods and for shortcuts. Upper elementary students might notice when dividing 25 by 11 that they are repeating the same calculations over and over again, and conclude they have a repeating decimal. By paying attention to the calculation of slope as they repeatedly check whether points are on the line through (1, 2) with slope 3, middle school students might abstract the equation (y – 2) = 3. Noticing the regularity in the way terms cancel when expanding (x – 1)(x + 1), (x – 1)(x² + x + 1), and (x – 1)(x³ + x² + x + 1) might lead them to the general formula for the sum of a geometric series. As they work to solve a problem, mathematically proficient students maintain oversight of the process, while attending to the details. They continually evaluate the reasonableness of their intermediate results.

Standard Relation to Course: Supporting

Cite specific textual evidence to support analysis of science and technical texts, attending to important distinctions the author makes and to any gaps or inconsistencies in the account.

Determine the central ideas or conclusions of a text; summarize complex concepts, processes, or information presented in a text by paraphrasing them in simpler but still accurate terms.

Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks; analyze the specific results based on explanations in the text.

Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 11–12 texts and topics.

Analyze how the text structures information or ideas into categories or hierarchies, demonstrating understanding of the information or ideas.

Analyze the author's purpose in providing an explanation, describing a procedure, or discussing an experiment in a text, identifying important issues that remain unresolved.

Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g., quantitative data, video, multimedia) in order to address a question or solve a problem.

Evaluate the hypotheses, data, analysis, and conclusions in a science or technical text, verifying the data when possible and corroborating or challenging conclusions with other sources of information.

Synthesize information from a range of sources (e.g., texts, experiments, simulations) into a coherent understanding of a process, phenomenon, or concept, resolving conflicting information when possible.

Initiate and participate effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grades 11–12 topics, texts, and issues, building on others' ideas and expressing their own clearly and persuasively.

a. Come to discussions prepared, having read and researched material under study; explicitly draw on that preparation by referring to evidence from texts and other research on the topic or issue to stimulate a thoughtful, well-reasoned exchange of ideas.

b. Work with peers to promote civil, democratic discussions and decision-making, set clear goals and deadlines, and establish individual roles as needed.

c. Propel conversations by posing and responding to questions that probe reasoning and evidence; ensure a hearing for a full range of positions on a topic or issue; clarify, verify, or challenge ideas and conclusions; and promote divergent and creative perspectives.

d. Respond thoughtfully to diverse perspectives; synthesize comments, claims, and evidence made on all sides of an issue; resolve contradictions when possible; and determine what additional information or research is required to deepen the investigation or complete the task.

Integrate multiple sources of information presented in diverse formats and media (e.g., visually, qualitatively, orally) in order to make informed decisions and solve problems, evaluating the credibility and accuracy of each source and noting any discrepancies among the data.

Evaluate a speaker's point of view, reasoning, and use of evidence and rhetoric, assessing the stance, premises, links among ideas, word choice, points of emphasis, and tone used.

Present information, findings, and supporting evidence, conveying a clear and distinct perspective, such that listeners can follow the line of reasoning, alternative or opposing perspectives are addressed, and the organization, development, substance, and style are appropriate to purpose, audience, and a range of formal and informal tasks.

Make strategic use of digital media (e.g., textual, graphical, audio, visual, and interactive elements) in presentations to enhance understanding of findings, reasoning, and evidence and to add interest.

Write arguments focused on discipline-specific content:

a. Introduce precise, knowledgeable claim(s), establish the significance of the claim(s), distinguish the claim(s) from alternate or opposing claims, and create an organization that logically sequences the claim(s), counterclaims, reasons, and evidence.

b. Develop claim(s) and counterclaims fairly and thoroughly, supplying the most relevant data and evidence for each while pointing out the strengths and limitations of both claim(s) and counterclaims in a discipline-appropriate form that anticipates the audience's knowledge level, concerns, values, and possible biases.

c. Use words, phrases, and clauses as well as varied syntax to link the major sections of the text, create cohesion, and clarify the relationships between claim(s) and reasons, between reasons and evidence, and between claim(s) and counterclaims.

d. Establish and maintain a formal style and objective tone while adhering to the norms and conventions of the discipline in which they are writing.

e. Provide a concluding statement or section that follows from or supports the argument presented.

Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes.

a. Introduce a topic and organize complex ideas, concepts, and information so that each new element builds on that which precedes it to create a unified whole; include formatting (e.g., headings), graphics (e.g., figures, tables), and multimedia when useful to aiding comprehension.

b. Develop the topic thoroughly by selecting the most significant and relevant facts, extended definitions, concrete details, quotations, or other information and examples appropriate to the audience's knowledge of the topic.

c. Use varied transitions and sentence structures to link the major sections of the text, create cohesion, and clarify the relationships among complex ideas and concepts.

d. Use precise language, domain-specific vocabulary and techniques such as metaphor, simile, and analogy to manage the complexity of the topic.
General Course Information and Notes

GENERAL NOTES

While the content focus of this course is consistent with the Physics I course, students will explore these concepts in greater depth. In general, the academic pace and rigor will be greatly increased for honors level course work. Laboratory investigations that include the use of scientific inquiry, research, measurement, problem solving, laboratory apparatus and technologies, experimental procedures, and safety procedures are an integral part of this course. The National Science Teachers Association (NSTA) recommends that at the high school level, all students should be in the science lab or field, collecting data every week. School laboratory investigations (labs) are defined by the National Research Council (NRC) as an experience in the laboratory, classroom, or the field that provides students with opportunities to interact directly with natural phenomena or with data collected by others using tools, materials, data collection techniques, and models (NRC, 2006, p. 3). Laboratory investigations in the high school classroom should help all students develop a growing understanding of the complexity and ambiguity of empirical work, as well as the skills to calibrate and troubleshoot equipment used to make observations. Learners should understand measurement error; and have the skills to aggregate, interpret, and present the resulting data (National Research Council, 2006, p. 77; NSTA, 2007).

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1. Ensuring wide reading from complex text that varies in length.
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- Engaging in argument from evidence.
- Obtaining, evaluating, and communicating information.

Honors and Advanced Level Course Note: Advanced courses require a greater demand on students through increased academic rigor. Academic rigor is obtained through the application, analysis, evaluation, and creation of complex ideas that are often abstract and multi-faceted. Students are challenged to think and collaborate critically on the content they are learning. Honors level rigor will be achieved by increasing text complexity through text selection, focus on high-level qualitative measures, and complexity of task. Instruction will be structured to give students a deeper understanding of conceptual themes and organization within and across disciplines. Academic rigor is more than simply assigning to students a greater quantity of work.

Literacy Standards in Science

Secondary science courses include reading standards for literacy in science and technical subjects 6-12 and writing standards for literacy in history/social studies, science, and technical subjects 6-12. The courses also include speaking and listening standards. For a complete list of standards required for this course click on the blue tile labeled course standards. You may also download the complete course including all required standards and notes sections using the export function located at the top of this page.

English Language Development ELD Standards Special Notes Section:

Teachers are required to provide listening, speaking, reading and writing instruction that allows English language learners (ELL) to communicate information, ideas and concepts for academic success in the content area of Science. For the given level of English language proficiency and with visual, graphic, or interactive support, students will interact with grade level words, expressions, sentences and discourse to process or produce language necessary for academic success. The ELD standard should specify a relevant content area concept or topic of study chosen by curriculum developers and teachers which maximizes an ELL’s need for communication and social skills. To access an ELL supporting document which delineates performance definitions and descriptors, please click on the following link:
https://cpalmsmediaprod.blob.core.windows.net/uploads/docs/standards/eld/sc.pdf

Additional Instructional Resources:
## Educator Certifications

<table>
<thead>
<tr>
<th>Certification</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Science (Secondary Grades 7-12)</td>
<td></td>
</tr>
<tr>
<td>Physics (Grades 6-12)</td>
<td></td>
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</tbody>
</table>

A.V.E. for Success Collection is provided by the Florida Association of School Administrators: [http://www.fasa.net/4DCGI/cms/review.html?Action=CMS_Document&DocID=139](http://www.fasa.net/4DCGI/cms/review.html?Action=CMS_Document&DocID=139). Please be aware that these resources have not been reviewed by CPALMS and there may be a charge for the use of some of them in this collection.
### Course Standards

<table>
<thead>
<tr>
<th>Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>SC.912.E.5.2:</td>
<td>Identify patterns in the organization and distribution of matter in the universe and the forces that determine them.</td>
</tr>
<tr>
<td>SC.912.E.5.6:</td>
<td>Develop logical connections through physical principles, including Kepler's and Newton's Laws about the relationships and the effects of Earth, Moon, and Sun on each other.</td>
</tr>
<tr>
<td>SC.912.E.5.8:</td>
<td>Connect the concepts of radiation and the electromagnetic spectrum to the use of historical and newly-developed observational tools.</td>
</tr>
<tr>
<td>SC.912.L.18.12:</td>
<td>Discuss the special properties of water that contribute to Earth's suitability as an environment for life: cohesive behavior, ability to moderate temperature, expansion upon freezing, and versatility as a solvent.</td>
</tr>
</tbody>
</table>
| SC.912.N.1.1: | Define a problem based on a specific body of knowledge, for example: biology, chemistry, physics, and earth/space science, and do the following:  
1. Pose questions about the natural world, (Articulate the purpose of the investigation and identify the relevant scientific concepts).  
2. Conduct systematic observations, (Write procedures that are clear and replicable. Identify observables and examine relationships between test (independent) variable and outcome (dependent) variable. Employ appropriate methods for accurate and consistent observations; conduct and record measurements at appropriate levels of precision. Follow safety guidelines).  
3. Examine books and other sources of information to see what is already known,  
4. Review what is known in light of empirical evidence, (Examine whether available empirical evidence can be interpreted in terms of existing knowledge and models, and if not, modify or develop new models).  
5. Plan investigations, (Design and evaluate a scientific investigation).  
6. Use tools to gather, analyze, and interpret data (this includes the use of measurement in metric and other systems, and also the generation and interpretation of graphical representations of data, including data tables and graphs), (Collect data or evidence in an organized way. Properly use instruments, equipment, and materials (e.g., scales, probeware, meter sticks, microscopes, computers) including set-up, calibration, technique, maintenance, and storage).  
7. Pose answers, explanations, or descriptions of events,  
8. Generate explanations that explicate or describe natural phenomena (inferences),  
9. Use appropriate evidence and reasoning to justify these explanations to others,  
10. Communicate results of scientific investigations, and  
11. Evaluate the merits of the explanations produced by others. |

**SC.912.N.1.2:** Describe and explain what characterizes science and its methods.  
**SC.912.N.1.5:** Describe and provide examples of how similar investigations conducted in many parts of the world result in the same outcome.  
**SC.912.N.1.6:** Describe how scientific inferences are drawn from scientific observations and provide examples from the content being studied.  
**SC.912.N.1.7:** Recognize the role of creativity in constructing scientific questions, methods and explanations.  
**SC.912.N.2.2:** Identify which questions can be answered through science and which questions are outside the boundaries of scientific investigation, such as questions addressed by other ways of knowing, such as art, philosophy, and religion.  
**SC.912.N.2.3:** Identify examples of pseudoscience (such as astrology, phrenology) in society.  
**SC.912.N.2.4:** Explain that scientific knowledge is both durable and robust and open to change. Scientific knowledge can change because it is often examined and re-examined by new investigations and scientific argumentation. Because of these frequent examinations, scientific knowledge becomes stronger, leading to its durability.  
**SC.912.N.2.5:** Describe instances in which scientists' varied backgrounds, talents, interests, and goals influence the inferences and thus the explanations that they make about observations of natural phenomena and describe that competing interpretations (explanations) of scientists are a strength of science as they are a source of new, testable ideas that have the potential to add new evidence to support one or another of the explanations.  
**SC.912.N.3.1:** Explain that a scientific theory is the culmination of many scientific investigations drawing together all the current evidence concerning a substantial range of phenomena; thus, a scientific theory represents the most powerful explanation scientists have to offer.  
**SC.912.N.3.2:** Describe the role consensus plays in the historical development of a theory in any one of the disciplines of science.  
**SC.912.N.3.3:** Explain that scientific laws are descriptions of specific relationships under given conditions in nature, but do not offer explanations for those relationships.  
**SC.912.N.3.4:** Recognize that theories do not become laws, nor do laws become theories; theories are well supported explanations and laws are well supported descriptions.  
**SC.912.N.3.5:** Describe the function of models in science, and identify the wide range of models used in science.  
**SC.912.N.4.1:** Explain how scientific knowledge and reasoning provide an empirically-based perspective to inform society's decision making.  
**SC.912.P.8.1:** Differentiate among the four states of matter.  
**SC.912.P.8.3:** Explore the scientific theory of atoms (also known as atomic theory) by describing changes in the atomic model over time and why those changes were necessitated by experimental evidence.  
**SC.912.P.8.4:** Explore the scientific theory of atoms (also known as atomic theory) by describing the structure of atoms in terms of protons, neutrons and electrons, and differentiate among these particles in terms of their mass, electrical charges and locations within the atom.  
**SC.912.P.10.1:** Differentiate among the various forms of energy and recognize that they can be transformed from one form to others.  
**SC.912.P.10.2:** Explore the Law of Conservation of Energy by differentiating among open, closed, and isolated systems and explain that the total energy in an isolated system is a conserved quantity.  
**SC.912.P.10.3:** Compare and contrast work and power qualitatively and quantitatively.  
**SC.912.P.10.4:** Describe heat as the energy transferred by convection, conduction, and radiation, and explain the connection of heat to change in temperature or states of matter.  
**SC.912.P.10.5:** Relate temperature to the average molecular kinetic energy.  
**SC.912.P.10.6:** Create and interpret potential energy diagrams, for example: chemical reactions, orbits around a central body, motion of a pendulum.  
**SC.912.P.10.7:** Distinguish between endothermic and exothermic chemical processes.  
**SC.912.P.10.8:** Explain entropy's role in determining the efficiency of processes that convert energy to work.
| SC.912.P.10.10: | Compare the magnitude and range of the four fundamental forces (gravitational, electromagnetic, weak nuclear, strong nuclear). |
| SC.912.P.10.13: | Relate the configuration of static charges to the electric field, electric force, electric potential, and electric potential energy. |
| SC.912.P.10.15: | Investigate and explain the relationships among current, voltage, resistance, and power. |
| SC.912.P.10.16: | Explain the relationship between moving charges and magnetic fields, as well as changing magnetic fields and electric fields, and their application to modern technologies. |
| SC.912.P.10.17: | Explore the theory of electromagnetism by explaining electromagnetic waves due to the relative motion of a source or a receiver. |
| SC.912.P.10.18: | Explore the theory of electromagnetism by comparing and contrasting the different parts of the electromagnetic spectrum in terms of wavelength, frequency, and energy, and relate them to phenomena and applications. |
| SC.912.P.10.19: | Describe the measurable properties of waves and explain the relationships among them and how these properties change when the wave moves from one medium to another. |
| SC.912.P.10.20: | Qualitatively describe the shift in frequency in sound or electromagnetic waves due to the relative motion of a source or a receiver. |
| SC.912.P.10.21: | Construct ray diagrams and use thin lens and mirror equations to locate the images formed by lenses and mirrors. |
| SC.912.P.10.22: | Distinguish between scalar and vector quantities and assess which should be used to describe an event. |
| SC.912.P.10.23: | Apply the law of conservation of linear momentum to interactions, such as collisions between objects. |
| SC.912.P.10.24: | Explore the theory of electromagnetism by explaining electromagnetic waves due to the relative motion of a source or a receiver. |
| SC.912.P.10.25: | Analyze the motion of an object in terms of its position, velocity, and acceleration (with respect to a frame of reference) as functions of time. |
| SC.912.P.10.26: | Describe how the gravitational force between two objects depends on their masses and the distance between them. |
| SC.912.P.10.27: | Interpret and apply Newton's three laws of motion. |
| SC.912.P.10.28: | Apply the law of conservation of linear momentum to interactions, such as collisions between objects. |
| SC.912.P.10.29: | Qualitatively apply the concept of angular momentum. |
| SC.912.P.10.30: | Recognize that nothing travels faster than the speed of light in vacuum which is the same for all observers no matter how they or the light source are moving. |
| SC.912.P.10.31: | Recognize that Newton's Laws are a limiting case of Einstein's Special Theory of Relativity at speeds that are much smaller than the speed of light. |
| SC.912.P.10.32: | Recognize that time, length, and energy depend on the frame of reference. |

Mathematicians who participate in effortful learning both individually and with others:
- Analyze the problem in a way that makes sense given the task.
- Ask questions that will help with solving the task.
- Build perseverance by modifying methods as needed while solving a challenging task.
- Stay engaged and maintain a positive mindset when working to solve tasks.
- Help and support each other when attempting a new method or approach.

Mathematicians who demonstrate understanding by representing problems in multiple ways:
- Cultivate a community of growth mindset learners.
- Foster perseverance in students by choosing tasks that are challenging.
- Develop students' ability to analyze and problem solve.
- Recognize students' effort when solving challenging problems.

Mathematicians who complete tasks with mathematical fluency:
- Select efficient and appropriate methods for solving problems within the given context.
- Maintain flexibility and accuracy while performing procedures and mental calculations.
- Complete tasks accurately and with confidence.
- Adapt procedures to apply them to a new context.
- Use feedback to improve efficiency when performing calculations.

Mathematicians who engage in discussions that reflect on the mathematical thinking of self and others:
- Communicate mathematical ideas, vocabulary and methods effectively.
- Analyze the mathematical thinking of others.
- Compare the efficiency of a method to those expressed by others.
- Recognize errors and suggest how to correctly solve the task.
MA.K12.MTR.4.1:
- Justify results by explaining methods and processes.
- Construct possible arguments based on evidence.

Clarifications:
Teachers who encourage students to engage in discussions that reflect on the mathematical thinking of self and others:
- Establish a culture in which students ask questions of the teacher and their peers, and error is an opportunity for learning.
- Create opportunities for students to discuss their thinking with peers.
- Select, sequence and present student work to advance and deepen understanding of correct and increasingly efficient methods.
- Develop students’ ability to justify methods and compare their responses to the responses of their peers.

MA.K12.MTR.5.1:
Use patterns and structure to help understand and connect mathematical concepts.
Mathematicians who use patterns and structure to help understand and connect mathematical concepts:
- Focus on relevant details within a problem.
- Create plans and procedures to logically order events, steps or ideas to solve problems.
- Decompose a complex problem into manageable parts.
- Relate previously learned concepts to new concepts.
- Look for similarities among problems.
- Connect solutions of problems to more complicated large-scale situations.

Clarifications:
Teachers who encourage students to use patterns and structure to help understand and connect mathematical concepts:
- Help students recognize the patterns in the world around them and connect these patterns to mathematical concepts.
- Support students to develop generalizations based on the similarities found among problems.
- Provide opportunities for students to create plans and procedures to solve problems.
- Develop students’ ability to construct relationships between their current understanding and more sophisticated ways of thinking.

MA.K12.MTR.6.1:
Assess the reasonableness of solutions.
Mathematicians who assess the reasonableness of solutions:
- Estimate to discover possible solutions.
- Use benchmark quantities to determine if a solution makes sense.
- Check calculations when solving problems.
- Verify possible solutions by explaining the methods used.
- Evaluate results based on the given context.

Clarifications:
Teachers who encourage students to assess the reasonableness of solutions:
- Have students estimate or predict solutions prior to solving.
- Prompt students to continually ask, “Does this solution make sense? How do you know?”
- Reinforce that students check their work as they progress within and after a task.
- Strengthen students’ ability to verify solutions through justifications.

MA.K12.MTR.7.1:
Apply mathematics to real-world contexts.
Mathematicians who apply mathematics to real-world contexts:
- Connect mathematical concepts to everyday experiences.
- Use models and methods to understand, represent and solve problems.
- Perform investigations to gather data or determine if a method is appropriate.
- Redesign models and methods to improve accuracy or efficiency.

Clarifications:
Teachers who encourage students to apply mathematics to real-world contexts:
- Provide opportunities for students to create models, both concrete and abstract, and perform investigations.
- Challenge students to question the accuracy of their models and methods.
- Support students as they validate conclusions by comparing them to the given situation.
- Indicate how various concepts can be applied to other disciplines.

MA.K12.MTR.8.1:
Cite evidence to explain and justify reasoning.

Clarifications:
K-1 Students include textual evidence in their oral communication with guidance and support from adults. The evidence can consist of details from the text without naming the text. During 1st grade, students learn how to incorporate the evidence in their writing.
2-3 Students include relevant textual evidence in their written and oral communication. Students should name the text when they refer to it. In 3rd grade, students should use a combination of direct and indirect citations.
4-5 Students continue with previous skills and reference comments made by speakers and peers. Students cite texts that they’ve directly quoted, paraphrased, or used for information. When writing, students will use the form of citation dictated by the instructor or the style guide referenced by the instructor.
6-8 Students continue with previous skills and use a style guide to create a proper citation.
9-12 Students continue with previous skills and should be aware of existing style guides and the ways in which they differ.

ELA.K12.EE.1.1:
Read and comprehend grade-level complex texts proficiently.

Clarifications:
See Text Complexity for grade-level complexity bands and a text complexity rubric.

ELA.K12.EE.2.1:
Make inferences to support comprehension.

Clarifications:
Students will make inferences before the words infer or inference are introduced. Kindergarten students will answer questions like “Why is the
<table>
<thead>
<tr>
<th>ELA.K12.EE.4.1:</th>
<th>Use appropriate collaborative techniques and active listening skills when engaging in discussions in a variety of situations.</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Clarifications:</strong></td>
<td>In kindergarten, students learn to listen to one another respectfully. In grades 1-2, students build upon these skills by justifying what they are thinking. For example: &quot;I think ______ because _______&quot; The collaborative conversations are becoming academic conversations. In grades 3-12, students engage in academic conversations discussing claims and justifying their reasoning, refining and applying skills. Students build on ideas, propel the conversation, and support claims and counterclaims with evidence.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>ELA.K12.EE.5.1:</th>
<th>Use the accepted rules governing a specific format to create quality work.</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Clarifications:</strong></td>
<td>Students will incorporate skills learned into work products to produce quality work. For students to incorporate these skills appropriately, they must receive instruction. A 3rd grade student creating a poster board display must have instruction in how to effectively present information to do quality work.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>ELA.K12.EE.6.1:</th>
<th>Use appropriate voice and tone when speaking or writing.</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Clarifications:</strong></td>
<td>In kindergarten and 1st grade, students learn the difference between formal and informal language. For example, the way we talk to our friends differs from the way we speak to adults. In 2nd grade and beyond, students practice appropriate social and academic language to discuss texts.</td>
</tr>
</tbody>
</table>

| ELD.K12.ELL.SC.1: | English language learners communicate information, ideas and concepts necessary for academic success in the content area of Science. |
| ELD.K12.ELL.SI.1: | English language learners communicate for social and instructional purposes within the school setting. |

**General Course Information and Notes**

**GENERAL NOTES**

While the content focus of this course is consistent with the Physics I course, students will explore these concepts in greater depth. In general, the academic pace and rigor will be greatly increased for honors level course work. Laboratory investigations that include the use of scientific inquiry, research, measurement, problem solving, laboratory apparatus and technologies, experimental procedures, and safety procedures are an integral part of this course. The National Science Teachers Association (NSTA) recommends that at the high school level, all students should be in the science lab or field, collecting data every week. School laboratory investigations (labs) are defined by the National Research Council (NRC) as an experience in the laboratory, classroom, or the field that provides students with opportunities to interact directly with natural phenomena or with data collected by others using tools, materials, data collection techniques, and models (NRC, 2006, p. 3). Laboratory investigations in the high school classroom should help all students develop a growing understanding of the complexity and ambiguity of empirical work, as well as the skills to calibrate and troubleshoot equipment used to make observations. Learners should understand measurement error; and have the skills to aggregate, interpret, and present the resulting data (National Research Council, 2006, p.77; NSTA, 2007).

**Special Notes:**

**Instructional Practices**

Teaching from a range of complex text is optimized when teachers in all subject areas implement the following strategies on a routine basis:

1. Ensuring wide reading from complex text that varies in length.
2. Making close reading and rereading of texts central to lessons.
3. Emphasizing text-specific complex questions, and cognitively complex tasks, reinforce focus on the text and cultivate independence.
4. Emphasizing students supporting answers based upon evidence from the text.
5. Providing extensive research and writing opportunities (claims and evidence).

**Science and Engineering Practices** (NRC Framework for K-12 Science Education, 2010)

- Asking questions (for science) and defining problems (for engineering).
- Developing and using models.
- Planning and carrying out investigations.
- Analyzing and interpreting data.
- Using mathematics, information and computer technology, and computational thinking.
- Constructing explanations (for science) and designing solutions (for engineering).
- Engaging in argument from evidence.
- Obtaining, evaluating, and communicating information.

**Honors and Advanced Level Course Note:** Advanced courses require a greater demand on students through increased academic rigor. Academic rigor is obtained through the application, analysis, evaluation, and creation of complex ideas that are often abstract and multi-faceted. Students are challenged to think and collaborate critically on the content they are learning. Honors level rigor will be achieved by increasing text complexity through text selection, focus on high-level qualitative measures, and complexity of task. Instruction will be structured to give students a deeper understanding of conceptual themes and organization within and across disciplines. Academic rigor is more than simply assigning to students a greater quantity of work.

**Florida's Benchmarks for Excellent Student Thinking (B.E.S.T.) Standards**

This course includes Florida's B.E.S.T. ELA Expectations (EE) and Mathematical Thinking and Reasoning Standards (MTRs) for students. Florida educators should intentionally embed these standards within the content and their instruction as applicable. For guidance on the implementation of the EE's and MTRs, please visit https://www.fourisims.org/Standards/BEST_Standards.aspx and select the appropriate B.E.S.T. Standards package.

**English Language Development ELD Standards Special Notes Section:**

Teachers are required to provide listening, speaking, reading and writing instruction that allows English language learners (ELL) to communicate information, ideas and concepts for academic success in the content area of Science. For the given level of English language proficiency and with visual, graphic, or interactive support, students will interact with grade level words, expressions, sentences and discourse to process or produce language necessary for academic success. The ELD standard should specify a relevant content area concept or topic of study chosen by curriculum developers and teachers which maximizes an ELL's need for communication and social skills.
To access an ELL supporting document which delineates performance definitions and descriptors, please click on the following link: https://cpalmsmediaprod.blob.core.windows.net/uploads/docs/standards/eld/sc.pdf

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### GENERAL INFORMATION

<table>
<thead>
<tr>
<th>Course Number:</th>
<th>2003390</th>
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</thead>
<tbody>
<tr>
<td>Number of Credits:</td>
<td>One (1) credit</td>
</tr>
<tr>
<td>Course Type:</td>
<td>Core Academic Course</td>
</tr>
<tr>
<td>Course Status:</td>
<td>State Board Approved</td>
</tr>
<tr>
<td>Grade Level(s):</td>
<td>9,10,11,12</td>
</tr>
<tr>
<td>Graduation Requirement:</td>
<td>Equally Rigorous Science</td>
</tr>
</tbody>
</table>

**Course Path:** Section: Grades PreK to 12 Education Courses > Grade Group: Grades 9 to 12 and Adult Education Courses > Subject: Science > SubSubject: Physical Sciences > Abbreviated Title: PHYS 1 HON

**Course Length:** Year (Y)

**Course Attributes:**  
- Honors

**Course Level:** 3

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<td>SC.912.E.5.7</td>
<td>Relate the history of and explain the justification for future space exploration and continuing technology development.</td>
</tr>
<tr>
<td>SC.912.E.5.8</td>
<td>Connect the concepts of radiation and the electromagnetic spectrum to the use of historical and newly-developed observational tools.</td>
</tr>
<tr>
<td>SC.912.E.5.9</td>
<td>Analyze the broad effects of space exploration on the economy and culture of Florida.</td>
</tr>
<tr>
<td>SC.912.E.5.10</td>
<td>Describe and apply the coordinate system used to locate objects in the sky.</td>
</tr>
<tr>
<td>SC.912.E.5.11</td>
<td>Distinguish the various methods of measuring astronomical distances and apply each in appropriate situations.</td>
</tr>
<tr>
<td>SC.912.E.6.6</td>
<td>Analyze past, present, and potential future consequences to the environment resulting from various energy production technologies.</td>
</tr>
<tr>
<td>SC.912.E.7.7</td>
<td>Identify, analyze, and relate the internal (Earth system) and external (astronomical) conditions that contribute to global climate change.</td>
</tr>
<tr>
<td>SC.912.L.15.2</td>
<td>Discuss the use of molecular clocks to estimate how long ago various groups of organisms diverged evolutionarily from one another.</td>
</tr>
<tr>
<td>SC.912.L.16.10</td>
<td>Evaluate the impact of biotechnology on the individual, society and the environment, including medical and ethical issues.</td>
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<tr>
<td>SC.912.L.17.11</td>
<td>Discuss the costs and benefits of renewable and nonrenewable resources, such as water, energy, fossil fuels, wildlife, and forests.</td>
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<td>SC.912.L.17.15</td>
<td>Discuss the effects of technology on environmental quality.</td>
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<td>SC.912.L.18.12</td>
<td>Discuss the special properties of water that contribute to Earth's suitability as an environment for life: cohesive behavior, ability to moderate temperature, expansion upon freezing, and versatility as a solvent.</td>
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<td>SC.912.N.1.2</td>
<td>Describe and explain what characterizes science and its methods.</td>
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<td>SC.912.N.1.3</td>
<td>Recognize that the strength or usefulness of a scientific claim is evaluated through scientific argumentation, which depends on critical and logical thinking, and the active consideration of alternative scientific explanations to explain the data presented.</td>
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<td>SC.912.N.1.4</td>
<td>Identify sources of information and assess their reliability according to the strict standards of scientific investigation.</td>
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<td>Describe and provide examples of how similar investigations conducted in many parts of the world result in the same outcome.</td>
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<td>Describe how scientific inferences are drawn from scientific observations and provide examples from the content being studied.</td>
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<td>Recognize the role of creativity in constructing scientific questions, methods and explanations.</td>
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<td>SC.912.N.2.1</td>
<td>Identify what is science, what clearly is not science, and what superficially resembles science (but fails to meet the criteria for science).</td>
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<td>SC.912.N.2.2</td>
<td>Identify which questions can be answered through science and which questions are outside the boundaries of scientific investigation, such as questions addressed by other ways of knowing, such as art, philosophy, and religion.</td>
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<td>SC.912.N.2.3</td>
<td>Identify examples of pseudoscience (such as astrology, phrenology) in society.</td>
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<td>SC.912.N.2.4</td>
<td>Explain that scientific knowledge is both durable and robust and open to change. Scientific knowledge can change because it is often examined and re-examined by new investigations and scientific argumentation. Because of these frequent examinations, scientific knowledge becomes stronger, leading to its durability.</td>
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<td>SC.912.N.2.5</td>
<td>Describe instances in which scientists' varied backgrounds, talents, interests, and goals influence the inferences and thus the explanations that they make about observations of natural phenomena and describe that competing interpretations (explanations) of scientists are a strength of science as they are a source of new, testable ideas that have the potential to add new evidence to support one or another of the explanations.</td>
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<td>SC.912.N.3.1</td>
<td>Explain that a scientific theory is the culmination of many scientific investigations drawing together all the current evidence concerning a substantial range of phenomena; thus, a scientific theory represents the most powerful explanation scientists have to offer.</td>
</tr>
<tr>
<td>SC.912.N.3.2</td>
<td>Describe the role consensus plays in the historical development of a theory in any one of the disciplines of science.</td>
</tr>
<tr>
<td>SC.912.N.3.3</td>
<td>Explain that scientific laws are descriptions of specific relationships under given conditions in nature, but do not offer explanations for those relationships.</td>
</tr>
<tr>
<td>SC.912.N.3.4</td>
<td>Recognize that theories do not become laws, nor do laws become theories; theories are well supported explanations and laws are well supported descriptions.</td>
</tr>
<tr>
<td>SC.912.N.3.5</td>
<td>Describe the function of models in science, and identify the wide range of models used in science.</td>
</tr>
<tr>
<td>SC.912.N.4.1</td>
<td>Explain how scientific knowledge and reasoning provide an empirically-based perspective to inform society's decision making.</td>
</tr>
<tr>
<td>SC.912.N.4.2</td>
<td>Weigh the merits of alternative strategies for solving a specific societal problem by comparing a number of different costs and benefits, such as human, economic, and environmental.</td>
</tr>
</tbody>
</table>
Describe heat as the energy transferred by convection, conduction, and radiation, and explain the connection of heat to change in temperature or states of matter.

Create and interpret potential energy diagrams, for example: chemical reactions, orbits around a central body, motion of a pendulum.

Explain entropy's role in determining the efficiency of processes that convert energy to work.

Describe the quantization of energy at the atomic level.

Compare the magnitude and range of the four fundamental forces (gravitational, electromagnetic, weak nuclear, strong nuclear).

Explain and compare nuclear reactions (radioactive decay, fission and fusion), the energy changes associated with them and their associated safety issues.

Differentiate between chemical and nuclear reactions.

Explain the relationship between moving charges and magnetic fields, as well as changing magnetic fields and electric fields, and their application to modern technologies.

Explore the theory of electromagnetism by explaining electromagnetic waves in terms of oscillating electric and magnetic fields.

Explore the theory of electromagnetism by comparing and contrasting the different parts of the electromagnetic spectrum in terms of wavelength, frequency, and energy, and relate them to phenomena and applications.

List that all objects emit and absorb electromagnetic radiation and distinguish between objects that are blackbody radiators and those that are not.

Qualitatively describe the shift in frequency in sound or electromagnetic waves due to the relative motion of a source or a receiver.

Apply the law of conservation of linear momentum to interactions, such as collisions between objects.

Qualitatively apply the concept of angular momentum.

Recognize that Newton's Laws are a limiting case of Einstein's Special Theory of Relativity at speeds that are much smaller than the speed of light.

Recognize that time, length, and energy depend on the frame of reference.

Interpret the behavior of ideal gases in terms of kinetic molecular theory.

Differentiate between chemical and nuclear reactions.

Discuss nuclear reactions (radioactive decay, fission and fusion), the energy changes associated with them and their associated safety issues.

Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g., visually, quantitatively, orally) in order to make well-reasoned exchange of ideas.

Introduce, develop, and resolve claims, counterclaims, reasons, and evidence in discourse to develop reader understanding and critical analysis.

Propel conversations by posing and responding to questions that probe reasoning and evidence; ensure a hearing for a full range of positions on a topic or issue; clarify, verify, or challenge ideas and conclusions; and promote divergent and creative perspectives.

By the end of grade 12, read and comprehend science/technical texts in the grades 11–12 text complexity band independently and proficiently.

Initiate and participate effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on 11–12 topics, texts, and issues, building on others' ideas and expressing their own clearly and persuasively.

Work with peers to promote civil, democratic discussions and decision-making, set clear goals and deadlines, and establish individual roles as needed.

Propel conversations by posing and responding to questions that probe reasoning and evidence; ensure a hearing for a full range of positions on a topic or issue; clarify, verify, or challenge ideas and conclusions; and promote divergent and creative perspectives.

Interpret the behavior of ideal gases in terms of kinetic molecular theory.

Evaluate the hypotheses, data, analysis, and conclusions in a science or technical text, verifying the data when possible and corroborating or challenging conclusions with other sources of information.

Synthesize information from a range of sources (e.g., texts, experiments, simulations) into a coherent understanding of a process, phenomenon, or concept, resolving conflicting information when possible.

Initiate and participate effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on 11–12 topics, texts, and issues, building on others' ideas and expressing their own clearly and persuasively.

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Work with peers to promote civil, democratic discussions and decision-making, set clear goals and deadlines, and establish individual roles as needed.

Evaluate the hypotheses, data, analysis, and conclusions in a science or technical text, verifying the data when possible and corroborating or challenging conclusions with other sources of information.
Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.

Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience.

Use technology, including the Internet, to produce, publish, and update individual or shared writing products in response to ongoing feedback, including new arguments or information.

Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation.

Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the strengths and limitations of each source in terms of the specific task, purpose, and audience; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and overreliance on any one source and following a standard format for citation.

Write routinely over extended time frames (time for reflection and revision) and shorter time frames (single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences.

Choose a level of accuracy appropriate to limitations on measurement when reporting quantities.

Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases.

Graph linear and quadratic functions and show intercepts, maxima, and minima.

Graph square root, cube root, and piecewise-defined functions, including step functions and absolute value functions.

Graph linear and quadratic functions and show intercepts, maxima, and minima; graph square root, cube root, and piecewise-defined functions, including step functions and absolute value functions.

Graph exponential and logarithmic functions, showing intercepts and end behavior.

Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases.

Graph linear and quadratic functions and show intercepts, maxima, and minima.

Graph square root, cube root, and piecewise-defined functions, including step functions and absolute value functions.

Graph exponential and logarithmic functions, showing intercepts and end behavior, and trigonometric functions, showing period, midline, and amplitude, and using phase shift.

Informally assess the fit of a function by plotting and analyzing residuals.

Fit a function to the data; use functions fitted to data to solve problems in the context of the data.

Convey a knowledgeable stance in a style that responds to the discipline and context as well as to the expertise of likely readers.

Provide a concluding statement or section that follows from and supports the information or explanation provided (e.g., articulating implications or the significance of the topic).
<table>
<thead>
<tr>
<th>Standard Relation to Course: Supporting</th>
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<tbody>
<tr>
<td><strong>MAFS.K12.MP.1.1:</strong> Make sense of problems and persevere in solving them.</td>
</tr>
<tr>
<td>Mathematically proficient students start by explaining to themselves the meaning of a problem and looking for entry points to its solution. They analyze givens, constraints, relationships, and goals. They make conjectures about the form and meaning of the solution and plan a solution pathway rather than simply jumping into a solution attempt. They consider analogous problems, and try special cases and simpler forms of the original problem in order to gain insight into its solution. They monitor and evaluate their progress and change course if necessary. Older students might, depending on the context of the problem, transform algebraic expressions or change the viewing window on their graphing calculator to get the information they need. Mathematically proficient students can explain correspondences between equations, verbal descriptions, tables, and graphs or draw diagrams of important features and relationships, graph data, and search for regularity or trends. Younger students might rely on using concrete objects or pictures to help conceptualize and solve a problem. Mathematically proficient students check their answers to problems using a different method, and they continually ask themselves, “Does this make sense?” They can understand the approaches of others to solving complex problems and identify correspondences between different approaches.</td>
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<tr>
<td><strong>MAFS.K12.MP.2.1:</strong> Reason abstractly and quantitatively.</td>
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<tr>
<td>Mathematically proficient students make sense of quantities and their relationships in problem situations. They bring two complementary abilities to bear on problems involving quantitative relationships: the ability to decontextualize— to abstract a given situation and represent it symbolically and manipulate the representing symbols as if they have a life of their own, without necessarily attending to their referents—and the ability to contextualize, to pause as needed during the manipulation process in order to probe into the referents for the symbols involved. Quantitative reasoning entails habits of creating a coherent representation of the problem at hand; considering the units involved; attending to the meaning of quantities, not just how to compute them; and knowing and flexibly using different properties of operations and objects.</td>
</tr>
<tr>
<td><strong>MAFS.K12.MP.3.1:</strong> Construct viable arguments and critique the reasoning of others.</td>
</tr>
<tr>
<td>Mathematically proficient students understand and use stated assumptions, definitions, and previously established results in constructing arguments. They make conjectures and build a logical progression of statements to explore the truth of their conjectures. They are able to analyze situations by breaking them into cases, and can recognize and use counterexamples. They justify their conclusions, communicate them to others, and respond to the arguments of others. They reason inductively about data, making plausible arguments that take into account the context from which the data arose. Mathematically proficient students are also able to compare the effectiveness of two plausible arguments, distinguish correct logic or reasoning from that which is flawed, and—if there is a flaw in an argument—explain what it is. Elementary students can construct arguments using concrete referents such as objects, drawings, diagrams, and actions. Such arguments can make sense and be correct, even though they are not generalized or made formal until later grades. Later, students learn to determine domains to which an argument applies. Students at all grades can listen or read the arguments of others, decide whether they make sense, and ask useful questions to clarify or improve the arguments.</td>
</tr>
<tr>
<td><strong>MAFS.K12.MP.4.1:</strong> Model with mathematics.</td>
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<tr>
<td>Mathematically proficient students can apply the mathematics they know to solve problems arising in everyday life, society, and the workplace. In early grades, this might be as simple as writing an addition equation to describe a situation. In middle grades, a student might apply proportional reasoning to plan a school event or analyze a problem in the community. By high school, a student might use geometry software, a statistical package, or dynamic geometry software to simulate situations and gain insights into the data provided. Mathematically proficient students make sense of quantities and their relationships in problem situations. They bring two complementary abilities to bear on problems involving quantitative relationships: the ability to decontextualize— to abstract a given situation and represent it symbolically and manipulate the representing symbols as if they have a life of their own, without necessarily attending to their referents—and the ability to contextualize, to pause as needed during the manipulation process in order to probe into the referents for the symbols involved. Quantitative reasoning entails habits of creating a coherent representation of the problem at hand; considering the units involved; attending to the meaning of quantities, not just how to compute them; and knowing and flexibly using different properties of operations and objects.</td>
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<tr>
<td><strong>MAFS.K12.MP.5.1:</strong> Use appropriate tools strategically.</td>
</tr>
<tr>
<td>Mathematically proficient students consider the available tools when solving a mathematical problem. These tools might include pencil and paper, concrete models, a ruler, a protractor, a calculator, a spreadsheet, a computer algebra system, a statistical package, or dynamic geometry software. Proficient students are sufficiently familiar with tools appropriate for their grade or course to make sound decisions about when each of these tools might be helpful, recognizing both the insight to be gained and their limitations. For example, mathematically proficient high school students analyze graphs of functions and solutions generated using a graphing calculator. They detect possible errors by strategically using estimation and other mathematical knowledge. When making mathematical models, they know that technology can enable them to visualize the results of varying assumptions, explore consequences, and compare predictions with data. Mathematically proficient students at various grade levels are able to identify relevant external mathematical resources, such as digital content located on a website, and use them to pose or solve problems. They are able to use technological tools to explore and deepen their understanding of concepts.</td>
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<tr>
<td><strong>MAFS.K12.MP.6.1:</strong> Attend to precision.</td>
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<tr>
<td>Mathematically proficient students try to communicate precisely to others. They try to use clear definitions in discussion with others and in their own reasoning. They state the meaning of the symbols they choose, including using the equal sign consistently and appropriately. They are careful about specifying units of measure, and labeling axes to clarify the correspondence with quantities in a problem. They calculate accurately and efficiently, express numerical answers with a degree of precision appropriate for the problem context. In the elementary grades, students give carefully formulated explanations to each other. By the time they reach high school they have learned to examine claims and make explicit use of definitions.</td>
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<tr>
<td><strong>MAFS.K12.MP.7.1:</strong> Look for and make use of structure.</td>
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| Mathematically proficient students look closely to discern a pattern or structure. Young students, for example, might notice that three and seven more is the same amount as seven and three more, or they may sort a collection of shapes according to how many sides the shapes have. Later, students will see 7+8 equals the well remembered 7×5+7×3, in preparation for learning about the distributive property. In the expression x²+9x+14, older students can see the 14 as 2×7 and the 9 as 2+7. They recognize the significance of an existing line in a geometric figure and can use the strategy of drawing an auxiliary line for solving problems. They also can step back for an overview and shift perspective. They can see
complicated things, such as some algebraic expressions, as single objects or as being composed of several objects. For example, they can see $5 - 3(x - y)^2$ as 5 minus a positive number times a square and use that to realize that its value cannot be more than 5 for any real numbers $x$ and $y$.

### Standard Relation to Course: Supporting

**MAFS.K12.MP.8.1:**

Mathematically proficient students notice if calculations are repeated, and look both for general methods and for shortcuts. Upper elementary students might notice when dividing 25 by 11 that they are repeating the same calculations over and over again, and conclude they have a repeating decimal. By paying attention to the calculation of slope as they repeatedly check whether points are on the line through $(1, 2)$ with slope $3$, middle school students might abstract the equation $(y - 2)/(x - 1) = 3$. Noticing the regularity in the way terms cancel when expanding $(x - 1)(x + 1)$, $(x - 1)(x^2 + x + 1)$, and $(x - 1)(x^3 + x^2 + x + 1)$ might lead them to the general formula for the sum of a geometric series. As they work to solve a problem, mathematically proficient students maintain oversight of the process, while attending to the details. They continually evaluate the reasonableness of their intermediate results.

### General Course Information and Notes

**ELD.K12.ELL.SI.1:**

English language learners communicate for social and instructional purposes within the school setting.

**ELD.K12.ELL.SI.1:**

English language learners communicate information, ideas and concepts necessary for academic success in the content area of Science.

**ELD.K12.ELL.SC.1:**

English language learners communicate information, ideas and concepts necessary for academic success in the content area of Science.

**MAFS.K12.MP.8.1:**

Mathematically proficient students notice if calculations are repeated, and look both for general methods and for shortcuts. Upper elementary students might notice when dividing 25 by 11 that they are repeating the same calculations over and over again, and conclude they have a repeating decimal. By paying attention to the calculation of slope as they repeatedly check whether points are on the line through $(1, 2)$ with slope $3$, middle school students might abstract the equation $(y - 2)/(x - 1) = 3$. Noticing the regularity in the way terms cancel when expanding $(x - 1)(x + 1)$, $(x - 1)(x^2 + x + 1)$, and $(x - 1)(x^3 + x^2 + x + 1)$ might lead them to the general formula for the sum of a geometric series. As they work to solve a problem, mathematically proficient students maintain oversight of the process, while attending to the details. They continually evaluate the reasonableness of their intermediate results.

### General Course Information and Notes

**GENERAL NOTES**

Laboratory investigations that include the use of scientific inquiry, research, measurement, problem solving, laboratory apparatus and technologies, experimental procedures, and safety procedures are an integral part of this course. The National Science Teachers Association (NSTA) recommends that at the high school level, all students should be in the science lab or field, collecting data every week. School laboratory investigations (labs) are defined by the National Research Council (NRC) as an experience in the laboratory, classroom, or the field that provides students with opportunities to interact directly with natural phenomena or with data collected by others using tools, materials, data collection techniques, and models (NRC, 2006, p. 3). Laboratory investigations in the high school classroom should help all students develop a growing understanding of the complexity and ambiguity of empirical work, as well as the skills to calibrate and troubleshoot equipment used to make observations. Learners should understand measurement error; and have the skills to aggregate, interpret, and present the resulting data (National Research Council, 2006, p. 77; NSTA, 2007).

**Special Notes**

**Instructional Practices**

Teaching from a range of complex text is optimized when teachers in all subject areas implement the following strategies on a routine basis:

1. Ensuring wide reading from complex text that varies in length.
2. Making close reading and rereading of texts central to lessons.
3. Emphasizing text-specific complex questions, and cognitively complex tasks, reinforce focus on the text and cultivate independence.
4. Emphasizing students supporting answers based upon evidence from the text.
5. Providing extensive research and writing opportunities (claims and evidence).

**Science and Engineering Practices** (NRC Framework for K-12 Science Education, 2010)

- Asking questions (for science) and defining problems (for engineering).
- Developing and using models.
- Planning and carrying out investigations.
- Analyzing and interpreting data.
- Using mathematics, information and computer technology, and computational thinking.
- Constructing explanations (for science) and designing solutions (for engineering).
- Engaging in argument from evidence.
- Obtaining, evaluating, and communicating information.

**Honors and Advanced Level Course Note:** Advanced courses require a greater demand on students through increased academic rigor. Academic rigor is obtained through the application, analysis, evaluation, and creation of complex ideas that are often abstract and multi-faceted. Students are challenged to think and collaborate critically on the content they are learning. Honors level rigor will be achieved by increasing text complexity through text selection, focus on high-level qualitative measures, and complexity of task. Instruction will be structured to give students a deeper understanding of conceptual themes and organization within and across disciplines. Academic rigor is more than simply assigning to students a greater quantity of work.

**Literacy Standards in Science**

Secondary science courses include reading standards for literacy in science and technical subjects 6-12 and writing standards for literacy in history/social studies, science, and technical subjects 6-12. The courses also include speaking and listening standards. For a complete list of standards required for this course click on the blue tile function located at the top of this page.

**English Language Development ELD Standards Special Notes Section:**

Teachers are required to provide listening, speaking, reading and writing instruction that allows English language learners (ELL) to communicate information, ideas and concepts for academic success in the content area of Science. For the given level of English language proficiency and with visual, graphic, or interactive support, students will interact with grade level words, expressions, sentences and discourse to process or produce language necessary for academic success. The ELD standard should specify a relevant content area concept or topic of study chosen by curriculum developers and teachers which maximizes an ELL's need for communication and social skills. To access an ELL supporting document which delineates performance definitions and descriptors, please click on the following link: https://cpalmsmediaprod.blob.core.windows.net/uploads/docs/standards/eld/sc.pdf

**GENERAL INFORMATION**

Course Path: Section: Grades PreK to 12 Education
Course Number: 2003410
Number of Credits: One (1) credit
Course Type: Core Academic Course
Course Status: Course Approved
Grade Level(s): 9,10,11,12
Graduation Requirement: Equally Rigorous Science

## Educator Certifications

<table>
<thead>
<tr>
<th>Science (Secondary Grades 7-12)</th>
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<tr>
<td>Physics (Grades 6-12)</td>
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SC.912.P.10.6: Create and interpret potential energy diagrams, for example: chemical reactions, orbits around a central body, motion of a pendulum.

SC.912.P.10.8: Explain entropy's role in determining the efficiency of processes that convert energy to work.

SC.912.P.10.9: Describe the quantization of energy at the atomic level.

SC.912.P.10.10: Compare the magnitude and range of the four fundamental forces (gravitational, electromagnetic, weak nuclear, strong nuclear).

SC.912.P.10.11: Explain and compare nuclear reactions (radioactive decay, fission and fusion), the energy changes associated with them and their associated safety issues.

SC.912.P.10.12: Differentiate between chemical and nuclear reactions.

SC.912.P.10.16: Explain the relationship between moving charges and magnetic fields, as well as changing magnetic fields and electric fields, and their application to modern technologies.

SC.912.P.10.17: Explore the theory of electromagnetism by explaining electromagnetic waves in terms of oscillating electric and magnetic fields.

SC.912.P.10.18: Explore the theory of electromagnetism by comparing and contrasting the different parts of the electromagnetic spectrum in terms of wavelength, frequency, and energy, and relate them to phenomena and applications.

SC.912.P.10.19: Explain that all objects emit and absorb electromagnetic radiation and distinguish between objects that are blackbody radiators and those that are not.

SC.912.P.10.21: Qualitatively describe the shift in frequency in sound or electromagnetic waves due to the relative motion of a source or a receiver.

SC.912.P.12.5: Apply the law of conservation of linear momentum to interactions, such as collisions between objects.

SC.912.P.12.6: Qualitatively apply the concept of angular momentum.

SC.912.P.12.8: Recognize that Newton's Laws are a limiting case of Einstein's Special Theory of Relativity at speeds that are much smaller than the speed of light.

SC.912.P.12.9: Recognize that time, length, and energy depend on the frame of reference.

SC.912.P.12.10: Interpret the behavior of ideal gases in terms of kinetic molecular theory.

Mathematicians who engage in discussions that reflect on the mathematical thinking of self and others:
- Analyze the problem in a way that makes sense given the task.
- Ask questions that will help with solving the task.
- Build perseverance by modifying methods as needed while solving a challenging task.
- Stay engaged and maintain a positive mindset when working to solve tasks.
- Help and support each other when attempting a new method or approach.

Mathematicians who complete tasks with mathematical fluency:
- Select efficient and appropriate methods for solving problems within the given context.
- Maintain flexibility and accuracy while performing procedures and mental calculations.
- Complete tasks accurately and with confidence.
- Adapt procedures to apply them to a new context.
- Use feedback to improve efficiency when performing calculations.

Mathematicians who demonstrate understanding by representing problems in multiple ways:
- Build understanding through modeling and using manipulatives.
- Represent solutions to problems in multiple ways using objects, drawings, tables, graphs and equations.
- Progress from modeling problems with objects and drawings to using algorithms and equations.
- Express connections between concepts and representations.
- Choose a representation based on the given context or purpose.

Mathematicians who participate in effortful learning both individually and with others:
- Analyze the problem in a way that makes sense given the task.
- Ask questions that will help with solving the task.
- Build perseverance by modifying methods as needed while solving a challenging task.
- Stay engaged and maintain a positive mindset when working to solve tasks.
- Help and support each other when attempting a new method or approach.

Clarifications:
Teachers who encourage students to participate actively in effortful learning both individually and with others:
- Cultivate a community of growth mindset learners.
- Foster perseverance in students by choosing tasks that are challenging.
- Develop students' ability to analyze and problem solve.
- Recognize students' effort when solving challenging problems.

Mathematicians who participate in effortful learning both individually and with others:
- Analyze the problem in a way that makes sense given the task.
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- Cultivate a community of growth mindset learners.
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- Develop students' ability to analyze and problem solve.
- Recognize students' effort when solving challenging problems.
Clarifications:
Teachers who encourage students to engage in discussions that reflect on the mathematical thinking of self and others:
- Establish a culture in which students ask questions of the teacher and their peers, and error is an opportunity for learning.
- Create opportunities for students to discuss their thinking with peers.
- Select, sequence and present student work to advance and deepen understanding of correct and increasingly efficient methods.
- Develop students' ability to justify methods and compare their responses to the responses of their peers.

Use patterns and structure to help understand and connect mathematical concepts.
Mathematicians who use patterns and structure to help understand and connect mathematical concepts:
- Focus on relevant details within a problem.
- Create plans and procedures to logically order events, steps or ideas to solve problems.
- Decompose a complex problem into manageable parts.
- Relate previously learned concepts to new concepts.
- Look for similarities among problems.
- Connect solutions of problems to more complicated large-scale situations.

Assess the reasonableness of solutions.
Mathematicians who assess the reasonableness of solutions:
- Estimate to discover possible solutions.
- Use benchmark quantities to determine if a solution makes sense.
- Check calculations when solving problems.
- Verify possible solutions by explaining the methods used.
- Evaluate results based on the given context.

Apply mathematics to real-world contexts.
Mathematicians who apply mathematics to real-world contexts:
- Connect mathematical concepts to everyday experiences.
- Use models and methods to understand, represent and solve problems.
- Perform investigations to gather data or determine if a method is appropriate.
- Redesign models and methods to improve accuracy or efficiency.

Cite evidence to explain and justify reasoning.

Clarifications:
K-1 Students include textual evidence in their oral communication with guidance and support from adults. The evidence can consist of details from the text without naming the text. During 1st grade, students learn how to incorporate the evidence in their writing. 2-3 Students include relevant textual evidence in their written and oral communication. Students should name the text when they refer to it. In 3rd grade, students should use a combination of direct and indirect citations.
4-5 Students continue with previous skills and reference comments made by speakers and peers. Students cite texts that they've directly quoted, paraphrased, or used for information. When writing, students will use the form of citation dictated by the instructor or the style guide referenced by the instructor.
6-8 Students continue with previous skills and use a style guide to create a proper citation.
9-12 Students continue with previous skills and should be aware of existing style guides and the ways in which they differ.

Read and comprehend grade-level complex texts proficiently.

Clarifications:
See Text Complexity for grade-level complexity bands and a text complexity rubric.

Make inferences to support comprehension.

Clarifications:
Students will make inferences before the words infer or inference are introduced. Kindergarten students will answer questions like "Why is the girl smiling?" or make predictions about what will happen based on the title page. Students will use the terms and apply them in 2nd grade and beyond.

Use appropriate collaborative techniques and active listening skills when engaging in discussions in a variety of situations.
General Course Information and Notes

**GENERAL NOTES**

Laboratory investigations that include the use of scientific inquiry, research, measurement, problem solving, laboratory apparatus and technologies, experimental procedures, and safety procedures are an integral part of this course. The National Science Teachers Association (NSTA) recommends that at the high school level, all students should be in the science lab or field, collecting data every week. School laboratory investigations (labs) are defined by the National Research Council (NRC) as an experience in the laboratory, classroom, or the field that provides students with opportunities to interact directly with natural phenomena or with data collected by others using tools, materials, data collection techniques, and models (NRC, 2006, p. 3). Laboratory investigations in the high school classroom should help all students develop a growing understanding of the complexity and ambiguity of empirical work, as well as the skills to calibrate and troubleshoot equipment used to make observations. Learners should understand measurement error; and have the skills to aggregate, interpret, and present the resulting data (National Research Council, 2006, p. 77; NSTA, 2007).

**Special Notes**

**Instructional Practices**
Teaching from a range of complex text is optimized when teachers in all subject areas implement the following strategies on a routine basis:

1. Ensuring wide reading from complex text that varies in length.
2. Making close reading and rereading of texts central to lessons.
3. Emphasizing text-specific complex questions, and cognitively complex tasks, reinforce focus on the text and cultivate independence.
4. Emphasizing students supporting answers based upon evidence from the text.
5. Providing extensive research and writing opportunities (claims and evidence).

**Science and Engineering Practices** (NRC Framework for K-12 Science Education, 2010)
- Asking questions (for science) and defining problems (for engineering).
- Developing and using models.
- Planning and carrying out investigations.
- Analyzing and interpreting data.
- Using mathematics, information and computer technology, and computational thinking.
- Constructing explanations (for science) and designing solutions (for engineering).
- Engaging in argument from evidence.
- Obtaining, evaluating, and communicating information.

**Honors and Advanced Level Course Notes**
Advanced courses require a greater demand on students through increased academic rigor. Academic rigor is obtained through the application, analysis, evaluation, and creation of complex ideas that are often abstract and multi-faceted. Students are challenged to think and collaborate critically on the content they are learning. Honors level rigor will be achieved by increasing text complexity through text selection, focus on high-level qualitative measures, and complexity of task. Instruction will be structured to give students a deeper understanding of conceptual themes and organization within and across disciplines. Academic rigor is more than simply assigning to students a greater quantity of work.

**Florida's Benchmarks for Excellent Student Thinking (B.E.S.T.) Standards**
This course includes Florida's B.E.S.T. ELA Expectations (EE) and Mathematical Thinking and Reasoning Standards (MTRs) for students. Florida educators should intentionally embed these standards within the content and their instruction as applicable. For guidance on the implementation of the EE and MTRs, please visit https://www.cpalms.org/Standards/BEST_Standards.aspx and select the appropriate B.E.S.T. Standards package.

**English Language Development ELD Standards Special Notes Section:**
Teachers are required to provide listening, speaking, reading and writing instruction that allows English language learners (ELL) to communicate information, ideas and concepts for academic success in the content area of Science. For the given level of English language proficiency and with visual, graphic, or interactive support, students will interact with grade level words, expressions, sentences and discourse to process or produce language necessary for academic success. The ELD standard should specify a relevant content area concept or topic of study chosen by curriculum developers and teachers which maximizes an ELL's need for communication and social skills. To access an ELL supporting document which delineates performance definitions and descriptors, please click on the following link: https://cpalmsmediaprod.blob.core.windows.net/uploads/docs/standards/eld/sc.pdf
Educator Certifications

Science (Secondary Grades 7-12)
Physics (Grades 6-12)
The course description for this Advanced Placement courses is located on the College Board site at http://apcentral.collegeboard.com/apc/public/courses/teachers_corner/index.html.

**GENERAL INFORMATION**

- **Course Number:** 2003421
- **Number of Credits:** One (1) credit
- **Course Type:** Core Academic Course
- **Course Status:** Course Approved
- **Grade Level(s):** 9,10,11,12
- **Graduation Requirement:** Equally Rigorous Science

**Course Path:** Section: Grades PreK to 12 Education Courses > Grade Group: Grades 9 to 12 and Adult Education Courses > Subject: Science > SubSubject: Physical Sciences >

**Abbreviated Title:** AP PHYSICS 1

**Course Length:** Year (Y)

**Course Attributes:**
- Advanced Placement (AP)

**Course Level:** 3

**Educator Certifications**

- Science (Secondary Grades 7-12)
- Physics (Grades 6-12)
General Course Information and Notes

VERSION DESCRIPTION

The course description for this Advanced Placement courses is located on the College Board site at http://apcentral.collegeboard.com/apc/public/courses/teachers_corner/index.html.

GENERAL INFORMATION

Course Number: 2003422
Number of Credits: One (1) credit
Course Type: Core Academic Course
Course Status: Course Approved
Grade Level(s): 9,10,11,12
Graduation Requirement: Equally Rigorous Science

Course Path: Section: Grades PreK to 12 Education Courses > Grade Group: Grades 9 to 12 and Adult Education Courses > Subject: Science > SubSubject: Physical Sciences
Abbreviated Title: AP PHYSICS 2
Course Length: Year (Y)
Course Attributes:
  • Advanced Placement (AP)
Course Level: 3

Educator Certifications

Science (Secondary Grades 7-12)
Physics (Grades 6-12)
Advanced Placement Physics C: Electricity and Magnetism (#2003425) 2014 - And Beyond (current)

General Course Information and Notes

GENERAL NOTES

The course description for this Advanced Placement courses is located on the College Board site at http://apcentral.collegeboard.com/apc/public/courses/teachers_corner/index.html.

GENERAL INFORMATION

- **Course Number:** 2003425
- **Number of Credits:** One (1) credit
- **Course Type:** Core Academic Course
- **Course Status:** Course Approved
- **Grade Level(s):** 9,10,11,12
- **Graduation Requirement:** Equally Rigorous Science

Course Path: Section: Grades PreK to 12 Education Courses > Grade Group: Grades 9 to 12 and Adult Education Courses > Subject: Science > SubSubject: Physical Sciences > Abbreviated Title: AP PHYSICS: E&M

- **Course Length:** Year (Y)
- **Course Attributes:**
  - Advanced Placement (AP)
- **Course Level:** 3

Educator Certifications

Science (Secondary Grades 7-12)
Physics (Grades 6-12)

Equivalent Courses

2003431-Cambridge AICE Physics 1 AS Level
General Course Information and Notes

GENERAL NOTES

The course description for this Advanced Placement courses is located on the College Board site at http://apcentral.collegeboard.com/apc/public/courses/teachers_corner/index.html.

GENERAL INFORMATION

- **Course Number:** 2003430
- **Number of Credits:** One (1) credit
- **Course Type:** Core Academic Course
- **Course Status:** Course Approved
- **Grade Level(s):** 9,10,11,12
- **Graduation Requirement:** Equally Rigorous Science

**Course Path:** Section: Grades PreK to 12 Education Courses > Grade Group: Grades 9 to 12 and Adult Education Courses > Subject: Science > SubSubject: Physical Sciences

**Abbreviated Title:** AP PHYSICS C: ME

- **Course Length:** Year (Y)
- **Course Attributes:**
  - Advanced Placement (AP)
- **Course Level:** 3

Educator Certifications

- Science (Secondary Grades 7-12)
- Physics (Grades 6-12)

Equivalent Courses

- 2003431-Cambridge AICE Physics 1 AS Level
General Course Information and Notes

GENERAL NOTES

For more information about this Cambridge course, visit http://www.cie.org.uk/programmes-and-qualifications/cambridge-advanced/cambridge-international-as-and-a-levels/curriculum/.

GENERAL INFORMATION

Course Number: 2003431

Number of Credits: One (1) credit

Course Type: Core Academic Course

Course Status: Course Approved

Graduation Requirement: Equally Rigorous Science

Course Path: Section: Grades PreK to 12 Education Courses > Grade Group: Grades 9 to 12 and Adult Education Courses > Subject: Science > SubSubject: Physical Sciences >

Abbreviated Title: AICE PHYSICS 1 AS

Course Length: Year (Y)

Course Attributes:
- Advanced International Certificate of Education (AICE)

Course Level: 3

Equivalent Courses

2003430-Advanced Placement Physics C: Mechanics
2003425-Advanced Placement Physics C: Electricity, Magnetism

Educator Certifications

Science (Secondary Grades 7-12)
Physics (Grades 6-12)
General Course Information and Notes

GENERAL NOTES


GENERAL INFORMATION

Course Number: 2003432
Number of Credits: One (1) credit
Course Type: Core Academic Course
Course Status: Course Approved
Grade Level(s): 9, 10, 11, 12
Graduation Requirement: Equally Rigorous Science

Course Path: Section: Grades PreK to 12 Education
Courses:

Grade Group: Grades 9 to 12 and Adult Education Courses
Subject: Science
SubSubject: Physical Sciences

Abbreviated Title: PRE-AICE PHYSICS IG
Course Length: Year (Y)
Course Attributes:
- Advanced International Certificate of Education (AICE)

Course Level: 3

Educator Certifications

Science (Secondary Grades 7-12)
Physics (Grades 6-12)
# General Course Information and Notes

## General Notes


## General Information

<table>
<thead>
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<th>Course Number: 2003433</th>
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<tr>
<td><strong>Course Path:</strong> Section: Grades PreK to 12 Education Courses &gt; Grade Group: Grades 9 to 12 and Adult Education Courses &gt; Subject: Science &gt; SubSubject: Physical Sciences</td>
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<tr>
<td><strong>Abbreviated Title:</strong> AICE PHYSICS 2 AL</td>
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<td><strong>Course Length:</strong> Year (Y)</td>
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<td><strong>Course Level:</strong> 3</td>
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<td><strong>Grade Level(s):</strong> 9, 10, 11, 12</td>
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<td><strong>Graduation Requirement:</strong> Equally Rigorous Science</td>
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</tbody>
</table>

## Educator Certifications

- Physics (Grades 6-12)
- Science (Secondary Grades 7-12)
Renewable Energy 1 Honors (#2003500) 2015 - 2022 (current)

Course Standards

<table>
<thead>
<tr>
<th>Name</th>
<th>Description</th>
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<tbody>
<tr>
<td>SC.912.E.5.8</td>
<td>Connect the concepts of radiation and the electromagnetic spectrum to the use of historical and newly-developed observational tools.</td>
</tr>
<tr>
<td>SC.912.E.5.9</td>
<td>Analyze the broad effects of space exploration on the economy and culture of Florida.</td>
</tr>
<tr>
<td>SC.912.E.6.4</td>
<td>Analyze how specific geologic processes and features are expressed in Florida and elsewhere.</td>
</tr>
<tr>
<td>SC.912.E.6.6</td>
<td>Analyze past, present, and potential future consequences to the environment resulting from various energy production technologies.</td>
</tr>
<tr>
<td>SC.912.E.7.1</td>
<td>Analyze the movement of matter and energy through the different biogeochemical cycles, including water and carbon.</td>
</tr>
<tr>
<td>SC.912.E.7.2</td>
<td>Analyze the causes of the various kinds of surface and deep water motion within the oceans and their impacts on the transfer of energy between the</td>
</tr>
<tr>
<td>SC.912.E.7.3</td>
<td>Differentiate and describe the various interactions among Earth systems, including: atmosphere, hydrosphere, cryosphere, geosphere, and biosphere.</td>
</tr>
<tr>
<td>SC.912.E.7.4</td>
<td>Summarize the conditions that contribute to the climate of a geographic area, including the relationships to lakes and oceans.</td>
</tr>
<tr>
<td>SC.912.E.7.7</td>
<td>Identify, analyze, and relate the internal (Earth system) and external (astronomical) conditions that contribute to global climate change.</td>
</tr>
<tr>
<td>SC.912.E.7.8</td>
<td>Explain how various atmospheric, oceanic, and hydrologic conditions in Florida have influenced and can influence human behavior, both individually</td>
</tr>
<tr>
<td>SC.912.E.7.9</td>
<td>Cite evidence that the ocean has had a significant influence on climate change by absorbing, storing, and moving heat, carbon, and water.</td>
</tr>
<tr>
<td>SC.912.L.17.11</td>
<td>Evaluate the costs and benefits of renewable and nonrenewable resources, such as water, energy, fossil fuels, wildlife, and forests.</td>
</tr>
<tr>
<td>SC.912.L.17.12</td>
<td>Discuss the political, social, and environmental consequences of sustainable use of land.</td>
</tr>
<tr>
<td>SC.912.L.17.13</td>
<td>Discuss the need for adequate monitoring of environmental parameters when making policy decisions.</td>
</tr>
<tr>
<td>SC.912.L.17.14</td>
<td>Assess the need for adequate waste management strategies.</td>
</tr>
<tr>
<td>SC.912.L.17.15</td>
<td>Discuss the effects of technology on environmental quality.</td>
</tr>
<tr>
<td>SC.912.L.17.16</td>
<td>Discuss the large-scale environmental impacts resulting from human activity, including waste spills, oil spills, runoff, greenhouse gases, ozone</td>
</tr>
<tr>
<td>SC.912.L.17.17</td>
<td>Assess the effectiveness of innovative methods of protecting the environment.</td>
</tr>
<tr>
<td>SC.912.L.17.18</td>
<td>Describe how human population size and resource use relate to environmental quality.</td>
</tr>
<tr>
<td>SC.912.L.17.19</td>
<td>Describe how different natural resources are produced and how their rates of use and renewal limit availability.</td>
</tr>
<tr>
<td>SC.912.L.17.20</td>
<td>Predict the impact of individuals on environmental systems and examine how human lifestyles affect sustainability.</td>
</tr>
</tbody>
</table>

Define a problem based on a specific body of knowledge, for example: biology, chemistry, physics, and earth/space science, and do the following:

1. Pose questions about the natural world. (Articulate the purpose of the investigation and identify the relevant scientific concepts).
2. Conduct systematic observations, (Write procedures that are clear and replicable. Identify observables and examine relationships between test (independent) variable and outcome (dependent) variable. Employ appropriate methods for accurate and consistent observations; conduct and record measurements at appropriate levels of precision. Follow safety guidelines).
3. Examine books and other sources of information to see what is already known.
4. Review what is known in light of empirical evidence, (Examine whether available empirical evidence can be interpreted in terms of existing knowledge and models, and if not, modify or develop new models).
5. Plan investigations, (Design and evaluate a scientific investigation).
6. Use tools to gather, analyze, and interpret data (this includes the use of measurement in metric and other systems, and also the generation and interpretation of graphical representations of data, including data tables and graphs), (Collect data or evidence in an organized way. Properly use instruments, equipment, and materials (e.g., scales, probeware, meter sticks, microscopes, computers) including set-up, calibration, technique, maintenance, and storage).
7. Pose answers, explanations, or descriptions of events.
8. Generate explanations that explicate or describe natural phenomena (inferences).
9. Use appropriate evidence and reasoning to justify these explanations to others,
10. Communicate results of scientific investigations, and
11. Evaluate the merits of the explanations produced by others.

SC.912.N.1.1:

SC.912.N.1.2:

SC.912.N.1.3:

SC.912.N.1.4:

SC.912.N.1.5:

SC.912.N.1.6:

SC.912.N.1.7:

SC.912.N.2.1:

SC.912.N.2.2:

SC.912.N.2.4:

SC.912.N.2.5:
Explain that a scientific theory is the culmination of many scientific investigations drawing together all the current evidence concerning a substantial range of phenomena; thus, a scientific theory represents the most powerful explanation scientists have to offer.

SC.912.N.3.2: Describe the role consensus plays in the historical development of a theory in any one of the disciplines of science.

SC.912.N.3.3: Explain that scientific laws are descriptions of specific relationships under given conditions in nature, but do not offer explanations for those relationships.

SC.912.N.3.4: Recognize that theories do not become laws, nor do laws become theories; theories are well supported explanations and laws are well supported descriptions.

SC.912.N.3.5: Describe the function of models in science, and identify the wide range of models used in science.

SC.912.N.4.1: Explain how scientific knowledge and reasoning provide an empirically-based perspective to inform society's decision making.

SC.912.N.4.2: Weigh the merits of alternative strategies for solving a specific societal problem by comparing a number of different costs and benefits, such as human, economic, and environmental.

SC.912.P.10.1: Differentiate among the various forms of energy and recognize that they can be transformed from one form to others.

SC.912.P.10.2: Explore the Law of Conservation of Energy by differentiating among open, closed, and isolated systems and explain that the total energy in an isolated system is a conserved quantity.

SC.912.P.10.11: Explain and compare nuclear reactions (radioactive decay, fission and fusion), the energy changes associated with them and their associated safety issues.


SC.912.P.10.15: Investigate and explain the relationships among current, voltage, resistance, and power.

SC.912.P.10.16: Explain the relationship between moving charges and magnetic fields, as well as changing magnetic fields and electric fields, and their application to modern technologies.

SC.912.P.10.17: Explore the theory of electromagnetism by explaining electromagnetic waves in terms of oscillating electric and magnetic fields.

SC.912.P.10.18: Explore the theory of electromagnetism by comparing and contrasting the different parts of the electromagnetic spectrum in terms of wavelength, frequency, and energy, and relate them to phenomena and applications.

LAFS.1112.RST.1.1: Cite specific textual evidence to support analysis of science and technical texts, attending to important distinctions the author makes and to any gaps or inconsistencies in the account.

LAFS.1112.RST.1.2: Determine the central ideas or conclusions of a text; summarize complex concepts, processes, or information presented in a text by paraphrasing them in simpler but still accurate terms.

LAFS.1112.RST.1.3: Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks; analyze the specific results based on explanations in the text.

LAFS.1112.RST.2.4: Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 11-12 texts and topics.

LAFS.1112.RST.2.5: Analyze how the text structures information or ideas into categories or hierarchies, demonstrating understanding of the information or ideas.

LAFS.1112.RST.2.6: Analyze the author's purpose in providing an explanation, describing a procedure, or discussing an experiment in a text, identifying important issues that remain unresolved.

LAFS.1112.RST.3.7: Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g., quantitative data, video, multimedia) in order to address a question or solve a problem.

LAFS.1112.RST.3.8: Evaluate the hypotheses, data, analysis, and conclusions in a science or technical text, verifying the data when possible and corroborating or challenging conclusions with other sources of information.

LAFS.1112.RST.3.9: Synthesize information from a range of sources (e.g., texts, experiments, simulations) into a coherent understanding of a process, phenomenon, or concept, resolving conflicting information when possible.

LAFS.1112.RST.4.10: By the end of grade 12, read and comprehend science/technical texts in the grades 11–12 text complexity band independently and proficiently.

LAFS.1112.SL.1.1: Initiate and participate effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grades 11–12 topics, texts, and issues, building on others' ideas and expressing their own clearly and persuasively.

a. Come to discussions prepared, having read and researched material under study, explicitly draw on that preparation by referring to evidence from texts and other research on the topic or issue to stimulate a thoughtful, well-reasoned exchange of ideas.

b. Work with peers to promote civil, democratic discussions and decision-making, set clear goals and deadlines, and establish individual roles as needed.

c. Propose conversations by posing and responding to questions that probe reasoning and evidence; ensure a hearing for a full range of positions on a topic or issue; clarify, verify, or challenge ideas and conclusions; and promote divergent and creative perspectives.

d. Respond thoughtfully to diverse perspectives; synthesize comments, claims, and evidence made on all sides of an issue; resolve contradictions when possible; and determine what additional information or research is required to deepen the investigation or complete the task.

LAFS.1112.SL.1.2: Integrate multiple sources of information presented in diverse formats and media (e.g., visually, quantitatively, or orally) in order to make informed decisions and solve problems, evaluating the credibility and accuracy of each source and noting any discrepancies among the data.

LAFS.1112.SL.1.3: Evaluate a speaker's point of view, reasoning, and use of evidence and rhetoric, assessing the stance, premises, links among ideas, word choice, points of emphasis, and tone used.

LAFS.1112.SL.2.4: Present information, findings, and supporting evidence, conveying a clear and distinct perspective, such that listeners can follow the line of reasoning, alternative or opposing perspectives are addressed, and the organization, development, substance, and style are appropriate to purpose, audience, and a range of formal and informal tasks.

LAFS.1112.SL.2.5: Make strategic use of digital media (e.g., text, visual, graphical, audio, visual, and interactive elements) in presentations to enhance understanding of findings, reasoning, and evidence and to add interest.

Write arguments focused on discipline-specific content.

a. Introduce precise, knowledgeable claims, establish the significance of the claim(s), distinguish the claim(s) from alternate or opposing claims, and create an organization that logically sequences the claim(s), counterclaims, reasons, and evidence.

b. Develop claims and counterclaims fairly and thoroughly, supplying the most relevant data and evidence for each while pointing out the strengths and limitations of both claim(s) and counterclaims in a discipline-appropriate form that anticipates the audience's knowledge level, concerns, values, and possible biases.

c. Use words, phrases, and clauses as well as varied syntax to link the major sections of the text, create cohesion, and clarify the relationships between claim(s) and reasons, between reasons and evidence, and between claim(s) and counterclaims.

d. Establish and maintain a formal style and objective tone while attending to the norms and conventions of the discipline in which they are writing.

e. Provide a concluding statement or section that follows from or supports the argument presented.

Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes.
a. Introduce a topic and organize complex ideas, concepts, and information so that each new element builds on that which precedes it to create a unified whole; include formatting (e.g., headings), graphics (e.g., figures, tables), and multimedia when useful to aiding comprehension.

b. Develop the topic thoroughly by selecting the most significant and relevant facts, extended definitions, concrete details, quotations, or other information and examples appropriate to the audience's knowledge of the topic.

c. Use varied transitions and sentence structures to link the major sections of the text, create cohesion, and clarify the relationships among complex ideas and concepts.

d. Use precise language, domain-specific vocabulary and techniques such as metaphor, simile, and analogy to manage the complexity of the topic; convey a knowledgeable stance in a style that responds to the discipline and context as well as to the expertise of likely readers.

e. Provide a concluding statement or section that follows from and supports the information or explanation provided (e.g., articulating implications or the significance of the topic).

LAFS.1112.WHST.2.4: Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.

LAFS.1112.WHST.2.5: Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience.

LAFS.1112.WHST.2.6: Use technology, including the Internet, to produce, publish, and update individual or shared writing products in response to ongoing feedback, including new arguments or information.

LAFS.1112.WHST.3.7: Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation.

LAFS.1112.WHST.3.8: Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the strengths and limitations of each source in terms of the specific task, purpose, and audience; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and overreliance on any one source and following a standard format for citation.

LAFS.1112.WHST.3.9: Draw evidence from informational texts to support analysis, reflection, and research.

LAFS.1112.WHST.4.10: Write routinely over extended time frames (time for reflection and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences.

MAFS.912.S-ID.2.6: Evaluate reports based on data.

Make sense of problems and persevere in solving them.

Mathematically proficient students start by explaining to themselves the meaning of a problem and looking for entry points to its solution. They analyze givens, constraints, relationships, and goals. They make conjectures about the form and meaning of the solution and plan a solution pathway rather than simply jumping into a solution attempt. They consider analogous problems, and try special cases and simpler forms of the original problem in order to gain insight into its solution. They monitor and evaluate their progress and change course if necessary. Older students might, depending on the context of the problem, transform algebraic expressions or change the viewing window on their graphing calculator to get the information they need. Mathematically proficient students can explain correspondences between equations, verbal descriptions, tables, and graphs or draw diagrams of important features and relationships, graph data, and search for regularity or trends. Younger students might rely on using concrete objects or pictures to help conceptualize and solve a problem. Mathematically proficient students check their answers to problems using different methods, and they continually ask themselves, “Does this make sense?” They can understand the approaches of others to solving complex problems and identify correspondences between different approaches.

Standard Relation to Course: Supporting

Reason abstractly and quantitatively.

Mathematically proficient students make sense of quantities and their relationships in problem situations. They bring two complementary abilities to bear on problems involving quantitative relationships: the ability to decontextualize—to abstract a given situation and represent it symbolically and manipulate the representing symbols as if they have a life of their own, without necessarily attending to their referents—and the ability to contextualize, to pause as needed during the manipulation process in order to probe into the referents for the symbols involved. Quantitative reasoning entails habits of creating a coherent representation of the problem at hand; considering the units involved; attending to the meaning of quantities, not just how to compute them; and knowing and flexibly using different properties of operations and objects.

Standard Relation to Course: Supporting

Construct viable arguments and critique the reasoning of others.

Mathematically proficient students understand and use stated assumptions, definitions, and previously established results in constructing arguments. They make conjectures and build a logical progression of statements to explore the truth of their conjectures. They are able to analyze situations by breaking them into cases, and can recognize and analyze counterexamples. They justify their conclusions, communicate them to others, and respond to the arguments of others. They reason inductively about data, making plausible arguments that take into account the context from which the data arose. Mathematically proficient students are also able to compare the effectiveness of two plausible arguments, distinguish correct logic or reasoning from that which is flawed, and—if there is a flaw in an argument—explain what it is. Elementary students can construct arguments using concrete referents such as objects, drawings, diagrams, and actions. Such arguments can make sense and be correct, even though they are not generalized or made formal until later grades. Later, students learn to determine domains to which an argument applies. Students at all grades can listen or read the arguments of others, decide whether they make sense, and ask useful questions to clarify or improve the arguments.

Standard Relation to Course: Supporting

Model with mathematics.

Mathematically proficient students can apply the mathematics they know to solve problems arising in everyday life, society, and the workplace. In early grades, this might be as simple as writing an addition equation to describe a situation. In middle grades, a student might apply proportional reasoning to plan a school event or analyze a problem in the community. By high school, a student might use geometry to solve a design problem or use a function to describe how one quantity of interest depends on another. Mathematically proficient students who can apply what they know are comfortable making assumptions and approximations to simplify a complicated situation, realizing that these may need revision later. They are able to identify important quantities in a practical situation and map their relationships using such tools as diagrams, two-way tables, graphs, flowcharts and formulas. They can analyze those relationships mathematically to draw conclusions. They routinely interpret their mathematical results in the context of the situation and reflect on whether the results make sense, possibly improving the model if it has not served its purpose.

Standard Relation to Course: Supporting

Use appropriate tools strategically.

Mathematically proficient students consider the available tools when solving a mathematical problem. These tools might include pencil and paper,
MAFS.K12.MP.5.1: Concrete models, a ruler, a protractor, a calculator, a spreadsheet, a computer algebra system, a statistical package, or dynamic geometry software. Proficient students are sufficiently familiar with tools appropriate for their grade or course to make sound decisions about when each of these tools might be helpful, recognizing both the insight to be gained and their limitations. For example, mathematically proficient high school students analyze graphs of functions and solutions generated using a graphing calculator. They detect possible errors by strategically using estimation and other mathematical knowledge. When making mathematical models, they know that technology can enable them to visualize the results of varying assumptions, explore consequences, and compare predictions with data. Mathematically proficient students at various grade levels are able to identify relevant external mathematical resources, such as digital content located on a website, and use them to pose or solve problems. They are able to use technological tools to explore and deepen their understanding of concepts.

**Standard Relation to Course: Supporting**

MAFS.K12.MP.6.1: Mathematically proficient students try to communicate precisely to others. They try to use clear definitions in discussion with others and in their own reasoning. They state the meaning of the symbols they choose, including using the equal sign consistently and appropriately. They are careful about specifying units of measure, and labeling axes to clarify the correspondence with quantities in a problem. They calculate accurately and efficiently, express numerical answers with a degree of precision appropriate for the problem context. In the elementary grades, students give carefully formulated explanations to each other. By the time they reach high school they have learned to examine claims and make explicit use of definitions.

**Standard Relation to Course: Supporting**

MAFS.K12.MP.7.1: Mathematically proficient students look closely to discern a pattern or structure. Young students, for example, might notice that three and seven more is the same amount as seven and three more, or they may sort a collection of shapes according to how many sides the shapes have. Later, students will see 7 x 8 equals the well remembered 7 x 5 + 7 x 3, in preparation for learning about the distributive property. In the expression x² + 9x + 14, older students can see the 14 as 2 x 7 and the 9 as 2 + 7. They recognize the significance of an existing line in a geometric figure and can use the strategy of drawing an auxiliary line for solving problems. They also can step back for an overview and shift perspective. They can see complicated things, such as some algebraic expressions, as single objects or as being composed of several objects. For example, they can see 5 – 3(x – y²) as 5 minus a positive number times a square and use that to realize that its value cannot be more than 5 for any real numbers x and y.

**Standard Relation to Course: Supporting**

MAFS.K12.MP.8.1: Mathematically proficient students notice if calculations are repeated, and look both for general methods and for shortcuts. Upper elementary students might notice when dividing 25 by 11 that they are repeating the same calculations over and over again, and conclude they have a repeating decimal. By paying attention to the calculation of slope as they repeatedly check whether points are on the line through (1, 2) with slope 3, middle school students might abstract the equation (y – 2)/(x – 1) = 3. Noticing the regularity in the way terms cancel when expanding (x – 1)(x + 1), (x – 1)(x² + x + 1), and (x – 1)(x⁴ + x³ + x² + x + 1) might lead them to the general formula for the sum of a geometric series. As they work to solve a problem, mathematically proficient students maintain oversight of the process, while attending to the details. They continually evaluate the reasonableness of their intermediate results.

**Standard Relation to Course: Supporting**

ELD.K12.ELL.SC.1: English language learners communicate information, ideas and concepts necessary for academic success in the content area of Science.

ELD.K12.ELL.SI.1: English language learners communicate for social and instructional purposes within the school setting.

HE.912.C.1.3: Clariﬁcations:
- Food options within a community; prenatal-care services; availability of recreational facilities; air quality; weather-safety awareness; and weather, air, and water conditions.

SS.912.C.2.8: Clariﬁcations:
- Examples are e-mail campaigns, boycotts, blogs, podcasts, protests, demonstrations, letters to editors.

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**General Course Information and Notes**

**VERSION DESCRIPTION**

The course content includes: an introduction to energy technology, renewable energy in a sustainable future, the science behind climate change, environmental impacts and economics, and careers in renewable energy. Students will be introduced to different types of renewable energy technologies, how they work, their advantages, disadvantages, and limitations. The types of renewable energies and technologies studied include: wind energy, solar (thermal and photovoltaic), hydro-electric, bio-energy, tidal power, wave energy, geothermal energy, ocean thermal, fuel cells, heat pump systems, and high voltage DC energy transport. The availability and integration of these energy types and technologies are also studied to understand how renewable energy can work as a compliment to and replacement for conventional technologies.

**GENERAL NOTES**

**Honors and Advanced Level Course Note:** Advanced courses require a greater demand on students through increased academic rigor. Academic rigor is obtained through the application, analysis, evaluation, and creation of complex ideas that are often abstract and multi-faceted. Students are challenged to think and collaborate critically on the content they are learning. Honors level rigor will be achieved by increasing text complexity through text selection, focus on high-level qualitative measures, and complexity of task. Instruction will be structured to give students a deeper understanding of conceptual themes and organization within and across disciplines. Academic rigor is more than simply assigning to students a greater quantity of work.

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**Instructional Practices**
Teaching from a range of complex text is optimized when teachers in all subject areas implement the following strategies on a routine basis:

1. Ensuring wide reading from complex text that varies in length.
2. Making close reading and rereading of texts central to lessons.
3. Emphasizing text-specific complex questions, and cognitively complex tasks, reinforce focus on the text and cultivate independence.
4. Emphasizing students supporting answers based upon evidence from the text.
5. Providing extensive research and writing opportunities (claims and evidence).

**English Language Development ELD Standards Special Notes Section:**
Teachers are required to provide listening, speaking, reading and writing instruction that allows English language learners (ELL) to communicate information, ideas and concepts for academic success in the content area of Science. For the given level of English language proficiency and with visual, graphic, or interactive support, students will interact with grade level words, expressions, sentences and discourse to process or produce language necessary for academic success. The ELD standard should specify a relevant content area concept or topic of study chosen by curriculum developers and teachers which maximizes an ELL's need for communication and social skills.

To access an ELL supporting document which delineates performance definitions and descriptors, please click on the following link:

https://cpalmsmediaprod.blob.core.windows.net/uploads/docs/standards/eld/sc.pdf

### GENERAL INFORMATION

<table>
<thead>
<tr>
<th><strong>Course Number:</strong> 2003500</th>
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</thead>
<tbody>
<tr>
<td><strong>Course Path:</strong> Section: Grades PreK to 12 Education Courses &gt; Grade Group: Grades 9 to 12 and Adult Education Courses &gt; Subject: Science &gt; SubSubject: Physical Sciences &gt;</td>
</tr>
<tr>
<td><strong>Abbreviated Title:</strong> RENEWABLE ENERGY 1 H</td>
</tr>
<tr>
<td><strong>Number of Credits:</strong> One (1) credit</td>
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<tr>
<td><strong>Course Type:</strong> Elective Course</td>
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<td><strong>Course Status:</strong> Course Approved</td>
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<tr>
<td><strong>Assessment:</strong> External</td>
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<tr>
<td><strong>Course Level(s):</strong> 9,10,11,12</td>
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</tbody>
</table>

**Course Attributes:**
- Honors

**Course Level:** 3

### Educator Certifications

<table>
<thead>
<tr>
<th>Chemistry (Grades 6-12)</th>
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<tbody>
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<td>Physics (Grades 6-12)</td>
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</tbody>
</table>
Assess the need for adequate waste management strategies.

Describe and provide examples of how similar investigations conducted in many parts of the world result in the same outcome.

Describe how human population size and resource use relate to environmental quality.

Evaluate the costs and benefits of renewable and nonrenewable energy production technologies.

Differentiate and describe the various interactions among Earth systems, including: atmosphere, hydrosphere, cryosphere, geosphere, and biosphere.

Summarize the conditions that contribute to the climate of a geographic area, including the relationships to lakes and oceans.

Identify sources of information and assess their reliability according to the strict standards of scientific investigation.

Discuss the need for adequate monitoring of environmental parameters when making policy decisions.

Describe and explain what characterizes science and its methods.

Recognize that the strength or usefulness of a scientific claim is evaluated through scientific argumentation, which depends on critical and logical thinking, and the active consideration of alternative scientific explanations to explain the data presented.

Identify what is science, what clearly is not science, and what superficially resembles science (but fails to meet the criteria for science).

Describe instances in which scientists' varied backgrounds, talents, interests, and goals influence the inferences and thus the explanations that they make about observations of natural phenomena and describe that competing interpretations (explanations) of scientists are a strength of science as they are a source of new, testable ideas that have the potential to add new evidence to support one or another of the explanations.
SC.912.N.3.1: Explain that a scientific theory is the culmination of many scientific investigations drawing together all the current evidence concerning a substantial range of phenomena; thus, a scientific theory represents the most powerful explanation scientists have to offer.

SC.912.N.3.2: Describe the role of consensus plays in the historical development of a theory in any one of the disciplines of science.

SC.912.N.3.3: Explain that scientific laws are descriptions of specific relationships under given conditions in nature, but do not offer explanations for those relationships.

SC.912.N.3.4: Recognize that theories do not become laws, nor do laws become theories; theories are well supported explanations and laws are well supported descriptions.

SC.912.N.3.5: Describe the function of models in science, and identify the wide range of models used in science.

SC.912.N.4.1: Explain how scientific knowledge and reasoning provide an empirically-based perspective to inform society's decision making.

SC.912.N.4.2: Weigh the merits of alternative strategies for solving a specific societal problem by comparing a number of different costs and benefits, such as human, economic, and environmental.

SC.912.P.10.1: Differentiate among the various forms of energy and recognize that they can be transformed from one form to others.

SC.912.P.10.2: Explore the Law of Conservation of Energy by differentiating among open, closed, and isolated systems and explain that the total energy in an isolated system is a conserved quantity.

SC.912.P.10.11: Explain and compare nuclear reactions (radioactive decay, fission and fusion), the energy changes associated with them and their associated safety issues.


SC.912.P.10.15: Investigate and explain the relationships among current, voltage, resistance, and power.

SC.912.P.10.16: Explain the relationship between moving charges and magnetic fields, as well as changing magnetic fields and electric fields, and their application to modern technologies.

MA.K12.MTR.1.1: Mathematicians who participate in effortful learning both individually and with others:
- Analyze the problem in a way that makes sense given the task.
- Ask questions that will help with solving the task.
- Build perseverance by modifying methods as needed while solving a challenging task.
- Stay engaged and maintain a positive mindset when working to solve tasks.
- Help and support each other when attempting a new method or approach.

MA.K12.MTR.1.1 Clarifications:
Teachers who encourage students to participate actively in effortful learning both individually and with others:
- Cultivate a community of growth mindset learners.
- Foster perseverance in students by choosing tasks that are challenging.
- Develop students' ability to analyze and problem solve.
- Recognize students' effort when solving challenging problems.

MA.K12.MTR.2.1: Demonstrate understanding by representing problems in multiple ways. Mathematicians who demonstrate understanding by representing problems in multiple ways:
- Build understanding through modeling and using manipulatives.
- Represent solutions to problems in multiple ways using objects, drawings, tables, graphs and equations.
- Progress from modeling problems with objects and drawings to using algorithms and equations.
- Express connections between concepts and representations.
- Choose a representation based on the given context or purpose.

MA.K12.MTR.2.1 Clarifications:
Teachers who encourage students to demonstrate understanding by representing problems in multiple ways:
- Help students make connections between concepts and representations.
- Provide opportunities for students to use manipulatives when investigating concepts.
- Guide students from concrete to pictorial to abstract representations as understanding progresses.
- Show students that various representations can have different purposes and can be useful in different situations.

MA.K12.MTR.3.1: Complete tasks with mathematical fluency. Mathematicians who complete tasks with mathematical fluency:
- Select efficient and appropriate methods for solving problems within the given context.
- Maintain flexibility and accuracy while performing procedures and mental calculations.
- Complete tasks accurately and with confidence.
- Adapt procedures to apply them to a new context.
- Use feedback to improve efficiency when performing calculations.

MA.K12.MTR.3.1 Clarifications:
Teachers who encourage students to complete tasks with mathematical fluency:
- Provide students with the flexibility to solve problems by selecting a procedure that allows them to solve efficiently and accurately.
- Offer multiple opportunities for students to practice efficient and generalizable methods.
- Provide opportunities for students to reflect on the method they used and determine if a more efficient method could have been used.

MA.K12.MTR.4.1: Engage in discussions that reflect on the mathematical thinking of self and others. Mathematicians who engage in discussions that reflect on the mathematical thinking of self and others:
- Communicate mathematical ideas, vocabulary and methods effectively.
- Analyze the mathematical thinking of others.
- Compare the efficiency of a method to those expressed by others.
- Recognize errors and suggest how to correctly solve the task.
- Justify results by explaining methods and processes.
- Construct possible arguments based on evidence.

MA.K12.MTR.4.1 Clarifications:
Teachers who encourage students to participate actively in discussion that reflect on the mathematical thinking of self and others:
- Offer multiple opportunities for students to add to, extend, and evaluate mathematical discussions.
- Encourage students to use specific mathematical vocabulary and representations in discussions.
- Guide students in drawing mathematical conclusions from discussions.
- Encourage students to express the value of mathematical ideas in their own words.
Clarifications:
Teachers who encourage students to engage in discussions that reflect on the mathematical thinking of self and others:
- Establish a culture in which students ask questions of the teacher and their peers, and error is an opportunity for learning.
- Create opportunities for students to discuss their thinking with peers.
- Select, sequence and present student work to advance and deepen understanding of correct and increasingly efficient methods.
- Develop students' ability to justify methods and compare their responses to the responses of their peers.

Use patterns and structure to help understand and connect mathematical concepts.
Mathematicians who use patterns and structure to help understand and connect mathematical concepts:
- Focus on relevant details within a problem.
- Create plans and procedures to logically order events, steps or ideas to solve problems.
- Decompose a complex problem into manageable parts.
- Relate previously learned concepts to new concepts.
- Look for similarities among problems.
- Connect solutions of problems to more complicated large-scale situations.

Assess the reasonableness of solutions.
Mathematicians who assess the reasonableness of solutions:
- Estimate to discover possible solutions.
- Use benchmark quantities to determine if a solution makes sense.
- Check calculations when solving problems.
- Verify possible solutions by explaining the methods used.
- Evaluate results based on the given context.

Apply mathematics to real-world contexts.
Mathematicians who apply mathematics to real-world contexts:
- Connect mathematical concepts to everyday experiences.
- Use models and methods to understand, represent and solve problems.
- Perform investigations to gather data or determine if a method is appropriate. • Redesign models and methods to improve accuracy or efficiency.

Cite evidence to explain and justify reasoning.

K-1 Students include textual evidence in their oral communication with guidance and support from adults. The evidence can consist of details from the text without naming the text. During 1st grade, students learn how to incorporate the evidence in their writing.
2-3 Students include relevant textual evidence in their written and oral communication. Students should name the text when they refer to it. In 3rd grade, students should use a combination of direct and indirect citations.
4-5 Students continue with previous skills and reference comments made by speakers and peers. Students cite texts that they’ve directly quoted, paraphrased, or used for information. When writing, students will use the form of citation dictated by the instructor or the style guide referenced by the instructor.
6-8 Students continue with previous skills and use a style guide to create a proper citation.
9-12 Students continue with previous skills and should be aware of existing style guides and the ways in which they differ.

Make inferences to support comprehension.

Students will make inferences before the words infer or inference are introduced. Kindergarten students will answer questions like “Why is the girl smiling?” or make predictions about what will happen based on the title page. Students will use the terms and apply them in 2nd grade and beyond.
<table>
<thead>
<tr>
<th>Standard</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>ELA.K12.EE.4.1</td>
<td>Use appropriate collaborative techniques and active listening skills when engaging in discussions in a variety of situations. <strong>Clarifications:</strong> In kindergarten, students learn to listen to one another respectfully. In grades 1-2, students build upon these skills by justifying what they are thinking. For example: &quot;I think ______ because ______.&quot; The collaborative conversations are becoming academic conversations. In grades 3-12, students engage in academic conversations discussing claims and justifying their reasoning, refining and applying skills. Students build on ideas, propel the conversation, and support claims and counterclaims with evidence.</td>
</tr>
<tr>
<td>ELA.K12.EE.5.1</td>
<td>Use the accepted rules governing a specific format to create quality work. <strong>Clarifications:</strong> Students will incorporate skills learned into work products to produce quality work. For students to incorporate these skills appropriately, they must receive instruction. A 3rd grade student creating a poster board display must have instruction in how to effectively present information to do quality work.</td>
</tr>
<tr>
<td>ELA.K12.EE.6.1</td>
<td>Use appropriate voice and tone when speaking or writing. <strong>Clarifications:</strong> In kindergarten and 1st grade, students learn the difference between formal and informal language. For example, the way we talk to our friends differs from the way we speak to adults. In 2nd grade and beyond, students practice appropriate social and academic language to discuss texts.</td>
</tr>
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<td>HE.912.C.1.3</td>
<td>Evaluate how environment and personal health are interrelated. <strong>Clarifications:</strong> Food options within a community; prenatal-care services; availability of recreational facilities; air quality; weather-safety awareness; and weather, air, and water conditions.</td>
</tr>
<tr>
<td>SS.912.C.2.8</td>
<td>Analyze the impact of citizen participation as a means of achieving political and social change. <strong>Clarifications:</strong> Examples are e-mail campaigns, boycotts, blogs, podcasts, protests, demonstrations, letters to editors.</td>
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**General Course Information and Notes**

**VERSION DESCRIPTION**

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4. Emphasizing students supporting answers based upon evidence from the text.
5. Providing extensive research and writing opportunities (claims and evidence).

**Florida's Benchmarks for Excellent Student Thinking (B.E.S.T.) Standards**
This course includes Florida's B.E.S.T. ELA Expectations (EE) and Mathematical Thinking and Reasoning Standards (MTRs) for students. Florida educators should intentionally embed these standards within the content and their instruction as applicable. For guidance on the implementation of the EE and MTRs, please visit https://www.cpalms.org/Standards/BEST_Standards.aspx and select the appropriate B.E.S.T. Standards package.

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Course Number: 2003500
Number of Credits: One (1) credit
Course Type: Elective Course
Course Status: State Board Approved
Grade Level(s): 9,10,11,12

Course Path: Section: Grades PreK to 12 Education Courses > Grade Group: Grades 9 to 12 and Adult Education Courses > Subject: Science > SubSubject: Physical Sciences >
Abbreviated Title: RENEWABLE ENERGY 1 H
Course Length: Year (Y)
Course Attributes:
- Honors
Course Level: 3

Educator Certifications
- Chemistry (Grades 6-12)
- Physics (Grades 6-12)
Discuss the need for adequate monitoring of environmental parameters when making policy decisions.

Assess the need for adequate waste management strategies.

Summarize the conditions that contribute to the climate of a geographic area, including the relationships to lakes and oceans.

Recognize the role of creativity in constructing scientific questions, methods and explanations.

Connect the concepts of radiation and the electromagnetic spectrum to analyze past, present, and potential future consequences to the environment resulting from various energy production technologies.

Analyze the causes of the various kinds of surface and deep water motion within the oceans and their impacts on the transfer of energy between the poles and the equator.

Differentiate and describe the various interactions among Earth systems, including: atmosphere, hydrosphere, cryosphere, geosphere, and biosphere.

Summarize the conditions that contribute to the climate of a geographic area, including the relationships to lakes and oceans.

Identify, analyze, and relate the internal (Earth system) and external (astronomical) conditions that contribute to global climate change.

Explain how various atmospheric, oceanic, and hydrologic conditions in Florida have influenced and can influence human behavior, both individually and collectively.

Cite evidence that the ocean has had a significant influence on climate change by absorbing, storing, and moving heat, carbon, and water.

Evaluate the costs and benefits of renewable and nonrenewable resources, such as water, energy, fossil fuels, wildlife, and forests.

Discuss the political, social, and environmental consequences of sustainable use of land.

Discuss the need for adequate monitoring of environmental parameters when making policy decisions.

Assess the need for adequate waste management strategies.

Discuss the effects of technology on environmental quality.

Explain how various atmospheric, oceanic, and hydrologic conditions in Florida have influenced and can influence human behavior, both individually and collectively.

Describe how scientific inferences are drawn from scientific observations and provide examples from the content being studied.

Discuss the large-scale environmental impacts resulting from human activity, including waste spills, oil spills, runoff, greenhouse gases, ozone depletion, and surface and groundwater pollution.

Discuss the effects of technology on environmental quality.

Assess the effectiveness of innovative methods of protecting the environment.

Describe how different natural resources are produced and how their rates of use and renewal limit availability.

Predict the impact of individuals on environmental systems and examine how human lifestyles affect sustainability.
Explain that a scientific theory is the culmination of many scientific investigations drawing together all the current evidence concerning a substantial range of phenomena; thus, a scientific theory represents the most powerful explanation scientists have to offer.

Differentiate among conductors, semiconductors, and insulators.

Investigate and explain the relationships among current, voltage, resistance, and power.

Explore the theory of electromagnetism by explaining electromagnetic waves in terms of oscillating electric and magnetic fields.

Explore the theory of electromagnetism by contrasting the different parts of the electromagnetic spectrum in terms of wavelength, frequency, and energy, and relate them to phenomena and applications.

Mathematicians who participate in effortful learning both individually and with others:
- Analyze the problem in a way that makes sense given the task.
- Ask questions that will help with solving the task.
- Build perseverance by modifying methods as needed while solving a challenging task.
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- Analyze the mathematical thinking of others.
- Compare the efficiency of a method to those expressed by others.
- Recognize errors and suggest how to correctly solve the task.
- Justify results by explaining methods and processes.
- Construct possible arguments based on evidence.
### Clarifications:
Teachers who encourage students to engage in discussions that reflect on the mathematical thinking of self and others:
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- Decompose a complex problem into manageable parts.
- Relate previously learned concepts to new concepts.
- Look for similarities among problems.
- Connect solutions of problems to more complicated large-scale situations.

### Assess the reasonableness of solutions.
Mathematicians who assess the reasonableness of solutions:
- Estimate to discover possible solutions.
- Use benchmark quantities to determine if a solution makes sense.
- Check calculations when solving problems.
- Verify possible solutions by explaining the methods used.
- Evaluate results based on the given context.

### Apply mathematics to real-world contexts.
Mathematicians who apply mathematics to real-world contexts:
- Connect mathematical concepts to everyday experiences.
- Use models and methods to understand, represent and solve problems.
- Perform investigations to gather data or determine if a method is appropriate. • Redesign models and methods to improve accuracy or efficiency.

### Cite evidence to explain and justify reasoning.
K-1 Students include textual evidence in their oral communication with guidance and support from adults. The evidence can consist of details from the text without naming the text. During 1st grade, students learn how to incorporate the evidence in their writing. 2-3 Students include relevant textual evidence in their written and oral communication. Students should name the text when they refer to it. In 3rd grade, students should use a combination of direct and indirect citations.
- 4-5 Students continue with previous skills and reference comments made by speakers and peers. Students cite texts that they've directly quoted, paraphrased, or used for information. When writing, students will use the form of citation dictated by the instructor or the style guide referenced by the instructor.
- 6-8 Students continue with previous skills and use a style guide to create a proper citation.
- 9-12 Students continue with previous skills and should be aware of existing style guides and the ways in which they differ.

### Read and comprehend grade-level complex texts proficiently.
See Text Complexity for grade-level complexity bands and a text complexity rubric.

### Make inferences to support comprehension.
Students will make inferences before the words infer or inference are introduced. Kindergarten students will answer questions like “Why is the girl smiling?” or make predictions about what will happen based on the title page. Students will use the terms and apply them in 2nd grade and beyond.
Use appropriate collaborative techniques and active listening skills when engaging in discussions in a variety of situations.

**Clarifications:**
In kindergarten, students learn to listen to one another respectfully. In grades 1-2, students build upon these skills by justifying what they are thinking. For example: “I think ______ because ______.” The collaborative conversations are becoming academic conversations. In grades 3-12, students engage in academic conversations discussing claims and justifying their reasoning, refining and applying skills. Students build on ideas, propel the conversation, and support claims and counterclaims with evidence.

Use the accepted rules governing a specific format to create quality work.

**Clarifications:**
Students will incorporate skills learned into work products to produce quality work. For students to incorporate these skills appropriately, they must receive instruction. A 3rd grade student creating a poster board display must have instruction in how to effectively present information to do quality work.

Use appropriate voice and tone when speaking or writing.

**Clarifications:**
In kindergarten and 1st grade, students learn the difference between formal and informal language. For example, the way we talk to our friends differs from the way we speak to adults. In 2nd grade and beyond, students practice appropriate social and academic language to discuss texts.

Evaluate how environment and personal health are interrelated.

**Clarifications:**
Food options within a community; prenatal-care services; availability of recreational facilities; air quality; weather-safety awareness; and weather, air, and water conditions.

Analyze the impact of civic engagement as a means of preserving or reforming institutions.

- Students will identify legal methods that citizens can use to promote social and political change (e.g., voting, peaceful protests, petitioning, demonstrations, contacting government offices).
- Students will identify historical examples of citizens achieving or preventing political and social change through civic engagement (e.g., the Abolitionist Movement).

**General Course Information and Notes**

**VERSION DESCRIPTION**

The course content includes: an introduction to energy technology, renewable energy in a sustainable future, the science behind climate change, environmental impacts and economics, and careers in renewable energy. Students will be introduced to different types of renewable energy technologies, how they work, their advantages, disadvantages, and limitations. The types of renewable energies and technologies studied include: wind energy, solar (thermal and photovoltaic), hydro-electric, bio-energy, tidal power, wave energy, geothermal energy, ocean thermal, fuel cells, heat pump systems, and high voltage DC energy transport. The availability and integration of these energy types and technologies are also studied to understand how renewable energy can work as a compliment to and replacement for conventional technologies.

**GENERAL NOTES**

**Honors and Advanced Level Course Note:** Advanced courses require a greater demand on students through increased academic rigor. Academic rigor is obtained through the application, analysis, evaluation, and creation of complex ideas that are often abstract and multi-faceted. Students are challenged to think and collaborate critically on the content they are learning. Honors level rigor will be achieved by increasing text complexity through text selection, focus on high-level qualitative measures, and complexity of task. Instruction will be structured to give students a deeper understanding of conceptual themes and organization within and across disciplines. Academic rigor is more than simply assigning to students a greater quantity of work.

**Special Notes:**

**Instructional Practices**
Teaching from a range of complex text is optimized when teachers in all subject areas implement the following strategies on a routine basis:

1. Ensuring wide reading from complex text that varies in length.
2. Making close reading and rereading of texts central to lessons.
3. Emphasizing text-specific complex questions, and cognitively complex tasks, reinforce focus on the text and cultivate independence.
4. Emphasizing students supporting answers based upon evidence from the text.
5. Providing extensive research and writing opportunities (claims and evidence).

**Florida's Benchmarks for Excellent Student Thinking (B.E.S.T.) Standards**
This course includes Florida's B.E.S.T. ELA Expectations (EE) and Mathematical Thinking and Reasoning Standards (MTRs) for students. Florida educators should intentionally embed these standards within the content and their instruction as applicable. For guidance on the implementation of the EE's and MTRs, please visit https://www.cpalms.org/Standards/BEST_Standards.aspx and select the appropriate B.E.S.T. Standards package.

**English Language Development ELD Standards Special Notes Section:**
Teachers are required to provide listening, speaking, reading and writing instruction that allows English language learners (ELL) to communicate information, ideas and concepts for academic success in the content area of Science. For the given level of English language proficiency and with visual, graphic, or interactive support, students will interact with grade level words, expressions, sentences and discourse to process or produce language necessary for academic success The ELD standard should specify a relevant content area concept or topic of study chosen by curriculum developers and teachers which maximizes an ELL's need for communication and social skills. To access
an ELL supporting document which delineates performance definitions and descriptors, please click on the following link:
https://cpalmsmediaprod.blob.core.windows.net/uploads/docs/standards/eld/sc.pdf

**General Information**

- **Course Number:** 2003500
- **Number of Credits:** One (1) credit
- **Course Type:** Elective Course
- **Course Status:** Draft - Course Pending Approval
- **Grade Level(s):** 9, 10, 11, 12

**Course Path:**
- Section: Grades PreK to 12 Education Courses
- Grade Group: Grades 9 to 12 and Adult Education Courses
- Subject: Science
- SubSubject: Physical Sciences

**Abbreviated Title:** RENEWABLE ENERGY 1 H

**Course Length:** Year (Y)

**Course Attributes:**
- Honors

**Course Level:** 3

**Educator Certifications**

- Chemistry (Grades 6-12)
- Physics (Grades 6-12)
### Course Standards

<table>
<thead>
<tr>
<th>Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>SC.912.L.17.11:</td>
<td>Evaluate the costs and benefits of renewable and nonrenewable resources, such as water, energy, fossil fuels, wildlife, and forests.</td>
</tr>
<tr>
<td>SC.912.L.17.15:</td>
<td>Discuss the effects of technology on environmental quality.</td>
</tr>
<tr>
<td>SC.912.L.17.11:</td>
<td>Define a problem based on a specific body of knowledge, for example: biology, chemistry, physics, and earth/space science, and do the following:</td>
</tr>
<tr>
<td>1. Pose questions about the natural world, (Articulate the purpose of the investigation and identify the relevant scientific concepts).</td>
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<tr>
<td>2. Conduct systematic observations, (Write procedures that are clear and replicable. Identify observables and examine relationships between test (independent) variable and outcome (dependent) variable. Employ appropriate methods for accurate and consistent observations; conduct and record measurements at appropriate levels of precision. Follow safety guidelines).</td>
<td></td>
</tr>
<tr>
<td>3. Examine books and other sources of information to see what is already known,</td>
<td></td>
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<tr>
<td>4. Review what is known in light of empirical evidence, (Examine whether available empirical evidence can be interpreted in terms of existing knowledge and models, and if not, modify or develop new models).</td>
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<tr>
<td>5. Plan investigations, (Design and evaluate a scientific investigation).</td>
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<tr>
<td>6. Use tools to gather, analyze, and interpret data (this includes the use of measurement in metric and other systems, and also the generation and interpretation of graphical representations of data, including data tables and graphs), (Collect data or evidence in an organized way. Properly use instruments, equipment, and materials (e.g., scales, probeware, meter sticks, microscopes, computers) including set-up, calibration, technique, maintenance, and storage).</td>
<td></td>
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<tr>
<td>7. Pose answers, explanations, or descriptions of events,</td>
<td></td>
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<tr>
<td>8. Generate explanations that explicate or describe natural phenomena (inferences),</td>
<td></td>
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<tr>
<td>9. Use appropriate evidence and reasoning to justify these explanations to others,</td>
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<tr>
<td>10. Communicate results of scientific investigations, and</td>
<td></td>
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<tr>
<td>11. Evaluate the merits of the explanations produced by others.</td>
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<tr>
<td>SC.912.L.17.12:</td>
<td>Describe and explain what characterizes science and its methods.</td>
</tr>
<tr>
<td>SC.912.L.17.13:</td>
<td>Recognize that the strength or usefulness of a scientific claim is evaluated through scientific argumentation, which depends on critical and logical thinking, and the active consideration of alternative scientific explanations to explain the data presented.</td>
</tr>
<tr>
<td>SC.912.L.17.14:</td>
<td>Identify sources of information and assess their reliability according to the strict standards of scientific investigation.</td>
</tr>
<tr>
<td>SC.912.L.17.15:</td>
<td>Describe how scientific inferences are drawn from scientific observations and provide examples from the content being studied.</td>
</tr>
<tr>
<td>SC.912.N.1.6:</td>
<td>Recognize the role of creativity in constructing scientific questions, methods and explanations.</td>
</tr>
<tr>
<td>SC.912.N.2.1:</td>
<td>Identify what is science, what clearly is not science, and what superficially resembles science (but fails to meet the criteria for science).</td>
</tr>
<tr>
<td>SC.912.N.2.2:</td>
<td>Identify which questions can be answered through science and which questions are outside the boundaries of scientific investigation, such as questions addressed by other ways of knowing, such as art, philosophy, and religion.</td>
</tr>
<tr>
<td>SC.912.N.2.3:</td>
<td>Identify examples of pseudoscience (such as astrology, phrenology) in society.</td>
</tr>
<tr>
<td>SC.912.N.2.4:</td>
<td>Explain that scientific knowledge is both durable and robust and open to change. Scientific knowledge can change because it is often examined and re-examined by new investigations and scientific argumentation. Because of these frequent examinations, scientific knowledge becomes stronger, leading to its durability.</td>
</tr>
<tr>
<td>SC.912.N.2.5:</td>
<td>Describe instances in which scientists’ varied backgrounds, talents, interests, and goals influence the inferences and thus the explanations that they make about observations of natural phenomena and describe that competing interpretations (explanations) of scientists are a strength of science as they are a source of new, testable ideas that have the potential to add new evidence to support one or another of the explanations.</td>
</tr>
<tr>
<td>SC.912.N.3.1:</td>
<td>Explain that a scientific theory is the culmination of many scientific investigations drawing together all the current evidence concerning a substantial range of phenomena; thus, a scientific theory represents the most powerful explanation scientists have to offer.</td>
</tr>
<tr>
<td>SC.912.N.3.2:</td>
<td>Describe the role consensus plays in the historical development of a theory in any one of the disciplines of science.</td>
</tr>
<tr>
<td>SC.912.N.3.3:</td>
<td>Explain that scientific laws are descriptions of specific relationships under given conditions in nature, but do not offer explanations for those relationships.</td>
</tr>
<tr>
<td>SC.912.N.3.4:</td>
<td>Recognize that theories do not become laws, nor do laws become theories; theories are well supported explanations and laws are well supported descriptions.</td>
</tr>
<tr>
<td>SC.912.N.3.5:</td>
<td>Describe the function of models in science, and identify the wide range of models used in science.</td>
</tr>
<tr>
<td>SC.912.N.4.1:</td>
<td>Explain how scientific knowledge and reasoning provide an empirically-based perspective to inform society’s decision making.</td>
</tr>
<tr>
<td>SC.912.N.4.2:</td>
<td>Weigh the merits of alternative strategies for solving a specific societal problem by comparing a number of different costs and benefits, such as human, economic, and environmental.</td>
</tr>
<tr>
<td>SC.912.P.8.1:</td>
<td>Differentiate among the four states of matter.</td>
</tr>
<tr>
<td>SC.912.P.8.2:</td>
<td>Explore the scientific theory of atoms (also known as atomic theory) by describing the structure of atoms in terms of protons, neutrons and electrons, and differentiate among these particles in terms of their mass, electrical charges and locations within the atom.</td>
</tr>
<tr>
<td>SC.912.P.8.3:</td>
<td>Differentiate among the various forms of energy and recognize that they can be transformed from one form to others.</td>
</tr>
<tr>
<td>SC.912.P.8.4:</td>
<td>Explore the Law of Conservation of Energy by differentiating among open, closed, and isolated systems and explain that the total energy in an isolated system is a conserved quantity.</td>
</tr>
<tr>
<td>SC.912.P.8.5:</td>
<td>Compare and contrast work and power qualitatively and quantitatively.</td>
</tr>
<tr>
<td>SC.912.P.8.6:</td>
<td>Describe heat as the energy transferred by convection, conduction, and radiation, and explain the connection of heat to change in temperature or states of matter.</td>
</tr>
<tr>
<td>SC.912.P.8.7:</td>
<td>Relate temperature to the average molecular kinetic energy.</td>
</tr>
<tr>
<td>SC.912.P.8.8:</td>
<td>Create and interpret potential energy diagrams, for example: chemical reactions, orbits around a central body, motion of a pendulum.</td>
</tr>
<tr>
<td>SC.912.P.8.9:</td>
<td>Compare the magnitude and range of the four fundamental forces (gravitational, electromagnetic, weak nuclear, strong nuclear).</td>
</tr>
</tbody>
</table>
Relate the configuration of static charges to the electric field, electric force, electric potential, and electric potential energy.

Differentiate among conductors, semiconductors, and insulators.

Investigate and explain the relationships among current, voltage, resistance, and power.

Distinguish between scalar and vector quantities and assess which should be used to describe an event.

Analyze the motion of an object in terms of its position, velocity, and acceleration (with respect to a frame of reference) as functions of time.

Interpret and apply Newton's three laws of motion.

Describe how the gravitational force between two objects depends on their masses and the distance between them.

Apply the law of conservation of linear momentum to interactions, such as collisions between objects.

Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.

Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience.

Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes.

Write arguments focused on discipline-specific content.

Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes.

Differentiate among conductors, semiconductors, and insulators.

Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience.

Differentiate among conductors, semiconductors, and insulators.

Introduce a concluding statement or section that follows from and supports the argument presented.

Integrate multiple sources of information presented in diverse media or formats (e.g., visually, quantitatively, orally) evaluating the credibility and accuracy of each source.

Explain the relationships among concepts in a text, including relationships among key terms (e.g., force, friction, reaction force, energy).

Analyze the author's purpose in providing an explanation, describing a procedure, or discussing an experiment in a text, defining the question the author seeks to address.

Translate quantitative or technical information expressed in words in a text into visual form (e.g., a table or chart) and translate information expressed visually or mathematically (e.g., in an equation) into words.

Assess the extent to which the reasoning and evidence in a text support the author's claim or a recommendation for solving a scientific or technical problem.

Introduce a concluding statement or section that follows from and supports the argument presented.

Evaluate a speaker's point of view, reasoning, and use of evidence and rhetoric, identifying any fallacious reasoning or exaggerated or distorted evidence.

Present information, findings, and supporting evidence clearly, concisely, and logically such that listeners can follow the line of reasoning and the organization, development, substance, and style are appropriate to purpose, audience, and task.

Integrate multiple sources of information presented in diverse media or formats (e.g., visually, quantitatively, orally) evaluating the credibility and accuracy of each source.

Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience.
LAFS.910.WHST.2.6: Use technology, including the Internet, to produce, publish, and update individual or shared writing products, taking advantage of technology's capacity to link to other information and to display information flexibly and dynamically.

LAFS.910.WHST.3.7: Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation.

LAFS.910.WHST.3.8: Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the usefulness of each source in answering the research question; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and following a standard format for citation.

LAFS.910.WHST.3.9: Draw evidence from informational texts to support analysis, reflection, and research.

LAFS.910.WHST.4.10: Write routinely over extended time frames (time for reflection and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences.

MAFS.912.N-Q.1.1: Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays. ★

MAFS.912.N-Q.1.3: Choose a level of accuracy appropriate to limitations on measurement when reporting quantities. ★

Make sense of problems and persevere in solving them.

Mathematically proficient students start by explaining to themselves the meaning of a problem and looking for entry points to its solution. They analyze givens, constraints, relationships, and goals. They make conjectures about the form and meaning of the solution and plan a solution pathway rather than simply jumping into a solution attempt. They consider analogous problems, and try special cases and simpler forms of the original problem in order to gain insight into its solution. They monitor and evaluate their progress and change course if necessary. Older students might, depending on the context of the problem, transform algebraic expressions or change the viewing window on their graphing calculator to get the information they need. Mathematically proficient students can explain correspondences between equations, verbal descriptions, tables, and graphs or draw diagrams of important features and relationships, graph data, and search for regularity or trends. Younger students might rely on using concrete objects or pictures to help conceptualize and solve a problem. Mathematically proficient students check their answers to problems using a different method, and they continually ask themselves, “Does this make sense?” They can understand the approaches of others to solving complex problems and identify correspondences between different approaches.

Standard Relation to Course: Supporting

Reason abstractly and quantitatively.

Mathematically proficient students make sense of quantities and their relationships in problem situations. They bring two complementary abilities to bear on problems involving quantitative relationships: the ability to decontextualize—to abstract a given situation and represent it symbolically and manipulate the representing symbols as if they have a life of their own, without necessarily attending to their referents—and the ability to contextualize, to pause as needed during the manipulation process in order to probe into the referents for the symbols involved. Quantitative reasoning entails habits of creating a coherent representation of the problem at hand; considering the units involved, attending to the meaning of quantities, not just how to compute them; and knowing and flexibly using different properties of operations and objects.

Standard Relation to Course: Supporting

Construct viable arguments and critique the reasoning of others.

Mathematically proficient students understand and use stated assumptions, definitions, and previously established results in constructing arguments. They make conjectures and build a logical progression of statements to explore the truth of their conjectures. They are able to analyze situations by breaking them into cases, and can recognize and use counterexamples. They justify their conclusions, communicate them to others, and respond to the arguments of others. They reason inductively about data, making plausible arguments that take into account the context from which the data arose. Mathematically proficient students are also able to compare the effectiveness of two plausible arguments, distinguish correct logic or reasoning from that which is flawed, and—if there is a flaw in an argument—explain what it is. Elementary students can construct arguments using concrete referents such as objects, drawings, diagrams, and actions. Such arguments can make sense and be correct, even though they are not generalized or made formal until later grades. Later, students learn to determine domains to which an argument applies. Students at all grades can listen or read the arguments of others, decide whether they make sense, and ask useful questions to clarify or improve the arguments.

Standard Relation to Course: Supporting

Model with mathematics.

Mathematically proficient students can apply the mathematics they know to solve problems arising in everyday life, society, and the workplace. In early grades, this might be as simple as writing an addition equation to describe a situation. In middle grades, a student might apply proportional reasoning to plan a school event or analyze a problem in the community. By high school, a student might use geometry to solve a design problem or use a function to describe how one quantity is related to another. Mathematically proficient students who can apply what they know are comfortable making assumptions and approximations to simplify a complicated situation, realizing that these may need revision later. They are able to identify important quantities in a practical situation and map their relationships using such tools as graphs, two-way tables, equations, and flowcharts and formulas. They can analyze those relationships mathematically to draw conclusions. They routinely interpret their mathematical results in the context of the situation and reflect on whether the results make sense, possibly improving the model if it has not served its purpose.

Standard Relation to Course: Supporting

Use appropriate tools strategically.

Mathematically proficient students consider the available tools when solving a mathematical problem. These tools might include pencil and paper, concrete models, a ruler, a protractor, a calculator, a spreadsheet, a computer algebra system, a statistical package, or dynamic geometry software. Proficient students are sufficiently familiar with tools appropriate for their grade or course to make sound decisions about when each of these tools might be helpful, recognizing both the insight to be gained and their limitations. For example, mathematically proficient high school students analyze graphs of functions and solutions generated using a graphing calculator. They detect possible errors by strategically using estimation and other mathematical knowledge. When making mathematical models, they know that technology can enable them to visualize the results of varying assumptions, explore consequences, and compare predictions with data. Mathematically proficient students at various grade levels are able to identify relevant external mathematical resources, such as digital content located on a website, and use them to pose or solve problems. They are able to use technological tools to explore and deepen their understanding of concepts.

Standard Relation to Course: Supporting

Attend to precision.

Mathematically proficient students try to communicate precisely to others. They try to use clear definitions in discussion with others and in their own reasoning. They state the meaning of the symbols they choose, including using the equal sign consistently and appropriately. They are careful
<table>
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<tr>
<th>MAFS.K12.MP.6.1:</th>
<th>about specifying units of measure, and labeling axes to clarify the correspondence with quantities in a problem. They calculate accurately and efficiently, express numerical answers with a degree of precision appropriate for the problem context. In the elementary grades, students give carefully formulated explanations to each other. By the time they reach high school they have learned to examine claims and make explicit use of definitions.</th>
</tr>
</thead>
<tbody>
<tr>
<td>MAFS.K12.MP.7.1:</td>
<td>Look for and make use of structure. Mathematically proficient students look closely to discern a pattern or structure. Young students, for example, might notice that three and seven more is the same amount as seven and three more, or they may sort a collection of shapes according to how many sides the shapes have. Later, students will see 7 \times 8 \text{ equals the well remembered } 7 \times 5 + 7 \times 3, \text{ in preparation for learning about the distributive property. In the expression } x^2 + 9x + 14, \text{ older students can see the 14 as } 2 \times 7 \text{ and the 9 as } 2 + 7. \text{ They recognize the significance of an existing line in a geometric figure and can use the strategy of drawing an auxiliary line for solving problems. They also can step back for an overview and shift perspective. They can see complicated things, such as some algebraic expressions, as single objects or as being composed of several objects. For example, they can see } 5 - 3(x - y)^2 \text{ as } 5 \text{ minus a positive number times a square and use that to realize that its value cannot be more than } 5 \text{ for any real numbers } x \text{ and } y.</td>
</tr>
<tr>
<td>MAFS.K12.MP.8.1:</td>
<td>Look for and express regularity in repeated reasoning. Mathematically proficient students notice if calculations are repeated, and look both for general methods and for shortcuts. Upper elementary students might notice when dividing 25 by 11 that they are repeating the same calculations over and over again, and conclude they have a repeating decimal. By paying attention to the calculation of slope as they repeatedly check whether points are on the line through (1, 2) with slope 3, middle school students might abstract the equation (y - 2)/(x - 1) = 3. Noticing the regularity in the way terms cancel when expanding (x - 1)(x + 1), (x - 1)(x^2 + x + 1), and (x - 1)(x^3 + x^2 + x + 1) might lead them to the general formula for the sum of a geometric series. As they work to solve a problem, mathematically proficient students maintain oversight of the process, while attending to the details. They continually evaluate the reasonableness of their intermediate results.</td>
</tr>
<tr>
<td>ELD.K12.ELL.SC.1:</td>
<td>English language learners communicate information, ideas and concepts necessary for academic success in the content area of Science.</td>
</tr>
<tr>
<td>ELD.K12.ELL.SI.1:</td>
<td>English language learners communicate for social and instructional purposes within the school setting.</td>
</tr>
</tbody>
</table>

**General Course Information and Notes**

**GENERAL NOTES**

Laboratory investigations that include the use of scientific inquiry, research, measurement, problem solving, laboratory apparatus and technologies, experimental procedures, and safety procedures are an integral part of this course. The National Science Teachers Association (NSTA) recommends that at the high school level, all students should be in the science lab or field, collecting data every week. School laboratory investigations (labs) are defined by the National Research Council (NRC) as an experience in the laboratory, classroom, or the field that provides students with opportunities to interact directly with natural phenomena or with data collected by others using tools, materials, data collection techniques, and models (NRC, 2006, p. 3). Laboratory investigations in the high school classroom should help all students develop a growing understanding of the complexity and ambiguity of empirical work, as well as the skills to calibrate and troubleshoot equipment used to make observations. Learners should understand measurement error; and have the skills to aggregate, interpret, and present the resulting data (National Research Council, 2006, p.77; NSTA, 2007).

**Special Notes**

**Instructional Practices**

Teaching from a range of complex text is optimized when teachers in all subject areas implement the following strategies on a routine basis:

1. Ensuring wide reading from complex text that varies in length.
2. Making close reading and rereading of texts central to lessons.
3. Emphasizing text-specific complex questions, and cognitively complex tasks, reinforce focus on the text and cultivate independence.
4. Emphasizing students supporting answers based upon evidence from the text.
5. Providing extensive research and writing opportunities (claims and evidence).

**Science and Engineering Practices** (NRC Framework for K-12 Science Education, 2010)

- Asking questions (for science) and defining problems (for engineering).
- Developing and using models.
- Planning and carrying out investigations.
- Analyzing and interpreting data.
- Using mathematics, information and computer technology, and computational thinking.
- Constructing explanations (for science) and designing solutions (for engineering).
- Engaging in argument from evidence.
- Obtaining, evaluating, and communicating information.

**Literacy Standards in Science**

Secondary science courses include reading standards for literacy in science and technical subjects 6-12 and writing standards for literacy in history/social studies, science, and technical subjects 6-12. The courses also include speaking and listening standards. For a complete list of standards required for this course click on the blue tile labeled course standards. You may also download the complete course including all required standards and notes sections using the export function located at the top of this page. Learn more at ELT website.

**English Language Development ELD Standards Special Notes Section:**

Teachers are required to provide listening, speaking, reading and writing instruction that allows English language learners (ELL) to communicate information, ideas and concepts for academic success in the content area of Science. For the given level of English language proficiency and with visual, graphic, or interactive support, students will interact with grade level words, expressions, sentences and discourse to process or produce language necessary for academic success. The ELD standard should specify a relevant content area concept or topic of study chosen by curriculum developers and teachers which maximizes an ELL's need for communication and social skills.

To access an ELL supporting document which delineates performance definitions and descriptors, please click on the following link: https://cpalmsmediaprod.blob.core.windows.net/uploads/docs/standards/eld/sc.pdf
**GENERAL INFORMATION**

**Course Number:** 2003600

**Number of Credits:** One (1) credit

**Course Type:** Core Academic Course

**Course Status:** Course Approved

**Grade Level(s):** 9,10,11,12

**Graduation Requirement:** Equally Rigorous Science

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**Educator Certifications**

<table>
<thead>
<tr>
<th>Science (Secondary Grades 7-12)</th>
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<tbody>
<tr>
<td>Physics (Grades 6-12)</td>
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Course Standards

<table>
<thead>
<tr>
<th>Name</th>
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<tbody>
<tr>
<td>SC.912.L.17.11:</td>
<td>Evaluate the costs and benefits of renewable and nonrenewable resources, such as water, energy, fossil fuels, wildlife, and forests.</td>
</tr>
<tr>
<td>SC.912.L.17.15:</td>
<td>Discuss the effects of technology on environmental quality.</td>
</tr>
<tr>
<td>SC.912.L.17.11:</td>
<td>Define a problem based on a specific body of knowledge, for example: biology, chemistry, physics, and earth/space science, and do the following: 1. Pose questions about the natural world. (Articulate the purpose of the investigation and identify the relevant scientific concepts). 2. Conduct systematic observations. (Write procedures that are clear and replicable. Identify observables and examine relationships between test (independent) variable and outcome (dependent) variable. Employ appropriate methods for accurate and consistent observations; conduct and record measurements at appropriate levels of precision. Follow safety guidelines). 3. Examine books and other sources of information to see what is already known. 4. Review what is known in light of empirical evidence. (Examine whether available empirical evidence can be interpreted in terms of existing knowledge and models, and if not, modify or develop new models). 5. Plan investigations. (Design and evaluate a scientific investigation). 6. Use tools to gather, analyze, and interpret data (this includes the use of measurement in metric and other systems, and also the generation and interpretation of graphical representations of data, including data tables and graphs). (Collect data or evidence in an organized way. Properly use instruments, equipment, and materials (e.g., scales, probeware, meter sticks, microscopes, computers) including set-up, calibration, technique, maintenance, and storage). 7. Pose answers, explanations, or descriptions of events. 8. Generate explanations that explicate or describe natural phenomena (inferences). 9. Use appropriate evidence and reasoning to justify these explanations to others. 10. Communicate results of scientific investigations, and 11. Evaluate the merits of the explanations produced by others.</td>
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<td>SC.912.N.1.1:</td>
<td>Describe and explain what characterizes science and its methods.</td>
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<td>SC.912.N.1.2:</td>
<td>Recognize that the strength or usefulness of a scientific claim is evaluated through scientific argumentation, which depends on critical and logical thinking, and the active consideration of alternative scientific explanations to explain the data presented.</td>
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<td>SC.912.N.1.3:</td>
<td>Identify sources of information and assess their reliability according to the strict standards of scientific investigation.</td>
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<td>SC.912.N.1.4:</td>
<td>Describe how scientific inferences are drawn from scientific observations and provide examples from the content being studied.</td>
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<td>SC.912.N.1.6:</td>
<td>Recognize the role of creativity in constructing scientific questions, methods and explanations.</td>
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<td>SC.912.N.2.1:</td>
<td>Identify what is science, what clearly is not science, and what superficially resembles science (but fails to meet the criteria for science).</td>
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<tr>
<td>SC.912.N.2.2:</td>
<td>Identify which questions can be answered through science and which questions are outside the boundaries of scientific investigation, such as questions addressed by other ways of knowing, such as art, philosophy, and religion.</td>
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<td>SC.912.N.2.3:</td>
<td>Identify examples of pseudoscience (such as astrology, phrenology) in society.</td>
</tr>
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<td>SC.912.N.2.4:</td>
<td>Explain that scientific knowledge is both durable and robust and open to change. Scientific knowledge can change because it is often examined and re-examined by new investigations and scientific argumentation. Because of these frequent examinations, scientific knowledge becomes stronger, leading to its durability.</td>
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<td>SC.912.N.2.5:</td>
<td>Describe instances in which scientists’ varied backgrounds, talents, interests, and goals influence the inferences and thus the explanations that they make about observations of natural phenomena and describe that competing interpretations (explanations) of scientists are a strength of science as they are a source of new, testable ideas that have the potential to add new evidence to support one or another of the explanations.</td>
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<td>SC.912.N.3.1:</td>
<td>Explain that a scientific theory is the culmination of many scientific investigations drawing together all the current evidence concerning a substantial range of phenomena; thus, a scientific theory represents the most powerful explanation scientists have to offer.</td>
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<tr>
<td>SC.912.N.3.2:</td>
<td>Describe the role consensus plays in the historical development of a theory in any one of the disciplines of science.</td>
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<td>SC.912.N.3.3:</td>
<td>Explain that scientific laws are descriptions of specific relationships under given conditions in nature, but do not offer explanations for those relationships.</td>
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<td>SC.912.N.3.4:</td>
<td>Recognize that theories do not become laws, nor do laws become theories; theories are well supported explanations and laws are well supported descriptions.</td>
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<td>SC.912.N.3.5:</td>
<td>Describe the function of models in science, and identify the wide range of models used in science.</td>
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<td>SC.912.N.4.1:</td>
<td>Explain how scientific knowledge and reasoning provide an empirically-based perspective to inform society’s decision making.</td>
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<td>SC.912.N.4.2:</td>
<td>Weigh the merits of alternative strategies for solving a specific societal problem by comparing a number of different costs and benefits, such as human, economic, and environmental.</td>
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<td>SC.912.P.8.1:</td>
<td>Differentiate among the four states of matter.</td>
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<td>SC.912.P.8.4:</td>
<td>Explore the scientific theory of atoms (also known as atomic theory) by describing the structure of atoms in terms of protons, neutrons and electrons, and differentiate among these particles in terms of their mass, electrical charges and locations within the atom.</td>
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<tr>
<td>SC.912.P.10.1:</td>
<td>Differentiate among the various forms of energy and recognize that they can be transformed from one form to others.</td>
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<tr>
<td>SC.912.P.10.2:</td>
<td>Explore the Law of Conservation of Energy by differentiating among open, closed, and isolated systems and explain that the total energy in an isolated system is a conserved quantity.</td>
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<td>SC.912.P.10.3:</td>
<td>Compare and contrast work and power qualitatively and quantitatively.</td>
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<td>SC.912.P.10.4:</td>
<td>Describe heat as the energy transferred by convection, conduction, and radiation, and explain the connection of heat to change in temperature or states of matter.</td>
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<td>SC.912.P.10.5:</td>
<td>Relate temperature to the average molecular kinetic energy.</td>
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<td>SC.912.P.10.6:</td>
<td>Create and interpret potential energy diagrams, for example: chemical reactions, orbits around a central body, motion of a pendulum.</td>
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<tr>
<td>SC.912.P.10.10:</td>
<td>Compare the magnitude and range of the four fundamental forces (gravitational, electromagnetic, weak nuclear, strong nuclear).</td>
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</table>
Relate the configuration of static charges to the electric field, electric force, electric potential, and electric potential energy.

Differentiate among conductors, semiconductors, and insulators.

Investigate and explain the relationships among current, voltage, resistance, and power.

Distinguish between scalar and vector quantities and assess which should be used to describe an event.

Analyze the motion of an object in terms of its position, velocity, and acceleration (with respect to a frame of reference) as functions of time.

Interpret and apply Newton’s three laws of motion.

Describe how the gravitational force between two objects depends on their masses and the distance between them.

Apply the law of conservation of linear momentum to interactions, such as collisions between objects.

Mathematicians who participate in effortful learning both individually and with others:
- Analyze the problem in a way that makes sense given the task.
- Ask questions that will help with solving the task.
- Build perseverance by modifying methods as needed while solving a challenging task.
- Stay engaged and maintain a positive mindset when working to solve tasks.
- Help and support each other when attempting a new method or approach.

Clarifications:
Teachers who encourage students to participate actively in effortful learning both individually and with others:
- Cultivate a community of growth mindset learners.
- Foster perseverance in students by choosing tasks that are challenging.
- Develop students’ ability to analyze and problem solve.
- Recognize students’ effort when solving challenging problems.

Demonstrate understanding by representing problems in multiple ways.
Mathematicians who demonstrate understanding by representing problems in multiple ways:
- Build understanding through modeling and using manipulatives.
- Represent solutions to problems in multiple ways using objects, drawings, tables, graphs and equations.
- Progress from modeling problems with objects and drawings to using algorithms and equations.
- Express connections between concepts and representations.
- Choose a representation based on the given context or purpose.

Clarifications:
Teachers who encourage students to demonstrate understanding by representing problems in multiple ways:
- Help students make connections between concepts and representations.
- Provide opportunities for students to use manipulatives when investigating concepts.
- Guide students from concrete to pictorial to abstract representations as understanding progresses.
- Show students that various representations can have different purposes and can be useful in different situations.

Complete tasks with mathematical fluency.
Mathematicians who complete tasks with mathematical fluency:
- Select efficient and appropriate methods for solving problems within the given context.
- Maintain flexibility and accuracy while performing procedures and mental calculations.
- Complete tasks accurately and with confidence.
- Adapt procedures to apply them to a new context.
- Use feedback to improve efficiency when performing calculations.

Clarifications:
Teachers who encourage students to complete tasks with mathematical fluency:
- Provide students with the flexibility to solve problems by selecting a procedure that allows them to solve efficiently and accurately.
- Offer multiple opportunities for students to practice efficient and generalizable methods.
- Provide opportunities for students to reflect on the method they used and determine if a more efficient method could have been used.

Engage in discussions that reflect on the mathematical thinking of self and others.
Mathematicians who engage in discussions that reflect on the mathematical thinking of self and others:
- Communicate mathematical ideas, vocabulary and methods effectively.
- Analyze the mathematical thinking of others.
- Compare the efficiency of a method to those expressed by others.
- Recognize errors and suggest how to correctly solve the task.
- Justify results by explaining methods and processes.
- Construct possible arguments based on evidence.

Clarifications:
Teachers who encourage students to engage in discussions that reflect on the mathematical thinking of self and others:
- Establish a culture in which students ask questions of the teacher and their peers, and error is an opportunity for learning.
- Create opportunities for students to discuss their thinking with peers.
- Select, sequence and present student work to advance and deepen understanding of correct and increasingly efficient methods.
- Develop students’ ability to justify methods and compare their responses to the responses of their peers.

Use patterns and structure to help understand and connect mathematical concepts.
Mathematicians who use patterns and structure to help understand and connect mathematical concepts:
- Focus on relevant details within a problem.
- Create plans and procedures to logically order events, steps or ideas to solve problems.
- Decompose a complex problem into manageable parts.
- Relate previously learned concepts to new concepts.
MA.K12.MTR.5.1:
- Look for similarities among problems.
- Connect solutions of problems to more complicated large-scale situations.

**Clarifications:**
Teachers who encourage students to use patterns and structure to help understand and connect mathematical concepts:
- Help students recognize the patterns in the world around them and connect these patterns to mathematical concepts.
- Support students to develop generalizations based on the similarities found among problems.
- Provide opportunities for students to create plans and procedures to solve problems.
- Develop students' ability to construct relationships between their current understanding and more sophisticated ways of thinking.

MA.K12.MTR.6.1:
- Assess the reasonableness of solutions.

**Mathematicians who assess the reasonableness of solutions:**
- Estimate to discover possible solutions.
- Use benchmark quantities to determine if a solution makes sense.
- Check calculations when solving problems.
- Verify possible solutions by explaining the methods used.
- Evaluate results based on the given context.

**Clarifications:**
Teachers who encourage students to assess the reasonableness of solutions:
- Have students estimate or predict solutions prior to solving.
- Prompt students to continually ask, "Does this solution make sense? How do you know?"
- Reinforce that students check their work as they progress within and after a task.
- Strengthen students' ability to verify solutions through justifications.

MA.K12.MTR.7.1:
- Apply mathematics to real-world contexts.

**Mathematicians who apply mathematics to real-world contexts:**
- Connect mathematical concepts to everyday experiences.
- Use models and methods to understand, represent and solve problems.
- Perform investigations to gather data or determine if a method is appropriate.
- Redesign models and methods to improve accuracy or efficiency.

**Clarifications:**
Teachers who encourage students to apply mathematics to real-world contexts:
- Provide opportunities for students to create models, both concrete and abstract, and perform investigations.
- Challenge students to question the accuracy of their models and methods.
- Support students as they validate conclusions by comparing them to the given situation.
- Indicate how various concepts can be applied to other disciplines.

ELA.K12.EE.1.1:
- Cite evidence to explain and justify reasoning.

**Clarifications:**
K-1 Students include textual evidence in their oral communication with guidance and support from adults. The evidence can consist of details from the text without naming the text. During 1st grade, students learn how to incorporate the evidence in their writing.

2-3 Students include relevant textual evidence in their written and oral communication. Students should name the text when they refer to it. In 3rd grade, students should use a combination of direct and indirect citations.

4-5 Students continue with previous skills and reference comments made by speakers and peers. Students cite texts that they've directly quoted, paraphrased, or used for information. When writing, students will use the form of citation dictated by the instructor or the style guide referenced by the instructor.

6-8 Students continue with previous skills and use a style guide to create a proper citation.

9-12 Students continue with previous skills and should be aware of existing style guides and the ways in which they differ.

ELA.K12.EE.2.1:
- Read and comprehend grade-level complex texts proficiently.

**Clarifications:**
See Text Complexity for grade-level complexity bands and a text complexity rubric.

ELA.K12.EE.3.1:
- Make inferences to support comprehension.

**Clarifications:**
Students will make inferences before the words infer or inference are introduced. Kindergarten students will answer questions like "Why is the girl smiling?" or make predictions about what will happen based on the title page. Students will use the terms and apply them in 2nd grade and beyond.

ELA.K12.EE.4.1:
- Use appropriate collaborative techniques and active listening skills when engaging in discussions in a variety of situations.

**Clarifications:**
In kindergarten, students learn to listen to one another respectfully.
In grades 1-2, students build upon these skills by justifying what they are thinking. For example: "I think _______ because _______" The collaborative conversations are becoming academic conversations.
In grades 3-12, students engage in academic conversations discussing claims and justifying their reasoning, refining and applying skills. Students build on ideas, propel the conversation, and support claims and counterclaims with evidence.

ELA.K12.EE.5.1:
- Use the accepted rules governing a specific format to create quality work.

**Clarifications:**
Students will incorporate skills learned into work products to produce quality work. For students to incorporate these skills appropriately, they must receive instruction. A 3rd grade student creating a poster board display must have instruction in how to effectively present information to do quality work.
General Course Information and Notes

GENERAL NOTES

Laboratory investigations that include the use of scientific inquiry, research, measurement, problem solving, laboratory apparatus and technologies, experimental procedures, and safety procedures are an integral part of this course. The National Science Teachers Association (NSTA) recommends that at the high school level, all students should be in the science lab or field, collecting data every week. School laboratory investigations (labs) are defined by the National Research Council (NRC) as an experience in the laboratory, classroom, or the field that provides students with opportunities to interact directly with natural phenomena or with data collected by others using tools, materials, data collection techniques, and models (NRC, 2006, p. 3). Laboratory investigations in the high school classroom should help all students develop a growing understanding of the complexity and ambiguity of empirical work, as well as the skills to calibrate and troubleshoot equipment used to make observations. Learners should understand measurement error; and have the skills to aggregate, interpret, and present the resulting data (National Research Council, 2006, p. 77; NSTA, 2007).

Special Notes

Instructional Practices
Teaching from a range of complex text is optimized when teachers in all subject areas implement the following strategies on a routine basis:

1. Ensuring wide reading from complex text that varies in length.
2. Making close reading and rereading of texts central to lessons.
3. Emphasizing text-specific complex questions, and cognitively complex tasks, reinforce focus on the text and cultivate independence.
4. Emphasizing students supporting answers based upon evidence from the text.
5. Providing extensive research and writing opportunities (claims and evidence).

- Asking questions (for science) and defining problems (for engineering).
- Developing and using models.
- Planning and carrying out investigations.
- Analyzing and interpreting data.
- Using mathematics, information and computer technology, and computational thinking.
- Constructing explanations (for science) and designing solutions (for engineering).
- Engaging in argument from evidence.
- Obtaining, evaluating, and communicating information.

Florida’s Benchmarks for Excellent Student Thinking (B.E.S.T.) Standards
This course includes Florida’s B.E.S.T. ELA Expectations (EE) and Mathematical Thinking and Reasoning Standards (MTRs) for students. Florida educators should intentionally embed these standards within the content and their instruction as applicable. For guidance on the implementation of the EEs and MTRs, please visit https://www.cpalms.org/Standards/BEST_Standards.aspx and select the appropriate B.E.S.T. Standards package.

English Language Development ELD Standards Special Notes Section:
Teachers are required to provide listening, speaking, reading and writing instruction that allows English language learners (ELL) to communicate information, ideas and concepts for academic success in the content area of Science. For the given level of English language proficiency and with visual, graphic, or interactive support, students will interact with grade level words, expressions, sentences and discourse to process or produce language necessary for academic success. The ELD standard should specify a relevant content area concept or topic of study chosen by curriculum developers and teachers which maximizes an ELL's need for communication and social skills. To access an ELL supporting document which delineates performance definitions and descriptors, please click on the following link: https://cpalmsmediaprod.blob.core.windows.net/uploads/docs/standards/eld/sc.pdf
Educator Certifications

<table>
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<th>Science (Secondary Grades 7-12)</th>
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<td>Describe and provide examples of how similar investigations conducted in many parts of the world result in the same outcome.</td>
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<td>Describe instances in which scientists' varied backgrounds, talents, interests, and goals influence the inferences and thus the explanations that they make about observations of natural phenomena and describe that competing interpretations (explanations) of scientists are a strength of science as they are a source of new, testable ideas that have the potential to add new evidence to support one or another of the explanations.</td>
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<td>Differentiate among the four states of matter.</td>
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<td>SC.912.P.8.2:</td>
<td>Differentiate between physical and chemical properties and physical and chemical changes of matter.</td>
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<td>SC.912.P.8.3:</td>
<td>Explore the scientific theory of atoms (also known as atomic theory) by describing changes in the atomic model over time and why those changes were necessitated by experimental evidence.</td>
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<td>SC.912.P.8.4:</td>
<td>Explore the scientific theory of atoms (also known as atomic theory) by describing the structure of atoms in terms of protons, neutrons and electrons, and differentiate among these particles in terms of their mass, electrical charges and locations within the atom.</td>
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<td>SC.912.P.8.5:</td>
<td>Relate properties of atoms and their position in the periodic table to the arrangement of their electrons.</td>
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<td>SC.912.P.8.6:</td>
<td>Distinguish between bonding forces holding compounds together and other attractive forces, including hydrogen bonding and van der Waals forces.</td>
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<td>SC.912.P.8.7:</td>
<td>Interpret formula representations of molecules and compounds in terms of composition and structure.</td>
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<td>SC.912.P.8.8:</td>
<td>Characterize types of chemical reactions, for example: redox, acid-base, synthesis, and single and double replacement reactions.</td>
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<td>SC.912.P.8.9:</td>
<td>Apply the mole concept and the law of conservation of mass to calculate quantities of chemicals participating in reactions.</td>
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<td>SC.912.P.8.11:</td>
<td>Relate acidity and basicity to hydronium and hydroxyl ion concentration and pH.</td>
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<td>Differentiate among the various forms of energy and recognize that they can be transformed from one form to others.</td>
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<td>Create and interpret potential energy diagrams, for example: chemical reactions, orbits around a central body, motion of a pendulum.</td>
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<td>Describe the quantization of energy at the atomic level.</td>
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<td>Differentiate between chemical and nuclear reactions.</td>
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<td>SC.912.P.10.10:</td>
<td>Interpret the theory of electromagnetism by comparing and contrasting the different parts of the electromagnetic spectrum in terms of wavelength, frequency, and energy, and relate them to phenomena and applications.</td>
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<td>SC.912.P.12.10:</td>
<td>Interpret the behavior of ideal gases in terms of kinetic molecular theory.</td>
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<td>SC.912.P.12.11:</td>
<td>Describe phase transitions in terms of kinetic molecular theory.</td>
</tr>
<tr>
<td>SC.912.P.12.12:</td>
<td>Explain how various factors, such as concentration, temperature, and presence of a catalyst affect the rate of a chemical reaction.</td>
</tr>
<tr>
<td>SC.912.P.12.13:</td>
<td>Explain the concept of dynamic equilibrium in terms of reversible processes occurring at the same rates.</td>
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</tbody>
</table>

**Make sense of problems and persevere in solving them.**

Mathematically proficient students start by explaining to themselves the meaning of a problem and looking for entry points to its solution. They analyze givens, constraints, relationships, and goals. They make conjectures about the form and meaning of the solution and plan a solution pathway rather than simply jumping into a solution attempt. They consider analogous problems, and try special cases and simpler forms of the
original problem in order to gain insight into its solution. They monitor and evaluate their progress and change course if necessary. Older students might, depending on the context of the problem, transform algebraic expressions or change the viewing window on their graphing calculator to get the information they need. Mathematically proficient students can explain correspondences between equations, verbal descriptions, tables, and graphs or draw diagrams of important features and relationships, graph data, and search for regularity or trends. Younger students might rely on using concrete objects or pictures to help conceptualize and solve a problem. Mathematically proficient students check their answers to problems using a different method, and they continually ask themselves, “Does this make sense?” They can understand the approaches of others to solving complex problems and identify correspondences between different approaches.

**Standard Relation to Course: Supporting**

**Reason abstractly and quantitatively.**

Mathematically proficient students make sense of quantities and their relationships in problem situations. They bring two complementary abilities to bear on problems involving quantitative relationships: the ability to decontextualize—to abstract a given situation and represent it symbolically and manipulate the representing symbols as if they have a life of their own, without necessarily attending to their referents—and the ability to contextualize, to pause as needed during the manipulation process in order to probe into the referents for the symbols involved. Quantitative reasoning entails habits of creating a coherent representation of the problem at hand; considering the units involved; attending to the meaning of quantities, not just how to compute them; and knowing and flexibly using different properties of operations and objects.

**Standard Relation to Course: Supporting**

**Construct viable arguments and critique the reasoning of others.**

Mathematically proficient students understand and use stated assumptions, definitions, and previously established results in constructing arguments. They make conjectures and build a logical progression of statements to explore the truth of their conjectures. They are able to analyze situations by breaking them into cases, and can recognize and use counterexamples. They justify their conclusions, communicate them to others, and respond to the arguments of others. They reason inductively about data, making plausible arguments that take into account the context from which the data arose. Mathematically proficient students are also able to compare the effectiveness of two plausible arguments, distinguish correct logic or reasoning from that which is flawed, and—if there is a flaw in an argument—explain what it is. Elementary students can construct arguments using concrete referents such as objects, drawings, diagrams, and actions. Such arguments can make sense and be correct, even though they are not generalized or made formal until later grades. Later, students learn to determine domains to which an argument applies. Students at all grades can listen or read the arguments of others, decide whether they make sense, and ask useful questions to clarify or improve the arguments.

**Standard Relation to Course: Supporting**

**Model with mathematics.**

Mathematically proficient students can apply the mathematics they know to solve problems arising in everyday life, society, and the workplace. In early grades, this might be as simple as writing an addition equation to describe a situation. In middle grades, a student might apply proportional reasoning to plan a school event or analyze a problem in the community. By high school, a student might use geometry to solve a design problem or use a function to describe how one quantity of interest depends on another. Mathematically proficient students who can apply what they know are comfortable making assumptions and approximations to simplify a complicated situation, realizing that these may need revision later. They are able to identify important quantities in a practical situation and map their relationships using such tools as diagrams, two-way tables, graphs, flowcharts and formulas. They can analyze those relationships mathematically to draw conclusions. They routinely interpret their mathematical results in the context of the situation and reflect on whether the results make sense, possibly improving the model if it has not served its purpose.

**Standard Relation to Course: Supporting**

**Use appropriate tools strategically.**

Mathematically proficient students consider the available tools when solving a mathematical problem. These tools might include pencil and paper, concrete models, a ruler, a protractor, a calculator, a spreadsheet, a computer algebra system, a statistical package, or dynamic geometry software. Proficient students are sufficiently familiar with tools appropriate for their grade or course to make sound decisions about when each of these tools might be helpful, recognizing both the insight to be gained and their limitations. For example, mathematically proficient high school students analyze graphs of functions and solutions generated using a graphing calculator. They detect possible errors by strategically using estimation and other mathematical knowledge. When making mathematical models, they know that technology can enable them to visualize the results of varying assumptions, explore consequences, and compare predictions with data. Mathematically proficient students at various grade levels are able to identify relevant external mathematical resources, such as digital content located on a website, and use them to pose or solve problems. They are able to use technological tools to explore and deepen their understanding of concepts.

**Standard Relation to Course: Supporting**

**Attend to precision.**

Mathematically proficient students try to communicate precisely to others. They try to use clear definitions in discussion with others and in their own reasoning. They state the meaning of the symbols they choose, including using the equal sign consistently and appropriately. They are careful about specifying units of measure, and labeling axes to clarify the correspondence with quantities in a problem. They calculate accurately and efficiently, express numerical answers with a degree of precision appropriate for the problem context. In the elementary grades, students give carefully formulated explanations to each other. By the time they reach high school they have learned to examine claims and make explicit use of definitions.

**Standard Relation to Course: Supporting**

**Look for and make use of structure.**

Mathematically proficient students look closely to discern a pattern or structure. Young students, for example, might notice that three and seven more is the same amount as seven and three more, or they may sort a collection of shapes according to how many sides the shapes have. Later, students will see 7 × 8 equals the well remembered 7 × 5 + 7 × 3, in preparation for learning about the distributive property. In the expression x² + 9x + 14, older students can see the 14 as 2 × 7 and the 9 as 2 + 7. They recognize the significance of an existing line in a geometric figure and can use the strategy of drawing an auxiliary line for solving problems. They also can step back for an overview and shift perspective. They can see complicated things, such as some algebraic expressions, as single objects or as being composed of several objects. For example, they can see 5 – (3x – y)² as 5 minus a positive number times a square and use that to realize that its value cannot be more than 5 for any real numbers x and y.

**Standard Relation to Course: Supporting**

**Look for and express regularity in repeated reasoning.**

Mathematically proficient students notice if calculations are repeated, and look both for general methods and for shortcuts. Upper elementary students might notice when dividing 25 by 11 that they are repeating the same calculations over and over again, and conclude they have a
repeating decimal. By paying attention to the calculation of slope as they repeatedly check whether points are on the line through \((1, 2)\) with slope 3, middle school students might abstract the equation \((y - 2) = 3(x - 1)\). Noticing the regularity in the way terms cancel when expanding \((x - 1)(x + 1)\), \((x - 1)(x^2 + x + 1)\), and \((x - 1)(x^3 + x^2 + x + 1)\) might lead them to the general formula for the sum of a geometric series. As they work to solve a problem, mathematically proficient students maintain oversight of the process, while attending to the details. They continually evaluate the reasonableness of their intermediate results.

### General Course Information and Notes

**General Notes**

**Special Note.** Pre-IB courses have been created by individual schools or school districts since before the MYP started. These courses mapped backwards the Diploma Programme (DP) to prepare students as early as age 14. The IB was never involved in creating or approving these courses. The IB acknowledges that it is important for students to receive preparation for taking part in the MYP, and that preparation is the MYP. The IB designed the MYP to address the whole child, which, as a result, has a different philosophical approach that aims at educating all students aged 11-16. Pre-IB courses usually deal with content, with less emphasis upon the needs of the whole child or the affective domain than the MYP. A school can have a course that it calls “pre-IB” as long as it makes it clear that the course and any supporting material have been developed independently of the IB. For this reason, the school must name the course along the lines of, for example, the “Any School pre-IB course”.

The IB does not recognize pre-IB courses or courses labeled IB by different school districts which are not an official part of the IBDP or IBCC curriculum. Typically, students enrolled in grade 9 or 10 are not in the IBDP or IBCC programmes. Florida’s Pre-IB courses should only be used in schools where MYP is not offered in order to prepare students to enter the IBDP. Teachers of Florida’s Pre-IB courses should have undergone IB training in order to ensure seamless articulation for students within the subject area.

**Honors and Advanced Level Course Note:** Advanced courses require a greater demand on students through increased academic rigor. Academic rigor is obtained through the application, analysis, evaluation, and creation of complex ideas that are often abstract and multi-faceted. Students are challenged to think and collaborate critically on the content they are learning. Honors level rigor will be achieved by increasing text complexity through text selection, focus on high-level qualitative measures, and complexity of task. Instruction will be structured to give students a deeper understanding of conceptual themes and organization within and across disciplines. Academic rigor is more than simply assigning to students a greater quantity of work.

**English Language Development ELD Standards Special Notes Section:** Teachers are required to provide listening, speaking, reading and writing instruction that allows English language learners (ELL) to communicate information, ideas and concepts for academic success in the content area of Science. For the given level of English language proficiency and with visual, graphic, or interactive support, students will interact with grade level words, expressions, sentences and discourse to process or produce language necessary for academic success. The ELD standard should specify a relevant content area concept or topic of study chosen by curriculum developers and teachers which maximizes an ELL’s need for communication and social skills. To access an ELL supporting document which delineates performance definitions and descriptors, please click on the following link: https://cpalmsmediaprod.blob.core.windows.net/uploads/docs/standards/eld/sc.pdf

### General Information

**Course Number:** 2003800

**Number of Credits:** One (1) credit

**Course Type:** Core Academic Course

**Course Status:** Course Approved

**Grade Level(s):** 9,10

**Graduation Requirement:** Equally Rigorous Science

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**Educator Certifications**

<table>
<thead>
<tr>
<th>Subject</th>
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<tbody>
<tr>
<td>Science (Secondary Grades 7-12)</td>
</tr>
<tr>
<td>Chemistry (Grades 6-12)</td>
</tr>
</tbody>
</table>

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**Equivalent Courses**

- 2003340-Chemistry 1
- 2003350-Chemistry 1 Honors
### Florida's Preinternational Baccalaureate Chemistry 1 (#2003800) 2022 - And Beyond

**Course Standards**

<table>
<thead>
<tr>
<th>Name</th>
<th>Description</th>
</tr>
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<tbody>
<tr>
<td>SC.912.N.1.1:</td>
<td>Define a problem based on a specific body of knowledge, for example: biology, chemistry, physics, and earth/space science, and do the following: 1. Pose questions about the natural world, (Articulate the purpose of the investigation and identify the relevant scientific concepts). 2. Conduct systematic observations, (Write procedures that are clear and replicable. Identify observables and examine relationships between test (independent) variable and outcome (dependent) variable. Employ appropriate methods for accurate and consistent observations; conduct and record measurements at appropriate levels of precision. Follow safety guidelines). 3. Examine books and other sources of information to see what is already known, 4. Review what is known in light of empirical evidence, (Examine whether available empirical evidence can be interpreted in terms of existing knowledge and models, and if not, modify or develop new models). 5. Plan investigations, (Design and evaluate a scientific investigation). 6. Use tools to gather, analyze, and interpret data (this includes the use of measurement in metric and other systems, and also the generation and interpretation of graphical representations of data, including data tables and graphs), (Collect data or evidence in an organized way. Properly use instruments, equipment, and materials (e.g., scales, probeware, meter sticks, microscopes, computers) including set-up, calibration, technique, maintenance, and storage). 7. Pose answers, explanations, or descriptions of events, 8. Generate explanations that explicate or describe natural phenomena (inferences), 9. Use appropriate evidence and reasoning to justify these explanations to others, 10. Communicate results of scientific investigations, and 11. Evaluate the merits of the explanations produced by others.</td>
</tr>
</tbody>
</table>

| SC.912.N.1.2: | Describe and explain what characterizes science and its methods. |
| SC.912.N.1.4: | Identify sources of information and assess their reliability according to the strict standards of scientific investigation. |
| SC.912.N.1.5: | Describe and provide examples of how similar investigations conducted in many parts of the world result in the same outcome. |
| SC.912.N.2.5: | Describe instances in which scientists' varied backgrounds, talents, interests, and goals influence the inferences and thus the explanations that they make about observations of natural phenomena and describe that competing interpretations (explanations) of scientists are a strength of science as they are a source of new, testable ideas that have the potential to add new evidence to support one or another of the explanations. |
| SC.912.N.3.2: | Describe the role consensus plays in the historical development of a theory in any one of the disciplines of science. |
| SC.912.N.3.3: | Explain that scientific laws are descriptions of specific relationships under given conditions in nature, but do not offer explanations for those relationships. |
| SC.912.N.3.5: | Describe the function of models in science, and identify the wide range of models used in science. |
| SC.912.N.4.1: | Explain how scientific knowledge and reasoning provide an empirically-based perspective to inform society's decision making. |
| SC.912.P.8.1: | Differentiate among the four states of matter. |
| SC.912.P.8.2: | Differentiate between physical and chemical properties and physical and chemical changes of matter. |
| SC.912.P.8.3: | Explore the scientific theory of atoms (also known as atomic theory) by describing changes in the atomic model over time and why those changes were necessitated by experimental evidence. |
| SC.912.P.8.4: | Explore the scientific theory of atoms (also known as atomic theory) by describing the structure of atoms in terms of protons, neutrons and electrons, and differentiating among these particles in their mass, electrical charges and locations within the atom. |
| SC.912.P.8.5: | Relate properties of atoms and their position in the periodic table to the arrangement of their electrons. |
| SC.912.P.8.6: | Distinguish between bonding forces holding compounds together and other attractive forces, including hydrogen bonding and van der Waals forces. |
| SC.912.P.8.7: | Interpret formula representations of molecules and compounds in terms of composition and structure. |
| SC.912.P.8.8: | Characterize types of chemical reactions, for example: redox, acid-base, synthesis, and single and double replacement reactions. |
| SC.912.P.8.9: | Apply the mole concept and the law of conservation of mass to calculate quantities of chemicals participating in reactions. |
| SC.912.P.8.11: | Relate acidity and basicity to hydronium and hydroxyl ion concentration and pH. |
| SC.912.P.10.1: | Differentiate among the various forms of energy and recognize that they can be transformed from one form to others. |
| SC.912.P.10.5: | Relate temperature to the average molecular kinetic energy. |
| SC.912.P.10.6: | Create and interpret potential energy diagrams, for example: chemical reactions, orbits around a central body, motion of a pendulum. |
| SC.912.P.10.7: | Distinguish between endothermic and exothermic chemical processes. |
| SC.912.P.10.9: | Describe the quantization of energy at the atomic level. |
| SC.912.P.10.12: | Differentiate between chemical and nuclear reactions. |
| SC.912.P.10.18: | Explore the theory of electromagnetism by comparing and contrasting the different parts of the electromagnetic spectrum in terms of wavelength, frequency, and energy, and relate them to phenomena and applications. |
| SC.912.P.12.10: | Interpret the behavior of ideal gases in terms of kinetic molecular theory. |
| SC.912.P.12.11: | Describe phase transitions in terms of kinetic molecular theory. |
| SC.912.P.12.12: | Explain how various factors, such as concentration, temperature, and presence of a catalyst affect the rate of a chemical reaction. |
| SC.912.P.12.13: | Explain the concept of dynamic equilibrium in terms of reversible processes occurring at the same rates. |

Mathematicians who participate in effortful learning both individually and with others:  
- Analyze the problem in a way that makes sense given the task.  
- Ask questions that will help with solving the task.  
- Build perseverance by modifying methods as needed while solving a challenging task.
*Stay engaged and maintain a positive mindset when working to solve tasks.*  
*Help and support each other when attempting a new method or approach.*

### MA.K12.MTR.1.1:

#### Clarifications:
Teachers who encourage students to participate actively in effortful learning both individually and with others:
- Cultivate a community of growth mindset learners.
- Foster perseverance in students by choosing tasks that are challenging.
- Help students' ability to analyze and problem solve.
- Recognize students' effort when solving challenging problems.

#### Demonstrate understanding by representing problems in multiple ways.
Mathematicians who demonstrate understanding by representing problems in multiple ways:
- Build understanding through modeling and using manipulatives.
- Represent solutions to problems in multiple ways using objects, drawings, tables, graphs and equations.
- Progress from modeling problems with objects and drawings to using algorithms and equations.
- Express connections between concepts and representations.
- Choose a representation based on the given context or purpose.

### MA.K12.MTR.2.1:

#### Clarifications:
Teachers who encourage students to complete tasks with mathematical fluency:
- Provide students with the flexibility to solve problems by selecting a procedure that allows them to solve efficiently and accurately.
- Offer multiple opportunities for students to practice efficient and generalizable methods.
- Provide opportunities for students to reflect on the method they used and determine if a more efficient method could have been used.

#### Complete tasks with mathematical fluency.
Mathematicians who complete tasks with mathematical fluency:
- Select efficient and appropriate methods for solving problems within the given context.
- Maintain flexibility and accuracy while performing procedures and mental calculations.
- Complete tasks accurately and with confidence.
- Adapt procedures to apply them to a new context.
- Use feedback to improve efficiency when performing calculations.

### MA.K12.MTR.3.1:

#### Clarifications:
Teachers who encourage students to engage in discussions that reflect on the mathematical thinking of self and others:
- Communicate mathematical ideas, vocabulary and methods effectively.
- Analyze the mathematical thinking of others.
- Compare the efficiency of a method to those expressed by others.
- Recognize errors and suggest how to correctly solve the task.
- Justify results by explaining methods and processes.
- Construct possible arguments based on evidence.

#### Engage in discussions that reflect on the mathematical thinking of self and others.
Mathematicians who engage in discussions that reflect on the mathematical thinking of self and others:
- Establish a culture in which students ask questions of the teacher and their peers, and error is an opportunity for learning.
- Create opportunities for students to discuss their thinking with peers.
- Select, sequence and present student work to advance and deepen understanding of correct and increasingly efficient methods.
- Develop students' ability to analyze and problem solve.

### MA.K12.MTR.4.1:

#### Use patterns and structure to help understand and connect mathematical concepts.
Mathematicians who use patterns and structure to help understand and connect mathematical concepts:
- Focus on relevant details within a problem.
- Create plans and procedures to logically order events, steps or ideas to solve problems.
- Decompose a complex problem into manageable parts.
- Relate previously learned concepts to new concepts.
- Look for similarities among problems.
- Connect solutions of problems to more complicated large-scale situations.

#### Clarifications:
Teachers who encourage students to use patterns and structure to help understand and connect mathematical concepts:
- Help students recognize the patterns in the world around them and connect these patterns to mathematical concepts.
- Support students to develop generalizations based on the similarities found among problems.
- Provide opportunities for students to create plans and procedures to solve problems.
- Develop students' ability to construct relationships between their current understanding and more sophisticated ways of thinking.

### MA.K12.MTR.5.1:

#### Assess the reasonableness of solutions.
Mathematicians who assess the reasonableness of solutions:
- Estimate to discover possible solutions.
- Use benchmark quantities to determine if a solution makes sense.
### MA.K12.MTR.6.1: Check calculations when solving problems. Verify possible solutions by explaining the methods used. Evaluate results based on the given context.

**Clarifications:**
- Teachers who encourage students to assess the reasonableness of solutions:
  - Have students estimate or predict solutions prior to solving.
  - Prompt students to continually ask, “Does this solution make sense? How do you know?”
  - Reinforce that students check their work as they progress within and after a task.
  - Strengthen students’ ability to verify solutions through justifications.

### MA.K12.MTR.7.1: Apply mathematics to real-world contexts. Mathematicians who apply mathematics to real-world contexts:

- Connect mathematical concepts to everyday experiences.
- Use models and methods to understand, represent and solve problems.
- Perform investigations to gather data or determine if a method is appropriate. • Redesign models and methods to improve accuracy or efficiency.

**Clarifications:**
- Teachers who encourage students to apply mathematics to real-world contexts:
  - Provide opportunities for students to create models, both concrete and abstract, and perform investigations.
  - Challenge students to question the accuracy of their models and methods.
  - Support students as they validate conclusions by comparing them to the given situation.
  - Indicate how various concepts can be applied to other disciplines.

### ELA.K12.EE.1.1: Cite evidence to explain and justify reasoning.

**Clarifications:**
- K-1 Students include textual evidence in their oral communication with guidance and support from adults. The evidence can consist of details from the text without naming the text. During 1st grade, students learn how to incorporate the evidence in their writing.
- 2-3 Students include relevant textual evidence in their written and oral communication. Students should name the text when they refer to it. In 3rd grade, students should use a combination of direct and indirect citations.
- 4-5 Students continue with previous skills and reference comments made by speakers and peers. Students cite texts that they've directly quoted, paraphrased, or used for information. When writing, students will use the form of citation dictated by the instructor or the style guide referenced by the instructor.
- 6-8 Students continue with previous skills and use a style guide to create a proper citation.
- 9-12 Students continue with previous skills and should be aware of existing style guides and the ways in which they differ.

### ELA.K12.EE.2.1: Read and comprehend grade-level complex texts proficiently.

**Clarifications:**
- See Text Complexity for grade-level complexity bands and a text complexity rubric.

### ELA.K12.EE.3.1: Make inferences to support comprehension.

**Clarifications:**
- Students will make inferences before the words infer or inference are introduced. Kindergarten students will answer questions like “Why is the girl smiling?” or make predictions about what will happen based on the title page. Students will use the terms and apply them in 2nd grade and beyond.

### ELA.K12.EE.4.1: Use appropriate collaborative techniques and active listening skills when engaging in discussions in a variety of situations.

**Clarifications:**
- In kindergarten, students learn to listen to one another respectfully.
- In grades 1-2, students build upon these skills by justifying what they are thinking. For example: “I think _____ because _____. “ The collaborative conversations are becoming academic conversations.
- In grades 3-12, students engage in academic conversations discussing claims and justifying their reasoning, refining and applying skills.
- Students build on ideas, propel the conversation, and support claims and counterclaims with evidence.

### ELA.K12.EE.5.1: Use the accepted rules governing a specific format to create quality work.

**Clarifications:**
- Students will incorporate skills learned into work products to produce quality work. For students to incorporate these skills appropriately, they must receive instruction. A 3rd grade student creating a poster board display must have instruction in how to effectively present information to do quality work.

### ELA.K12.EE.6.1: Use appropriate voice and tone when speaking or writing.

**Clarifications:**
- In kindergarten and 1st grade, students learn the difference between formal and informal language. For example, the way we talk to our friends differs from the way we speak to adults. In 2nd grade and beyond, students practice appropriate social and academic language to discuss texts.
(DP) to prepare students as early as age 14. The IB was never involved in creating or approving these courses. The IB acknowledges that it is important for students to receive preparation for taking part in the DP, and that preparation is the MYP. The IB designed the MYP to address the whole child, which, as a result, has a very different philosophical approach that aims at educating all students aged 11-16. Pre-IB courses usually deal with content, with less emphasis upon the needs of the whole child or the affective domain than the MYP. A school can have a course that it calls “pre-IB” as long as it makes it clear that the course and any supporting material have been developed independently of the IB. For this reason, the school must name the course along the lines of, for example, the “Any School pre-IB course”.

The IB does not recognize pre-IB courses or courses labeled IB by different school districts which are not an official part of the IBDP or IBCC curriculum. Typically, students enrolled in grade 9 or 10 are not in the IBDP or IBCC programmes.

https://ibanswers.ibo.org/app/answers/detail/a_id/5414/kw/pre-ib. Florida’s Pre-IB courses should only be used in schools where MYP is not offered in order to prepare students to enter the IBDP. Teachers of Florida’s Pre-IB courses should have undergone IB training in order to ensure seamless articulation for students within the subject area.

Honors and Advanced Level Course Note: Advanced courses require a greater demand on students through increased academic rigor. Academic rigor is obtained through the application, analysis, evaluation, and creation of complex ideas that are often abstract and multi-faceted. Students are challenged to think and collaborate critically on the content they are learning. Honors level rigor will be achieved by increasing text complexity through text selection, focus on high-level qualitative measures, and complexity of task. Instruction will be structured to give students a deeper understanding of conceptual themes and organization within and across disciplines. Academic rigor is more than simply assigning to students a greater quantity of work.

Florida's Benchmarks for Excellent Student Thinking (B.E.S.T.) Standards
This course includes Florida’s B.E.S.T. ELA Expectations (EE) and Mathematical Thinking and Reasoning Standards (MTRs) for students. Florida educators should intentionally embed these standards within the content and their instruction as applicable. For guidance on the implementation of the EEs and MTRs, please visit https://www.cpalms.org/Standards/BEST_Standards.aspx and select the appropriate B.E.S.T. Standards package.

English Language Development ELD Standards Special Notes Section:
Teachers are required to provide listening, speaking, reading and writing instruction that allows English language learners (ELL) to communicate information, ideas and concepts for academic success in the content area of Science. For the given level of English language proficiency and with visual, graphic, or interactive support, students will interact with grade level words, expressions, sentences and discourse to process or produce language necessary for academic success. The ELD standard should specify a relevant content area concept or topic of study chosen by curriculum developers and teachers which maximizes an ELL's need for communication and social skills. To access an ELL supporting document which delineates performance definitions and descriptors, please click on the following link: https://cpalmsmediaprod.blob.core.windows.net/uploads/docs/standards/eld/sc.pdf

GENERAL INFORMATION

Course Number: 2003800
Course Path: Section: Grades PreK to 12 Education
Courses > Grade Group: Grades 9 to 12 and Adult
Education Courses > Subject: Science > SubSubject: Chemistry>
Abbreviated Title: FL PRE-IB CHEM 1
Number of Credits: One (1) credit
Course Length: Year (Y)
Course Attributes:
• Honors
Course Level: 3

Graduation Requirement: Equally Rigorous Science

Educator Certifications
Science (Secondary Grades 7-12)
Chemistry (Grades 6-12)

Equivalent Courses
2003340-Chemistry 1
2003350-Chemistry 1 Honors
International Baccalaureate Chemistry 1
(#2003805) 2014 - And Beyond (current)

General Course Information and Notes

GENERAL NOTES

The curriculum description for this IB course is provided at http://www.ibo.org/en/programmes/.

GENERAL INFORMATION

Course Number: 2003805
Course Path: Section: Grades PreK to 12 Education Courses > Grade Group: Grades 9 to 12 and Adult Education Courses > Subject: Science > SubSubject: Chemistry
Abbreviated Title: IB CHEMISTRY 1
Number of Credits: One (1) credit
Course Length: Year (Y)
Course Attributes:
- International Baccalaureate (IB)
Course Level: 3
Course Status: Course Approved
Graduation Requirement: Equally Rigorous Science

Educator Certifications

Science (Secondary Grades 7-12)
Chemistry (Grades 6-12)
General Course Information and Notes

GENERAL NOTES

The curriculum description for this IB course is provided at http://www.ibo.org/en/programmes/.

GENERAL INFORMATION

Course Number: 2003810

Course Path: Section: Grades PreK to 12 Education Courses > Grade Group: Grades 9 to 12 and Adult Education Courses > Subject: Science > SubSubject: Chemistry

Abbreviated Title: IB CHEM 2

Number of Credits: One (1) credit

Course Length: Year (Y)

Course Attributes:
- International Baccalaureate (IB)

Course Grade Level(s): 9, 10, 11, 12

Course Level: 3

Graduation Requirement: Equally Rigorous Science

Educator Certifications

Science (Secondary Grades 7-12)
Chemistry (Grades 6-12)
General Course Information and Notes

GENERAL NOTES

The curriculum description for this IB course is provided at http://www.ibo.org/en/programmes/.

GENERAL INFORMATION

- **Course Number:** 2003820
- **Number of Credits:** One (1) credit
- **Course Type:** Core Academic Course
- **Course Status:** Course Approved
- **Grade Level(s):** 9,10,11,12
- **Graduation Requirement:** Equally Rigorous Science

**Course Path:**
- **Section:** Grades PreK to 12 Education Courses > 
- **Grade Group:** Grades 9 to 12 and Adult Education Courses > 
- **Subject:** Science > 
- **SubSubject:** Chemistry >

**Abbreviated Title:** IB CHEM 3

**Course Length:** Year (Y)

**Course Attributes:**
- International Baccalaureate (IB)

**Course Level:** 3

Educator Certifications

- Science (Secondary Grades 7-12)
- Chemistry (Grades 6-12)

Equivalent Courses

- 2003360-Chemistry 2 Honors
General Course Information and Notes

GENERAL NOTES

The curriculum description for this IB course is provided at http://www.ibo.org/en/programmes/.

GENERAL INFORMATION

Course Number: 2003830
Number of Credits: One (1) credit
Course Type: Core Academic Course
Course Status: Course Approved
Grade Level(s): 9,10,11,12
Graduation Requirement: Equally Rigorous Science

Course Path: Section: Grades PreK to 12 Education
Courses: Grade Group: Grades 9 to 12 and Adult Education Courses
Subject: Science
SubSubject: Chemistry
Abbreviated Title: IB MYP CHEM
Course Length: Year (Y)
Course Attributes:
- International Baccalaureate (IB)
Course Level: 3

Educator Certifications

<table>
<thead>
<tr>
<th>Chemistry (Grades 6-12)</th>
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<tbody>
<tr>
<td>Science (Secondary Grades 7-12)</td>
</tr>
<tr>
<td>Middle Grades General Science (Middle Grades 5-9)</td>
</tr>
</tbody>
</table>
SC.912.E.5.2: Identify patterns in the organization and distribution of matter in the universe and the forces that determine them.

SC.912.E.5.6: Develop logical connections through physical principles, including Kepler's and Newton's Laws about the relationships and the effects of Earth, Moon, and Sun on each other.

SC.912.E.5.8: Connect the concepts of radiation and the electromagnetic spectrum to the use of historical and newly-developed observational tools.

SC.912.L.18.12: Discuss the special properties of water that contribute to Earth's suitability as an environment for life: cohesive behavior, ability to moderate temperature, expansion upon freezing, and versatility as a solvent.

SC.912.N.1.1: Define a problem based on a specific body of knowledge, for example: biology, chemistry, physics, and earth/space science, and do the following:

1. Pose questions about the natural world, (Articulate the purpose of the investigation and identify the relevant scientific concepts).
2. Conduct systematic observations, (Write procedures that are clear and replicable. Identify observables and examine relationships between test (independent) variable and outcome (dependent) variable. Employ appropriate methods for accurate and consistent observations; conduct and record measurements at appropriate levels of precision. Follow safety guidelines).
3. Examine books and other sources of information to see what is already known,
4. Review what is known in light of empirical evidence, (Examine whether available empirical evidence can be interpreted in terms of existing knowledge and models, and if not, modify or develop new models).
5. Plan investigations, (Design and evaluate a scientific investigation).
6. Use tools to gather, analyze, and interpret data (this includes the use of measurement in metric and other systems, and also the generation and interpretation of graphical representations of data, including data tables and graphs), (Collect data or evidence in an organized way. Properly use instruments, equipment, and materials (e.g., scales, probeware, meter sticks, microscopes, computers) including set-up, calibration, technique, maintenance, and storage).
7. Pose answers, explanations, or descriptions of events,
8. Generate explanations that explicate or describe natural phenomena (inferences),
9. Use appropriate evidence and reasoning to justify these explanations to others,
10. Communicate results of scientific investigations, and
11. Evaluate the merits of the explanations produced by others.

SC.912.N.1.2: Describe and explain what characterizes science and its methods.

SC.912.N.1.5: Describe and provide examples of how similar investigations conducted in many parts of the world result in the same outcome.

SC.912.N.1.6: Describe how scientific inferences are drawn from scientific observations and provide examples from the content being studied.

SC.912.N.1.7: Recognize the role of creativity in constructing scientific questions, methods and explanations.

SC.912.N.2.2: Identify which questions can be answered through science and which questions are outside the boundaries of scientific investigation, such as questions addressed by other ways of knowing, such as art, philosophy, and religion.

SC.912.N.2.3: Identify examples of pseudoscience (such as astrology, phrenology) in society.

SC.912.N.2.4: Explain that scientific knowledge is both durable and robust and open to change. Scientific knowledge can change because it is often examined and re-examined by new investigations and scientific argumentation. Because of these frequent examinations, scientific knowledge becomes stronger, leading to its durability.

SC.912.N.2.5: Describe instances in which scientists' varied backgrounds, talents, interests, and goals influence the inferences and thus the explanations that they make about observations of natural phenomena and describe that competing interpretations (explanations) of scientists are a strength of science as they are a source of new, testable ideas that have the potential to add new evidence to support one or another of the explanations.

SC.912.N.3.1: Explain that a scientific theory is the culmination of many scientific investigations drawing together all the current evidence concerning a substantial range of phenomena; thus, a scientific theory represents the most powerful explanation scientists have to offer.

SC.912.N.3.2: Discuss the role consensus plays in the historical development of a theory in anyone of the disciplines of science.

SC.912.N.3.3: Explain that scientific laws are descriptions of specific relationships under given conditions in nature, but do not offer explanations for those relationships.

SC.912.N.3.4: Recognize that theories do not become laws, nor do laws become theories; theories are well supported explanations and laws are well supported descriptions.

SC.912.N.3.5: Describe the function of models in science, and identify the wide range of models used in science.

SC.912.N.4.1: Explain how scientific knowledge and reasoning provide an empirically-based perspective to inform society's decision making.

SC.912.P.8.1: Differentiate among the four states of matter.

SC.912.P.8.3: Explore the scientific theory of atoms (also known as atomic theory) by describing changes in the atomic model over time and why those changes were necessitated by experimental evidence.

SC.912.P.8.4: Explore the scientific theory of atoms (also known as atomic theory) by describing the structure of atoms in terms of protons, neutrons and electrons, and differentiate among these particles in terms of their mass, electrical charges and locations within the atom.

SC.912.P.10.1: Differentiate among the various forms of energy and recognize that they can be transformed from one form to others.

SC.912.P.10.2: Explore the Law of Conservation of Energy by differentiating among open, closed, and isolated systems and explain that the total energy in an isolated system is a conserved quantity.

SC.912.P.10.3: Compare and contrast work and power qualitatively and quantitatively.

SC.912.P.10.4: Describe heat as the energy transferred by convection, conduction, and radiation, and explain the connection of heat to change in temperature or states of matter.

SC.912.P.10.5: Relate temperature to the average molecular kinetic energy.
SC.912.P.10.6: Create and interpret potential energy diagrams, for example: chemical reactions, orbits around a central body, motion of a pendulum.

SC.912.P.10.7: Distinguish between endothermic and exothermic chemical processes.

SC.912.P.10.8: Explain entropy's role in determining the efficiency of processes that convert energy to work.

SC.912.P.10.10: Compare the magnitude and range of the four fundamental forces (gravitational, electromagnetic, weak nuclear, strong nuclear).

SC.912.P.10.13: Relate the configuration of static charges to the electric field, electric force, electric potential, and electric potential energy.


SC.912.P.10.15: Investigate and explain the relationships among current, voltage, resistance, and power.

SC.912.P.10.16: Explain the relationship between moving charges and magnetic fields, as well as changing magnetic fields and electric fields, and their application to modern technologies.

SC.912.P.10.17: Explore the theory of electromagnetism by explaining electromagnetic waves in terms of oscillating electric and magnetic fields.

SC.912.P.10.18: Explore the theory of electromagnetism by comparing and contrasting the different parts of the electromagnetic spectrum in terms of wavelength, frequency, and energy, and relate them to phenomena and applications.

SC.912.P.10.20: Describe the measurable properties of waves and explain the relationships among them and how these properties change when the wave moves from one medium to another.

SC.912.P.10.21: Qualitatively describe the shift in frequency in sound or electromagnetic waves due to the relative motion of a source or a receiver.

SC.912.P.10.22: Construct ray diagrams and use thin lens and mirror equations to locate the images formed by lenses and mirrors.

SC.912.P.12.1: Distinguish between scalar and vector quantities and assess which should be used to describe an event.

SC.912.P.12.2: Analyze the motion of an object in terms of its position, velocity, and acceleration (with respect to a frame of reference) as functions of time.

SC.912.P.12.3: Interpret and apply Newton's three laws of motion.

SC.912.P.12.4: Describe how the gravitational force between two objects depends on their masses and the distance between them.

SC.912.P.12.5: Apply the law of conservation of linear momentum to interactions, such as collisions between objects.

SC.912.P.12.6: Qualitatively apply the concept of angular momentum.

SC.912.P.12.7: Recognize that nothing travels faster than the speed of light in vacuum which is the same for all observers no matter how they or the light source are moving.

SC.912.P.12.8: Recognize that Newton's Laws are a limiting case of Einstein's Special Theory of Relativity at speeds that are much smaller than the speed of light.

SC.912.P.12.9: Recognize that time, length, and energy depend on the frame of reference.

LAFS.1112.RST.1.1: Cite specific textual evidence to support analysis of science and technical texts, attending to important distinctions the author makes and to any gaps or inconsistencies in the account.

LAFS.1112.RST.1.2: Determine the central ideas or conclusions of a text; summarize complex concepts, processes, or information presented in a text by paraphrasing them in simpler but still accurate terms.

LAFS.1112.RST.1.3: Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks; analyze the specific results based on explanations in the text.

LAFS.1112.RST.2.4: Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 11-12 texts and topics.

LAFS.1112.RST.2.5: Analyze how the text structures information or ideas into categories or hierarchies, demonstrating understanding of the information or ideas.

LAFS.1112.RST.2.6: Analyze the author's purpose in providing an explanation, describing a procedure, or discussing an experiment in a text, identifying important issues that remain unresolved.

LAFS.1112.RST.3.7: Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g., quantitative data, video, multimedia) in order to address a question or solve a problem.

LAFS.1112.RST.3.8: Evaluate the hypotheses, data, analysis, and conclusions in a science or technical text, verifying the data when possible and corroborating or challenging conclusions with other sources of information.

LAFS.1112.RST.3.9: Synthesize information from a range of sources (e.g., texts, experiments, simulations) into a coherent understanding of a process, phenomenon, or concept, resolving conflicting information when possible.

LAFS.1112.RST.4.10: By the end of grade 12, read and comprehend science/technical texts in the grades 11-12 text complexity band independently and proficiently.

LAFS.1112.SL.1.1: Initiate and participate effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grades 11-12 topics, texts, and issues, building on others' ideas and expressing their own clearly and persuasively.

a. Come to discussions prepared, having read and researched material under study; explicitly draw on that preparation by referring to evidence from texts and other research on the topic or issue to stimulate a thoughtful, well-reasoned exchange of ideas.

b. Work with peers to promote civil, democratic discussions and decision-making; set clear goals and deadlines, and establish individual roles as needed.

c. Propose conversations by posing and responding to questions that probe reasoning and evidence; ensure a hearing for a full range of positions on a topic or issue; clarify, verify, or challenge ideas and conclusions; and promote divergent and creative perspectives.

d. Respond thoughtfully to diverse perspectives; synthesize comments, claims, and evidence made on all sides of an issue; resolve contradictions when possible; and determine what additional information or research is required to deepen the investigation or complete the task.

LAFS.1112.SL.1.2: Integrate multiple sources of information presented in diverse formats and media (e.g., visually, quantitatively, orally) in order to make informed decisions and solve problems, evaluating the credibility and accuracy of each source and noting any discrepancies among the data.

LAFS.1112.SL.1.3: Evaluate a speaker's point of view, reasoning, and use of evidence and rhetoric, assessing the stance, premises, links among ideas, word choice, points of emphasis, and tone used.

LAFS.1112.SL.2.4: Present information, findings, and supporting evidence, conveying a clear and distinct perspective, such that listeners can follow the line of reasoning, alternative or opposing perspectives are addressed, and the organization, development, substance, and style are appropriate to purpose, audience, and a range of formal and informal tasks.

LAFS.1112.SL.2.5: Make strategic use of digital media (e.g., textual, graphical, audio, visual, and interactive elements) in presentations to enhance understanding of findings, reasoning, and evidence and to add interest.

Write arguments focused on discipline-specific content.

a. Introduce precise, knowledgeable claim(s), establish the significance of the claim(s), distinguish the claim(s) from alternate or opposing claims, and create an organization that logically sequences the claim(s), counterclaims, reasons, and evidence.

b. Develop claim(s) and counterclaims fairly and thoroughly, supplying the most relevant data and evidence for each while pointing out the strengths and limitations of both claim(s) and counterclaims in a discipline-appropriate form that anticipates the audience's knowledge level, concerns, values, and possible biases.

c. Use words, phrases, and clauses as well as varied syntax to link the major sections of the text, create cohesion, and clarify the relationships between claim(s) and reasons, between reasons and evidence, and between claim(s) and counterclaims.
d. Establish and maintain a formal style and objective tone while attending to the norms and conventions of the discipline in which they are writing.
e. Provide a concluding statement or section that follows from or supports the argument presented.

**LAFS.1112.WHST.1.2:** Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes.

a. Introduce a topic and organize complex ideas, concepts, and information so that each new element builds on that which preceded it to create a unified whole; include formatting (e.g., headings), graphics (e.g., figures, tables), and multimedia when useful to aiding comprehension.
b. Develop the topic thoroughly by selecting the most significant and relevant facts, extended definitions, concrete details, quotations, or other information and examples appropriate to the audience's knowledge of the topic.
c. Use varied transitions and sentence structures to link the major sections of the text, create cohesion, and clarify the relationships among complex ideas and concepts.
d. Use precise language, domain-specific vocabulary and techniques such as metaphor, simile, and analogy to manage the complexity of the topic; convey a knowledgeable stance in a style that responds to the discipline and context as well as to the expertise of likely readers.
e. Provide a concluding statement or section that follows from and supports the information or explanation presented (e.g., articulating implications or the significance of the topic).

**LAFS.1112.WHST.2.4:** Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.

**LAFS.1112.WHST.2.5:** Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience.

**LAFS.1112.WHST.2.6:** Use technology, including the Internet, to produce, publish, and update individual or shared writing products in response to ongoing feedback, including new arguments or information.

**LAFS.1112.WHST.2.7:** Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation.

**LAFS.1112.WHST.2.8:** Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the strengths and limitations of each source in terms of the specific task, purpose, and audience; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and overreliance on any one source and following a standard format for citation.

**LAFS.1112.WHST.3.9:** Draw evidence from informational texts to support analysis, reflection, and research.

**LAFS.1112.WHST.4.10:** Write routinely over extended time frames (time for reflection and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences.

**LAFS.910.RST.1.1:** Cite specific textual evidence to support analysis of science and technical texts, attending to the precise details of explanations or descriptions.

**LAFS.910.RST.1.3:** Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks, attending to special cases or exceptions defined in the text.

**LAFS.910.RST.3.7:** Translate quantitative or technical information expressed in words in a text into visual form (e.g., a table or chart) and translate information expressed visually or mathematically (e.g., in an equation) into words.

**LAFS.910.WHST.1.2:** Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes.

a. Introduce a topic and organize ideas, concepts, and information to make important connections and distinctions; include formatting (e.g., headings), graphics (e.g., figures, tables), and multimedia when useful to aiding comprehension.
b. Develop the topic with well-chosen, relevant, and sufficient facts, extended definitions, concrete details, quotations, or other information and examples appropriate to the audience's knowledge of the topic.
c. Use varied transitions and sentence structures to link the major sections of the text, create cohesion, and clarify the relationships among ideas and concepts.
d. Use precise language and domain-specific vocabulary to manage the complexity of the topic and convey a style appropriate to the discipline and context as well as to the expertise of likely readers.
e. Establish and maintain a formal style and objective tone while attending to the norms and conventions of the discipline in which they are writing.
f. Provide a concluding statement or section that follows from and supports the information or explanation presented (e.g., articulating implications or the significance of the topic).

**LAFS.910.WHST.3.9:** Draw evidence from informational texts to support analysis, reflection, and research.

**MAFS.912.A-CED.1.4:** Rearrange formulas to highlight a quantity of interest, using the same reasoning as in solving equations. For example, rearrange Ohm’s law V = IR to highlight resistance R.

**MAFS.912.F-IF.2.4:** For a function that models a relationship between two quantities, interpret key features of graphs and tables in terms of the quantities, and sketch graphs showing key features given a verbal description of the relationship. Key features include: intercepts; intervals where the function is increasing, decreasing, positive, or negative; relative maximums and minimums; symmetries; end behavior; and periodicity.

**MAFS.912.F-IF.3.7:** Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases.

a. Graph linear and quadratic functions and show intercepts, maxima, and minima.
b. Graph square root, cube root, and piecewise-defined functions, including step functions and absolute value functions.
c. Graph polynomial functions, identifying zeros when suitable factorizations are available, and showing end behavior.
d. Graph rational functions, identifying zeros and asymptotes when suitable factorizations are available, and showing end behavior.
e. Graph exponential and logarithmic functions, showing intercepts and end behavior, and trigonometric functions, showing period, midline, and amplitude, and using phase shift.

**MAFS.912.G-MGD.1.3:** Use volume formulas for cylinders, pyramids, cones, and spheres to solve problems.

**MAFS.912.G-MG.1.2:** Apply concepts of density based on area and volume in modeling situations (e.g., persons per square mile, BTUs per cubic foot).

**MAFS.912.N-Q.1.1:** Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays.

**MAFS.912.N-Q.1.3:** Choose a level of accuracy appropriate to limitations on measurement when reporting quantities.

**MAFS.912.N-VM.1.1:** Recognize vector quantities as having both magnitude and direction. Represent vector quantities by directed line segments, and use appropriate symbols for vectors and their magnitudes (e.g., $\mathbf{v}, |\mathbf{v}|, \|\mathbf{v}\|, \mathbf{v}$).

**MAFS.912.N-VM.1.2:** Find the components of a vector by subtracting the coordinates of an initial point from the coordinates of a terminal point.

**MAFS.912.N-VM.1.3:** Solve problems involving velocity and other quantities that can be represented by vectors.

**MAFS.912.S-IC.2.6:** Evaluate reports based on data.
Clarifications:
In grades 6 – 8, students describe center and spread in a data distribution. Here they choose a summary statistic appropriate to the characteristics of the data distribution, such as the shape of the distribution or the existence of extreme data points.

MAFS.912.S-ID.1.2: Clarifications:
Use statistics appropriate to the shape of the data distribution to compare center (median, mean) and spread (interquartile range, standard deviation) of two or more different data sets. ★

MAFS.912.S-ID.1.3: Clarifications:
Interpret differences in shape, center, and spread in the context of the data sets, accounting for possible effects of extreme data points (outliers). ★

MAFS.912.S-ID.1.4: Use the mean and standard deviation of a data set to fit it to a normal distribution and to estimate population percentages. Recognize that there are data sets for which such a procedure is not appropriate. Use calculators, spreadsheets, and tables to estimate areas under the normal curve. ★

MAFS.912.S-ID.2.5: Summarize categorical data for two categories in two-way frequency tables. Interpret relative frequencies in the context of the data (including joint, marginal, and conditional relative frequencies). Recognize possible associations and trends in the data. ★

MAFS.912.S-ID.2.6: Represent data on two quantitative variables on a scatter plot, and describe how the variables are related. ★

a. Fit a function to the data; use functions fitted to data to solve problems in the context of the data. Use given functions or choose a function suggested by the context. Emphasize linear, and exponential models.

b. Informally assess the fit of a function by plotting and analyzing residuals.

c. Fit a linear function for a scatter plot that suggests a linear association.

Clarifications:
Students take a more sophisticated look at using a linear function to model the relationship between two numerical variables. In addition to fitting a line to data, students assess how well the model fits by analyzing residuals.

Make sense of problems and persevere in solving them.

Mathematically proficient students start by explaining to themselves the meaning of a problem and looking for entry points to its solution. They analyze givens, constraints, relationships, and goals. They make conjectures about the form and meaning of the solution and plan a solution pathway rather than simply jumping into a solution attempt. They consider analogous problems and try special cases and simpler forms of the original problem in order to gain insight into its solution. They monitor and evaluate their progress and change course if necessary. Older students might, depending on the context of the problem, transform algebraic expressions or change the viewing window on their graphing calculator to get the information they need. Mathematically proficient students can explain correspondences between equations, verbal descriptions, tables, and graphs or draw diagrams of important features and relationships, graph data, and search for regularity or trends. Younger students might rely on using concrete objects or pictures to help conceptualize and solve a problem. Mathematically proficient students check their answers to problems using a different method, and they continually ask themselves, “Does this make sense?” They can understand the approaches of others to solving complex problems and identify correspondences between different approaches.

Reason abstractly and quantitatively.

Mathematically proficient students make sense of quantities and their relationships in problem situations. They bring two complementary abilities to bear on problems involving quantitative relationships: the ability to decontextualize—to abstract a given situation and represent it symbolically and manipulate the representing symbols as if they have a life of their own, without necessarily attending to their referents—and the ability to contextualize, to pause as needed during the manipulation process in order to probe into the referents for the symbols involved. Quantitative reasoning entails habits of creating a coherent representation of the problem at hand; considering the units involved; attending to the meaning of quantities, not just how to compute them; and knowing and flexibly using different properties of operations and objects.

Clarifications:

Construct viable arguments and critique the reasoning of others.

Mathematically proficient students understand and use stated assumptions, definitions, and previously established results in constructing arguments. They make conjectures and build a logical progression of statements to explore the truth of their conjectures. They are able to analyze situations by breaking them into cases, and can recognize and use counterexamples. They justify their conclusions, communicate them to others, and respond to the arguments of others. They reason inductively about data, making plausible arguments that take into account the context from which the data arose. Mathematically proficient students are also able to compare the effectiveness of two plausible arguments, distinguish correct logic or reasoning from that which is flawed, and—if there is a flaw in an argument—explain what it is. Elementary students can construct arguments using concrete referents such as objects, drawings, diagrams, and actions. Such arguments can make sense and be correct, even though they are not generalized or made formal until later grades. Later, students learn to determine domains to which an argument applies. Students at all grades can listen or read the arguments of others, decide whether they make sense, and ask useful questions to clarify or improve the arguments.

Model with mathematics.

Mathematically proficient students can apply the mathematics they know to solve problems arising in everyday life, society, and the workplace. In early grades, this might be as simple as writing an addition equation to describe a situation. In middle grades, a student might apply proportional reasoning to plan a school event or analyze a problem in the community. By high school, a student might use geometry to solve a design problem or use a function to describe how one quantity of interest depends on another. Mathematically proficient students who can apply what they know are comfortable making assumptions and approximations to simplify a complicated situation, realizing that these may need revision later. They are able to identify important quantities in a practical situation and map their relationships using such tools as diagrams, two-way tables, graphs, flowcharts and formulas. They can analyze those relationships mathematically to draw conclusions. They routinely interpret their mathematical results in the context of the situation and reflect on whether the results make sense, possibly improving the model if it has not served its purpose.

Use appropriate tools strategically.

Mathematically proficient students consider the available tools when solving a mathematical problem. These tools might include pencil and paper, concrete models, a ruler, a protractor, a calculator, a spreadsheet, a computer algebra system, a statistical package, or dynamic geometry software.
MAFS.K12.MP.5.1: Proficient students are sufficiently familiar with tools appropriate for their grade or course to make sound decisions about when each of these tools might be helpful, recognizing both the insight to be gained and their limitations. For example, mathematically proficient high school students analyze graphs of functions and solutions generated using a graphing calculator. They detect possible errors by strategically using estimation and other mathematical knowledge. When making mathematical models, they know that technology can enable them to visualize the results of varying assumptions, explore consequences, and compare predictions with data. Mathematically proficient students at various grade levels are able to identify relevant external mathematical resources, such as digital content located on a website, and use them to pose or solve problems. They are able to use technological tools to explore and deepen their understanding of concepts.

Attending to precision.

MAFS.K12.MP.6.1: Mathematically proficient students try to communicate precisely to others. They try to use clear definitions in discussion with others and in their own reasoning. They state the meaning of the symbols they choose, including using the equal sign consistently and appropriately. They are careful about specifying units of measure, and labeling axes to clarify the correspondence with quantities in a problem. They calculate accurately and efficiently, express numerical answers with a degree of precision appropriate for the problem context. In the elementary grades, students give closely approximated values for intermediate calculations, expressing them with a degree of precision appropriate to the problem context. For example, they do not use a fraction like 3/16 to describe a distance that is closer to 1/8.

Look for and make use of structure.

MAFS.K12.MP.7.1: Mathematically proficient students look closely to discern a pattern or structure. Young students, for example, might notice that three and seven more is the same amount as seven and three more, or that a shape is composed of some other shape(s). Young students might notice that the shape in the middle of a line is the midpoint of a segment and can anticipate when having crossed the diagonal of a square one might pass through its center. Mathematically proficient students can see complicated things, such as some algebraic expressions, as single objects or as being composed of several objects. For example, they can see 5 - 3(x - y)² as 5 minus a positive number times a square and use that to realize that its value cannot be more than 5 for any real numbers x and y.

Look for and express regularity in repeated reasoning.

MAFS.K12.MP.8.1: Mathematically proficient students notice if calculations are repeated, and look both for general methods and for shortcuts. Upper elementary students might notice when dividing 25 by 11 that they are repeating the same calculations over and over again, and conclude they have a repeating decimal. By paying attention to the calculation of slope as they repeatedly compute whether points are on the line through (1, 2) with slope 3, middle school students might abstract the equation (y - 2)/(x - 1) = 3, noticing regularity in the way terms cancel when expanding (x - 1)(x + 1), (x - 1)(x² + x + 1), and (x - 1)(x³ + x² + x + 1). They might notice that the first two equations are equal because they come from expanding the same expression, (x - 1)(x + 1)(x² + x + 1), and the third is different. By contrast, looking for structures in the graph of an equation a(x) = b(x) helps students to determine whether they are equal at a given x.

General Course Information and Notes

GENERAL NOTES

While the content focus of this course is consistent with the Physics 1 course, students will explore these concepts in greater depth as preparatory work for the IB Physics course(s). In general, the academic pace and rigor will be greatly increased for pre-IB level coursework. Coursework should include opportunities for students to develop their understanding of both theory and experiments, developing traditional practical skills and techniques while also developing interpersonal and digital communication skills in preparation for the IB Physics course.

Integral to the experience of students in Pre-IB Physics courses is their experience in the classroom laboratory or in the field. Practical activities allow students to interact directly with natural phenomena and secondary data sources. These experiences provide the students with the opportunity to design investigations, collect data, develop manipulative skills, analyze results, collaborate with peers and evaluate and communicate their findings. Experiments can be used to introduce a topic, investigate a phenomenon or allow students to consider and examine questions and curiosities. These laboratory experiences are essential as preparatory work for the IB Physics course(s).

Instructional Practices

Teaching from a range of complex text is optimized when teachers in all subject areas implement the following strategies on a routing basis:

1. Ensuring wide reading from complex text that varies in length.
2. Making close reading and rereading of texts central to lessons.
3. Emphasizing text-specific complex questions, and cognitively complex tasks, reinforce focus on the text and cultivate independence.
4. Emphasizing students supporting answers based upon evidence from the text.
5. Providing extensive research and writing opportunities (claims and evidence).


- Asking questions (for science) and defining problems (for engineering).
- Developing and using models.
- Planning and carrying out investigations.
- Analyzing and interpreting data.
- Using mathematics, information and computer technology, and computational thinking.
- Constructing explanations (for science) and designing solutions (for engineering).
- Engaging in argument from evidence.
- Obtaining, evaluating, and communicating information.

Honors and Advanced Level Course Notes: Advanced courses require a greater demand on students through increased academic rigor. Academic rigor is obtained through the application, analysis, evaluation, and creation of complex ideas that are often abstract and multi-faceted. Students are challenged to think and collaborate critically on the content they are learning. Honors level rigor will be achieved by increasing text complexity through text selection, focus on high-level qualitative measures,
and complexity of task. Instruction will be structured to give students a deeper understanding of conceptual themes and organization within a

**English Language Development ELD Standards Special Notes Section:**

Teachers are required to provide listening, speaking, reading and writing instruction that allows English language learners (ELL) to communicate information, ideas and concepts for academic success in the content area of Science. For the given level of English language proficiency and with visual, graphic, or interactive support, students will interact with grade level words, expressions, sentences and discourse to process or produce language necessary for academic success. The ELD standard should specify a relevant content area concept or topic of study chosen by curriculum developers and teachers which maximizes an ELL's need for communication and social skills. To access an ELL supporting document which delineates performance definitions and descriptors, please click on the following link: https://cpalmsmediaprod.blob.core.windows.net/uploads/docs/standards/eld/sc.pdf.

**Course Standards**

Appropriate grade levels standards in Language Arts should be used for students in Grades 9-10 and Grades 11-12.

### GENERAL INFORMATION

- **Course Number:** 2003836
- **Course Path:** Grades PreK to 12 Education Courses > Grade Group: Grades 9 to 12 and Adult Education Courses > Subject: Science > SubSubject: Physical Sciences
- **Abbreviated Title:** FL PRE-IB PHYSICS 1
- **Number of Credits:** One (1) credit
- **Course Length:** Year (Y)
- **Course Attributes:**
  - Honors
- **Course Level:** 3
- **Grade Level(s):** 9, 10
- **Graduation Requirement:** Equally Rigorous Science

**Educator Certifications**

[Physics (Grades 6-12)]
Explore the scientific theory of atoms (also known as atomic theory) by explain that a scientific theory is the culmination of many scientific developments through physical principles, including Kepler's and Newton's laws about the relationships and the effects of Earth, Moon, and Sun on each other. Connect the concepts of radiation and the electromagnetic spectrum to the use of historical and newly-developed observational tools. Discuss the special properties of water that contribute to Earth's suitability as an environment for life: cohesive behavior, ability to moderate temperature, expansion upon freezing, and versatility as a solvent.

Define a problem based on a specific body of knowledge, for example: biology, chemistry, physics, and earth/space science, and do the following:
1. Pose questions about the natural world, (Articulate the purpose of the investigation and identify the relevant scientific concepts).
2. Conduct systematic observations, (Write procedures that are clear and replicable. Identify observables and examine relationships between test (independent) variable and outcome (dependent) variable. Employ appropriate methods for accurate and consistent observations; conduct and record measurements at appropriate levels of precision. Follow safety guidelines).
3. Examine books and other sources of information to see what is already known,
4. Review what is known in light of empirical evidence, (Examine whether available empirical evidence can be interpreted in terms of existing knowledge and models, and if not, modify or develop new models).
5. Plan investigations, (Design and evaluate a scientific investigation).
6. Use tools to gather, analyze, and interpret data (this includes the use of measurement in metric and other systems, and also the generation and interpretation of graphical representations of data, including data tables and graphs), (Collect data or evidence in an organized way. Properly use instruments, equipment, and materials (e.g., scales, probeware, meter sticks, microscopes, computers) including set-up, calibration, technique, maintenance, and storage).
7. Pose answers, explanations, or descriptions of events,
8. Generate explanations that explicate or describe natural phenomena (inferences),
9. Use appropriate evidence and reasoning to justify these explanations to others,
10. Communicate results of scientific investigations, and
11. Evaluate the merits of the explanations produced by others.

Describe and explain what characterizes science and its methods.

Compare and contrast work and power qualitatively and quantitatively. Explore the Law of Conservation of Energy by differentiating among open, closed, and isolated systems and explain that the total energy in an isolated system is a conserved quantity.

Describe heat as the energy transferred by convection, conduction, and radiation, and explain the connection of heat to change in temperature or states of matter.

Describe and explain what characterizes science and its methods.

Examine books and other sources of information to see what is already known, review what is known in light of empirical evidence, plan investigations, use tools to gather, analyze, and interpret data, pose answers, explanations, or descriptions of events, generate explanations that explicate or describe natural phenomena (inferences), use appropriate evidence and reasoning to justify these explanations to others, communicate results of scientific investigations, and evaluate the merits of the explanations produced by others.

Describe how scientific inferences are drawn from scientific observations and provide examples from the content being studied.

Describe instances in which scientists' varied backgrounds, talents, interests, and goals influence the inferences and thus the explanations that they make about observations of natural phenomena and describe that competing interpretations (explanations) of scientists are a strength of science as they are a source of new, testable ideas that have the potential to add new evidence to support one or another of the explanations.

Explain that scientific laws are descriptions of specific relationships under given conditions in nature, but do not offer explanations for those relationships.

Explain how scientific knowledge and reasoning provide an empirically-based perspective to inform society's decision making.

Describe how scientific knowledge and reasoning provide an empirically-based perspective to inform society's decision making.

Connect the concepts of radiation and the electromagnetic spectrum to the use of historical and newly-developed observational tools.

Describe the special properties of water that contribute to Earth's suitability as an environment for life: cohesive behavior, ability to moderate temperature, expansion upon freezing, and versatility as a solvent.

Explore the scientific theory of atoms (also known as atomic theory) by explain that a scientific theory is the culmination of many scientific developments through physical principles, including Kepler's and Newton's laws about the relationships and the effects of Earth, Moon, and Sun on each other.

Discuss the special properties of water that contribute to Earth’s suitability as an environment for life: cohesive behavior, ability to moderate temperature, expansion upon freezing, and versatility as a solvent.

Explain that scientific knowledge is both durable and robust and open to change. Scientific knowledge can change because it is often examined and re-examined by new investigations and scientific argumentation. Because of these frequent examinations, scientific knowledge becomes stronger, leading to its durability.

Explain that scientific laws are descriptions of specific relationships under given conditions in nature, but do not offer explanations for those relationships.

Explain how scientific knowledge and reasoning provide an empirically-based perspective to inform society's decision making.

Describing the function of models in science, and identify the wide range of models used in science.

Explain how scientific knowledge and reasoning provide an empirically-based perspective to inform society's decision making.

Distinguish among the four states of matter.
Create and interpret potential energy diagrams, for example: chemical reactions, orbits around a central body, motion of a pendulum.

SC.912.P.10.2.6

Distinguish between endothermic and exothermic chemical processes.

SC.912.P.10.2.7

Explain entropy's role in determining the efficiency of processes that convert energy to work.

SC.912.P.10.2.8

Compare the magnitude and range of the four fundamental forces (gravitational, electromagnetic, weak nuclear, strong nuclear).

SC.912.P.10.2.10

Relate the configuration of static charges to the electric field, electric force, electric potential, and electric potential energy.

SC.912.P.10.2.13

Differentiate among conductors, semiconductors, and insulators.

SC.912.P.10.2.14

Investigate and explain the relationships among current, voltage, resistance, and power.

SC.912.P.10.2.15

Explain the relationship between moving charges and magnetic fields, as well as changing magnetic fields and electric fields, and their application to modern technologies.

SC.912.P.10.2.16

Explore the theory of electromagnetism by explaining electromagnetic waves in terms of oscillating electric and magnetic fields.

SC.912.P.10.2.17

Describe the measurable properties of waves and explain the relationships among them and how these properties change when the wave moves from one medium to another.

SC.912.P.10.2.20

Qualitatively describe the shift in frequency in sound or electromagnetic waves due to the relative motion of a source or a receiver.

SC.912.P.10.2.21

Construct ray diagrams and use thin lens and mirror equations to locate the images formed by lenses and mirrors.

SC.912.P.10.2.22

Distinguish between scalar and vector quantities and assess which should be used to describe an event.

SC.912.P.10.2.23

Apply the law of conservation of linear momentum to interactions, such as collisions between objects.

SC.912.P.10.2.26

Recognize that nothing travels faster than the speed of light in vacuum which is the same for all observers no matter how they or the light source are moving.

SC.912.P.10.2.27

Recognize that Newton's Laws are a limiting case of Einstein's Special Theory of Relativity at speeds that are much smaller than the speed of light.

SC.912.P.10.2.29

Recognize that time, length, and energy depend on the frame of reference.

SC.912.P.10.2.30

Analyze the mathematical thinking of others.

MA.K12.MTR.1.1: Mathematicians who participate in effortful learning both individually and with others:

- Analyze the problem in a way that makes sense given the task.
- Ask questions that will help with solving the task.
- Build perseverance by modifying methods as needed while solving a challenging task.
- Stay engaged and maintain a positive mindset when working to solve tasks.
- Help and support each other when attempting a new method or approach.

Clarifications:

- Teachers who encourage students to participate actively in effortful learning both individually and with others:
  - Cultivate a community of growth mindset learners.
  - Foster perseverance in students by choosing tasks that are challenging.
  - Develop students' ability to analyze and problem solve.
  - Recognize students' effort when solving challenging problems.

Demonstrate understanding by representing problems in multiple ways. Mathematicians who demonstrate understanding by representing problems in multiple ways:

- Build understanding through modeling and using manipulatives.
- Represent solutions to problems in multiple ways using objects, drawings, tables, graphs and equations.
- Progress from modeling problems with objects and drawings to using algorithms and equations.
- Express connections between concepts and representations.
- Choose a representation based on the given context or purpose.

Clarifications:

- Teachers who encourage students to demonstrate understanding by representing problems in multiple ways:
  - Help students make connections between concepts and representations.
  - Provide opportunities for students to use manipulatives when investigating concepts.
  - Guide students from concrete to pictorial to abstract representations as understanding progresses.
  - Show students that various representations can have different purposes and can be useful in different situations.

Complete tasks with mathematical fluency. Mathematicians who complete tasks with mathematical fluency:

- Select efficient and appropriate methods for solving problems within the given context.
- Maintain flexibility and accuracy while performing procedures and mental calculations.
- Complete tasks accurately and with confidence.
- Adapt procedures to apply them to a new context.
- Use feedback to improve efficiency when performing calculations.

Clarifications:

- Teachers who encourage students to complete tasks with mathematical fluency:
  - Provide students with the flexibility to solve problems by selecting a procedure that allows them to solve efficiently and accurately.
  - Offer multiple opportunities for students to practice efficient and generalizable methods.
  - Provide opportunities for students to reflect on the method they used and determine if a more efficient method could have been used.
  - Communicate mathematical ideas, vocabulary and methods effectively.
  - Analyze the mathematical thinking of others.

Engage in discussions that reflect on the mathematical thinking of self and others. Mathematicians who engage in discussions that reflect on the mathematical thinking of self and others:

Clarifications:
MA.K12.MTR.4.1: Compare the efficiency of a method to those expressed by others. Recognize errors and suggest how to correctly solve the task. Justify results by explaining methods and processes. Construct possible arguments based on evidence.

Clarifications:
Teachers who encourage students to engage in discussions that reflect on the mathematical thinking of self and others:
- Establish a culture in which students ask questions of the teacher and their peers, and error is an opportunity for learning.
- Create opportunities for students to discuss their thinking with peers.
- Select, sequence and present student work to advance and deepen understanding of correct and increasingly efficient methods.
- Develop students' ability to justify methods and compare their responses to the responses of their peers.

Use patterns and structure to help understand and connect mathematical concepts. Mathematicians who use patterns and structure to help understand and connect mathematical concepts:
- Focus on relevant details within a problem.
- Create plans and procedures to logically order events, steps or ideas to solve problems.
- Decompose a complex problem into manageable parts.
- Relate previously learned concepts to new concepts.
- Look for similarities among problems.
- Connect solutions of problems to more complicated large-scale situations.

Clarifications:
Teachers who encourage students to use patterns and structure to help understand and connect mathematical concepts:
- Help students recognize the patterns in the world around them and connect these patterns to mathematical concepts.
- Support students to develop generalizations based on the similarities found among problems.
- Provide opportunities for students to create plans and procedures to solve problems.
- Develop students' ability to construct relationships between their current understanding and more sophisticated ways of thinking.

Assess the reasonableness of solutions. Mathematicians who assess the reasonableness of solutions:
- Estimate to discover possible solutions.
- Use benchmark quantities to determine if a solution makes sense.
- Check calculations when solving problems.
- Verify possible solutions by explaining the methods used.
- Evaluate results based on the given context.

Clarifications:
Teachers who encourage students to assess the reasonableness of solutions:
- Have students estimate or predict solutions prior to solving.
- Prompt students to continually ask, "Does this solution make sense? How do you know?"
- Reinforce that students check their work as they progress within and after a task.
- Strengthen students' ability to verify solutions through justifications.

Apply mathematics to real-world contexts. Mathematicians who apply mathematics to real-world contexts:
- Connect mathematical concepts to everyday experiences.
- Use models and methods to understand, represent and solve problems.
- Perform investigations to gather data or determine if a method is appropriate. Redesign models and methods to improve accuracy or efficiency.

Clarifications:
Teachers who encourage students to apply mathematics to real-world contexts:
- Provide opportunities for students to create models, both concrete and abstract, and perform investigations.
- Challenge students to question the accuracy of their models and methods.
- Support students as they validate conclusions by comparing them to the given situation.
- Indicate how various concepts can be applied to other disciplines.

Cite evidence to explain and justify reasoning.

Clarifications:
K-1 Students include textual evidence in their oral communication with guidance and support from adults. The evidence can consist of details from the text without naming the text. During 1st grade, students learn how to incorporate the evidence in their writing. 2-3 Students include relevant textual evidence in their written and oral communication. Students should name the text when they refer to it. In 3rd grade, students should use a combination of direct and indirect citations. 4-5 Students continue with previous skills and reference comments made by speakers and peers. Students cite texts that they've directly quoted, paraphrased, or used for information. When writing, students will use the form of citation dictated by the instructor or the style guide referenced by the instructor. 6-8 Students continue with previous skills and use a style guide to create a proper citation. 9-12 Students continue with previous skills and should be aware of existing style guides and the ways in which they differ.

ELA.K12.CC.2.1: Read and comprehend grade-level complex texts proficiently.

Clarifications:
See Text Complexity for grade-level complexity bands and a text complexity rubric.

Make inferences to support comprehension.
ELA.K12.EE.3.1: Students will make inferences before the words infer or inference are introduced. Kindergarten students will answer questions like “Why is the girl smiling?” or make predictions about what will happen based on the title page. Students will use the terms and apply them in 2nd grade and beyond.

Clarifications:
Use appropriate collaborative techniques and active listening skills when engaging in discussions in a variety of situations.

ELA.K12.EE.4.1: In kindergarten, students learn to listen to one another respectfully.
In grades 1-2, students build upon these skills by justifying what they are thinking. For example: “I think ______ because ______.” The collaborative conversations are becoming academic conversations.

Clarifications:
Use the accepted rules governing a specific format to create quality work.

ELA.K12.EE.5.1: Students will incorporate skills learned into work products to produce quality work. For students to incorporate these skills appropriately, they must receive instruction. A 3rd grade student creating a poster board display must have instruction in how to effectively present information to do quality work.

Clarifications: Students will make inferences before the words infer or inference are introduced. Kindergarten students will answer questions like “Why is the girl smiling?” or make predictions about what will happen based on the title page. Students will use the terms and apply them in 2nd grade and beyond.

ELA.K12.EE.6.1: Use appropriate voice and tone when speaking or writing.

Clarifications: English language learners communicate information, ideas and concepts necessary for academic success in the content area of Science.

ELD.K12.ELL.SC.1:

General Course Information and Notes

GENERAL NOTES

While the content focus of this course is consistent with the Physics 1 course, students will explore these concepts in greater depth as preparatory work for the IB Physics course(s). In general, the academic pace and rigor will be greatly increased for pre-IB level coursework. Coursework should include opportunities for students to develop their understanding of both theory and experiments, developing traditional practical skills and techniques while also developing interpersonal and digital communication skills in preparation for the IB Physics course.

Integral to the experience of students in Pre-IB Physics courses is their experience in the classroom laboratory or in the field. Practical activities allow students to interact directly with natural phenomena and secondary data sources. These experiences provide the students with the opportunity to design investigations, collect data, develop manipulative skills, analyze results, collaborate with peers and evaluate and communicate their findings. Experiments can be used to introduce a topic, investigate a phenomenon or allow students to consider and examine questions and curiosities. These laboratory experiences are essential as preparatory work for the IB Physics course(s).

Instructional Practices

Teaching from a range of complex text is optimized when teachers in all subject areas implement the following strategies on a routing basis:

1. Ensuring wide reading from complex text that varies in length.
2. Making close reading and rereading of texts central to lessons.
3. Emphasizing text-specific complex questions, and cognitively complex tasks, reinforce focus on the text and cultivate independence.
4. Emphasizing students supporting answers based upon evidence from the text.
5. Providing extensive research and writing opportunities (claims and evidence).


- Asking questions (for science) and defining problems (for engineering).
- Developing and using models.
- Planning and carrying out investigations.
- Analyzing and interpreting data.
- Using mathematics, information and computer technology, and computational thinking.
- Constructing explanations (for science) and designing solutions (for engineering).
- Engaging in argument from evidence.
- Obtaining, evaluating, and communicating information.

Honors and Advanced Level Course Note: Advanced courses require a greater demand on students through increased academic rigor. Academic rigor is obtained through the application, analysis, evaluation, and creation of complex ideas that are often abstract and multi-faceted. Students are challenged to think and collaborate critically on the content they are learning. Honors level rigor will be achieved by increasing text complexity through text selection, focus on high-level qualitative measures, and complexity of task. Instruction will be structured to give students a deeper understanding of conceptual themes and organization within and across disciplines. Academic rigor is more than simply assigning to students a greater quantity of work.

Florida’s Benchmarks for Excellent Student Thinking (B.E.S.T.) Standards:

This course includes Florida’s B.E.S.T. ELA Expectations (EE) and Mathematical Thinking and Reasoning Standards (MTRs) for students. Florida educators should intentionally embed these standards within the content and their instruction as applicable. For guidance on the implementation of the EE and MTRs, please visit https://www.cpalms.org/Standards/BEST_Standards.aspx and select the appropriate B.E.S.T. Standards package.

English Language Development ELD Standards Special Notes Section:

Teachers are required to provide listening, speaking, reading and writing instruction that allows English language learners (ELL) to communicate information, ideas and...
Educator Certifications

Physics (Grades 6-12)

Appropriate grade levels standards in Language Arts should be used for students in Grades 9-10 and Grades 11-12.

GENERAL INFORMATION

Course Number: 2003836

Course Path: Section: Grades PreK to 12 Education Courses > Grade Group: Grades 9 to 12 and Adult Education Courses > Subject: Science > SubSubject: Physical Sciences

Abbreviated Title: Fl. PRE-IB PHYSICS 1

Course Length: Year (Y)

Course Attributes: Honors

Course Level: 3

Graduation Requirement: Equally Rigorous Science
International Baccalaureate Physics 1 (#2003840) 2014 - And Beyond (current)

General Course Information and Notes

GENERAL NOTES

The curriculum description for this IB course is provided at:
http://www.ibo.org/en/programmes/

GENERAL INFORMATION

Course Number: 2003840

Number of Credits: One (1) credit

Course Type: Core Academic Course
Course Status: Course Approved
Grade Level(s): 9,10,11,12
Graduation Requirement: Equally Rigorous Science

Course Path: Section: Grades PreK to 12 Education Courses > Grade Group: Grades 9 to 12 and Adult Education Courses > Subject: Science > SubSubject: Physical Sciences
Abbreviated Title: IB PHYSICS 1
Course Length: Year (Y)
Course Attributes:
  • International Baccalaureate (IB)
Course Level: 3

Educator Certifications

Science (Secondary Grades 7-12)
Physics (Grades 6-12)
General Course Information and Notes

GENERAL NOTES

The curriculum description for this IB course is provided at http://www.ibo.org/en/programmes/.

GENERAL INFORMATION

Course Number: 2003845
Number of Credits: One (1) credit

Course Path: Section: Grades PreK to 12 Education Courses > Grade Group: Grades 9 to 12 and Adult Education Courses > Subject: Science > SubSubject: Physical Sciences >
Abbreviated Title: IB PHYSICS 2
Course Length: Year (Y)
Course Attributes:
• International Baccalaureate (IB)
Course Level: 3

Grade Level(s): 9,10,11,12
Graduation Requirement: Equally Rigorous Science

Educator Certifications

Science (Secondary Grades 7-12)
Physics (Grades 6-12)
General Course Information and Notes

GENERAL NOTES

The curriculum description for this IB course is provided at http://www.ibo.org/en/programmes/.

GENERAL INFORMATION

Course Number: 2003850
Number of Credits: One (1) credit
Course Type: Core Academic Course
Course Status: Course Approved
Grade Level(s): 9,10,11,12
Graduation Requirement: Equally Rigorous Science

Course Path: Section: Grades PreK to 12 Education Courses > Grade Group: Grades 9 to 12 and Adult Education Courses > Subject: Science > SubSubject: Physical Sciences
Abbreviated Title: IB PHYSICS 3
Course Length: Year (Y)
Course Attributes:
- International Baccalaureate (IB)
Course Level: 3

Educator Certifications

Science (Secondary Grades 7-12)
Physics (Grades 6-12)
General Course Information and Notes

GENERAL NOTES

The curriculum description for this IB course is provided at http://www.ibo.org/en/programmes/.

GENERAL INFORMATION

Course Number: 2003855

Course Path: Section: Grades PreK to 12 Education Courses > Grade Group: Grades 9 to 12 and Adult Education Courses > Subject: Science > SubSubject: Physical Sciences >

Abbreviated Title: IB MYP PHYSICS

Course Length: Year (Y)

Course Attributes:
- International Baccalaureate (IB)

Course Level: 3

Number of Credits: One (1) credit

Course Type: Core Academic Course

Course Status: Course Approved

Graduation Requirement: Equally Rigorous Science

Educator Certifications

<table>
<thead>
<tr>
<th>Science (Secondary Grades 7-12)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Physics (Grades 6-12)</td>
</tr>
</tbody>
</table>
General Course Information and Notes

GENERAL NOTES

The curriculum description for this IB course is provided at http://www.ibo.org/en/programmes/.

QUALIFICATIONS

As well as any certification requirements listed on the course description, the following qualifications may also be acceptable for the course:

Any academic coverage (any coverage classified as an academic coverage in Rules 6A-4.0101 through 6A-4.0343, Florida Administrative Code).

GENERAL INFORMATION

Course Number: 2003860
Course Path: Grades PreK to 12 Education Courses > Grade Group: Grades 9 to 12 and Adult Education Courses > Subject: Science > SubSubject: Physical Sciences > Abbreviated Title: IB DESIGN TECH 1
Number of Credits: One (1) credit
Course Type: Elective Course
Course Status: Course Approved
Grade Level(s): 9,10,11,12
Course Length: Year (Y)
Course Attributes:
- International Baccalaureate (IB)
Course Level: 3
General Course Information and Notes

GENERAL NOTES

The curriculum description for this IB course is provided at http://www.ibo.org/en/programmes/.

QUALIFICATIONS

As well as any certification requirements listed on the course description, the following qualifications may also be acceptable for the course:

Any academic coverage (any coverage classified as an academic coverage in Rules 6A-4.0101 through 6A-4.0343, Florida Administrative Code).

GENERAL INFORMATION

Course Number: 2003862
Course Path: Grades PreK to 12 Education Courses
Grade Group: Grades 9 to 12 and Adult Education Courses
Subject: Science
SubSubject: Physical Sciences
Abbreviated Title: IB DESIGN TECH 2
Course Length: Year (Y)
Course Attributes:
  • International Baccalaureate (IB)
Course Level: 3
Number of Credits: One (1) credit
Course Type: Elective Course
Course Status: Course Approved
Grade Level(s): 9,10,11,12
General Course Information and Notes

GENERAL NOTES

The curriculum description for this IB course is provided at http://www.ibo.org/en/programmes/.

QUALIFICATIONS

As well as any certification requirements listed on the course description, the following qualifications may also be acceptable for the course:

Any academic coverage (any coverage classified as an academic coverage in Rules 6A-4.0101 through 6A-4.0343, Florida Administrative Code).

GENERAL INFORMATION

Course Number: 2003864
Course Path: Grades PreK to 12 Education Courses > Grade Group: Grades 9 to 12 and Adult Education Courses > Subject: Science > SubSubject: Physical Sciences
Abbreviated Title: IB DESIGN TECH 3
Course Length: Year (Y)
Course Attributes:
- International Baccalaureate (IB)
Course Level: 3

Number of Credits: One (1) credit
Course Type: Elective Course
Course Status: Course Approved
Grade Level(s): 9,10,11,12
Course Standards

<table>
<thead>
<tr>
<th>Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>SC.912.E.5.1:</td>
<td>Cite evidence used to develop and verify the scientific theory of the Big Bang (also known as the Big Bang Theory) of the origin of the universe.</td>
</tr>
<tr>
<td>SC.912.E.5.2:</td>
<td>Identify patterns in the organization and distribution of matter in the universe and the forces that determine them.</td>
</tr>
<tr>
<td>SC.912.E.5.3:</td>
<td>Explain the physical properties of the Sun and its dynamic nature and connect them to conditions and events on Earth.</td>
</tr>
<tr>
<td>SC.912.E.5.4:</td>
<td>Consider the history of and explain the justification for future space exploration and continuing technology development.</td>
</tr>
<tr>
<td>SC.912.E.5.5:</td>
<td>Connect the concepts of radiation and the electromagnetic spectrum to the use of historical and newly-developed observational tools.</td>
</tr>
<tr>
<td>SC.912.E.5.6:</td>
<td>Analyze past, present, and potential future consequences to the environment resulting from various energy production technologies.</td>
</tr>
<tr>
<td>SC.912.E.5.7:</td>
<td>Analyze the movement of matter and energy through the different biogeochemical cycles, including water and carbon.</td>
</tr>
<tr>
<td>SC.912.L.14.6:</td>
<td>Explain the significance of genetic factors, environmental factors, and pathogenic agents to health from the perspectives of both individual and public health.</td>
</tr>
<tr>
<td>SC.912.L.15.2:</td>
<td>Discuss the use of molecular clocks to estimate how long ago various groups of organisms diverged evolutionarily from one another.</td>
</tr>
<tr>
<td>SC.912.L.16.10:</td>
<td>Evaluate the impact of biotechnology on the individual, society and the environment, including medical and ethical issues.</td>
</tr>
<tr>
<td>SC.912.L.17.13:</td>
<td>Discuss the need for adequate monitoring of environmental parameters when making policy decisions.</td>
</tr>
<tr>
<td>SC.912.L.17.14:</td>
<td>Assess the need for adequate waste management strategies.</td>
</tr>
<tr>
<td>SC.912.L.17.15:</td>
<td>Discuss the effects of technology on environmental quality.</td>
</tr>
<tr>
<td>SC.912.L.17.16:</td>
<td>Discuss the large-scale environmental impacts resulting from human activity, including waste spills, oil spills, runoff, greenhouse gases, ozone depletion, and surface and groundwater pollution.</td>
</tr>
</tbody>
</table>

**SC.912.N.1.1:**

Define a problem based on a specific body of knowledge, for example: biology, chemistry, physics, and earth/space science, and do the following:

1. Pose questions about the natural world. (Articulate the purpose of the investigation and identify the relevant scientific concepts).
2. Conduct systematic observations. (Write procedures that are clear and replicable. Identify observables and examine relationships between test (independent) variable and outcome (dependent) variable. Employ appropriate methods for accurate and consistent observations; conduct and record measurements at appropriate levels of precision. Follow safety guidelines).
3. Examine books and other sources of information to see what is already known.
4. Review what is known in light of empirical evidence. (Examine whether available empirical evidence can be interpreted in terms of existing knowledge and models, and if not, modify or develop new models).
5. Plan investigations. (Design and evaluate a scientific investigation).
6. Use tools to gather, analyze, and interpret data (this includes the use of measurement in metric and other systems, and also the generation and interpretation of graphical representations of data, including data tables and graphs). (Collect data or evidence in an organized way. Properly use instruments, equipment, and materials (e.g., scales, probeware, meter sticks, microscopes, computers) including set-up, calibration, technique, maintenance, and storage).
7. Pose answers, explanations, or descriptions of events.
8. Generate explanations that explicate or describe natural phenomena (inferences).
9. Use appropriate evidence and reasoning to justify these explanations to others.
10. Communicate results of scientific investigations, and
11. Evaluate the merits of the explanations produced by others.

**SC.912.N.1.2:**

Describe and explain what characterizes science and its methods.

**SC.912.N.1.3:**

Recognize that the strength or usefulness of a scientific claim is evaluated through scientific argumentation, which depends on critical and logical thinking, and the active consideration of alternative scientific explanations to explain the data presented.

**SC.912.N.1.4:**

Identify sources of information and assess their reliability according to the strict standards of scientific investigation.

**SC.912.N.1.5:**

Describe and provide examples of how similar investigations conducted in many parts of the world result in the same outcome.

**SC.912.N.1.6:**

Describe how scientific inferences are drawn from scientific observations and provide examples from the content being studied.

**SC.912.N.1.7:**

Recognize the role of creativity in constructing scientific questions, methods, and explanations.

**SC.912.N.2.1:**

Identify what is science, what clearly is not science, and what superficially resembles science (but fails to meet the criteria for science).

**SC.912.N.2.2:**

Identify which questions can be answered through science and which questions are outside the boundaries of scientific investigation, such as questions addressed by other ways of knowing, such as art, philosophy, and religion.

**SC.912.N.2.3:**

Identify examples of pseudoscience (such as astrology, phrenology) in society.

**SC.912.N.2.4:**

Explain that scientific knowledge is both durable and robust and open to change. Scientific knowledge can change because it is often examined and re-examined by new investigations and scientific argumentation. Because of these frequent examinations, scientific knowledge becomes stronger, leading to its durability.

**SC.912.N.2.5:**

Describe instances in which scientists’ varied backgrounds, talents, interests, and goals influence the inferences and thus the explanations that they make about observations of natural phenomena and describe that competing interpretations (explanations) of scientists are a strength of science as they are a source of new, testable ideas that have the potential to add new evidence to support one or another of the explanations.

**SC.912.N.3.1:**

Explain that a scientific theory is the culmination of many scientific investigations drawing together all the current evidence concerning a substantial range of phenomena; thus, a scientific theory represents the most powerful explanation scientists have to offer.

**SC.912.N.3.2:**

Describe the role consensus plays in the historical development of a theory in any one of the disciplines of science.

**SC.912.N.3.3:**

Explain that scientific laws are descriptions of specific relationships under given conditions in nature, but do not offer explanations for those relationships.

**SC.912.N.3.4:**

Recognize that theories do not become laws, nor do laws become theories; theories are well supported explanations and laws are well supported descriptions.
 Describe the function of models in science, and identify the wide range of models used in science.

 SC.912.N.4.1: Explain how scientific knowledge and reasoning provide an empirically-based perspective to inform society's decision making.
 SC.912.N.4.2: Weigh the merits of alternative strategies for solving a specific societal problem by comparing a number of different costs and benefits, such as human, economic, and environmental.

 SC.912.P.8.3: Explore the scientific theory of atoms (also known as atomic theory) by describing changes in the atomic model over time and why those changes were necessitated by experimental evidence.

 SC.912.P.8.4: Explore the scientific theory of atoms (also known as atomic theory) by describing the structure of atoms in terms of protons, neutrons and electrons, and differentiate among these particles in terms of their mass, electrical charges and locations within the atom.

 SC.912.P.8.5: Relate properties of atoms and their position in the periodic table to the arrangement of their electrons.

 SC.912.P.10.2: Explore the Law of Conservation of Energy by differentiating among open, closed, and isolated systems and explain that the total energy in an isolated system is a conserved quantity.

 SC.912.P.10.8: Explain entropy's role in determining the efficiency of processes that convert energy to work.

 SC.912.P.10.9: Describe the quantization of energy at the atomic level.

 SC.912.P.10.10: Compare the magnitude and range of the four fundamental forces (gravitational, electromagnetic, weak nuclear, strong nuclear).

 SC.912.P.10.11: Explain and compare nuclear reactions (radioactive decay, fission and fusion), the energy changes associated with them and their associated safety issues.

 SC.912.P.10.12: Differentiate between chemical and nuclear reactions.

 SC.912.P.10.16: Explain the relationship between moving charges and magnetic fields, as well as changing magnetic fields and electric fields, and their application to modern technologies.

 SC.912.P.10.18: Explore the theory of electromagnetism by comparing and contrasting the different parts of the electromagnetic spectrum in terms of wavelength, frequency, and energy, and relate them to phenomena and applications.

 SC.912.P.12.5: Apply the law of conservation of linear momentum to interactions, such as collisions between objects.

 SC.912.P.12.7: Recognize that nothing travels faster than the speed of light in vacuum which is the same for all observers no matter how they or the light source are moving.

 SC.912.P.12.9: Recognize that time, length, and energy depend on the frame of reference.

 LAFS.1112.RST.1.1: Cite specific textual evidence to support analysis of science and technical texts, attending to important distinctions the author makes and to any gaps or inconsistencies in the account.

 LAFS.1112.RST.1.2: Determine the central ideas or conclusions of a text; summarize complex concepts, processes, or information presented in a text by paraphrasing them in simpler but still accurate terms.

 LAFS.1112.RST.1.3: Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks; analyze the specific results based on explanations in the text.

 LAFS.1112.RST.2.4: Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 11–12 texts and topics.

 LAFS.1112.RST.2.5: Analyze how the text structures information or ideas into categories or hierarchies, demonstrating understanding of the information or ideas.

 LAFS.1112.RST.2.6: Analyze the author's purpose in providing an explanation, describing a phenomenon, or presenting the results of an experiment in a text, identifying important issues that remain unresolved.

 LAFS.1112.RST.3.7: Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g., quantitative data, video, multimedia) in order to address a question or solve a problem.

 LAFS.1112.RST.3.8: Evaluate the hypotheses, data, analysis, and conclusions in a science or technical text, verifying the data when possible and corroborating or challenging other sources of information.

 LAFS.1112.RST.3.9: Synthesize information from a range of sources (e.g., texts, experiments, simulations) into a coherent understanding of a process, phenomenon, or concept, resolving conflicting information when possible.

 LAFS.1112.RST.4.10: By the end of grade 12, read and comprehend science/technical texts in the grades 11-12 text complexity band independently and proficiently.

 LAFS.1112.SL.1.1: Initiate and participate effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grades 11–12 topics, texts, and issues, building on others' ideas and expressing their own clearly and persuasively.
 a. Come to discussions prepared, having read and researched material under study; explicitly draw on that preparation by referring to evidence from texts and other research on the topic or issue to stimulate a thoughtful, well-reasoned exchange of ideas.
 b. Work with peers to promote civil, democratic discussions and decision-making, set clear goals and deadlines, and establish individual roles as needed.
 c. Propel conversations by posing and responding to questions that probe reasoning and evidence; ensure a hearing for a full range of positions on a topic or issue; clarify, verify, or challenge ideas and conclusions; and promote divergent and creative perspectives.
 d. Respond thoughtfully to diverse perspectives; synthesize comments, claims, and evidence made on all sides of an issue; resolve contradictions when possible; and determine additional information or research is required to deepen the investigation or complete the task.

 LAFS.1112.SL.1.2: Integrate multiple sources of information presented in diverse formats and media (e.g., visually, quantitatively, orally) in order to make informed decisions and solve problems, evaluating the credibility and accuracy of each source and noting any discrepancies among the data.

 LAFS.1112.SL.1.3: Evaluate a speaker's point of view, reasoning, and use of evidence and rhetoric, assessing the stance, premises, links among ideas, word choice, points of emphasis, and tone used.

 LAFS.1112.SL.2.4: Present information, findings, and supporting evidence, conveying a clear and distinct perspective, such that listeners can follow the line of reasoning, alternative or opposing perspectives are addressed, and the organization, development, substance, and style are appropriate to purpose, audience, and a range of formal and informal tasks.

 LAFS.1112.SL.2.5: Make strategic use of digital media (e.g., textual, graphical, audio, visual, and interactive elements) in presentations to enhance understanding of findings, reasoning, and evidence and to add interest.

 LAFS.1112.WHST.1.1: Write arguments focused on discipline-specific content.
 a. Introduce precise, knowledgeable claim(s), establish the significance of the claim(s), distinguish the claim(s) from alternate or opposing claims, and create an organization that logically sequences the claim(s), counterclaims, reasons, and evidence.
 b. Develop claim(s) and counterarguments fairly and thoroughly, supplying the most relevant data and evidence for each while pointing out the strengths and limitations of both claim(s) and counterclaims in a discipline-appropriate form that anticipates the audience's knowledge level, concerns, values, and possible biases.
 c. Use words, phrases, and clauses as well as varied syntax to link the major sections of the text, create cohesion, and clarify the relationships between claim(s) and reasons, between reasons and evidence, and between claim(s) and counterclaims.
 d. Establish and maintain a formal style and objective tone while attending to the norms and conventions of the discipline in which they are writing.
### LAFS.1112.WHST.1.2:
- Write informative/explanatory texts, including the narration of historical events, scientific procedures/experiments, or technical processes.
  - Introduce a topic and organize complex ideas, concepts, and information so that each new element builds on that which precedes it to create a unified whole; include formatting (e.g., headings), graphics (e.g., figures, tables), and multimedia when useful to aiding comprehension.
  - Develop the topic thoroughly by selecting the most significant and relevant facts, extended definitions, concrete details, quotations, or other information and examples appropriate to the audience’s knowledge of the topic.
  - Use varied transitions and sentence structures to link major sections of the text, create cohesion, and clarify the relationships among complex ideas and concepts.
  - Use precise language, domain-specific vocabulary and techniques such as metaphor, simile, and analogy to manage the complexity of the topic; convey a knowledgeable stance in a style that responds to the discipline and context as well as to the expertise of likely readers.
  - Provide a concluding statement or section that follows from or supports the argument provided (e.g., articulating implications or the significance of the topic).

### LAFS.1112.WHST.2.4:
- Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.

### LAFS.1112.WHST.2.5:
- Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience.

### LAFS.1112.WHST.2.6:
- Use technology, including the Internet, to produce, publish, and update individual or shared writing products in response to ongoing feedback, including new arguments or information.

### LAFS.1112.WHST.3.7:
- Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject; demonstrating understanding of the subject under investigation.

### LAFS.1112.WHST.3.8:
- Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the strengths and limitations of each source in terms of the specific task, purpose, and audience; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and overreliance on any one source and following a standard format for citation.

### LAFS.1112.WHST.3.9:
- Draw evidence from informational texts to support analysis, reflection, and research.

### LAFS.1112.WHST.4.10:
- Write routinely over extended time frames (time for reflection and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences.

### MAFS.912.F-IF.3.7:
- Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases.
  - Graph linear and quadratic functions and show intercepts, maxima, and minima.
  - Graph square root, cube root, and piecewise-defined functions, including step functions and absolute value functions.
  - Graph polynomial functions, identifying zeros when suitable factorizations are available, and showing end behavior.
  - Graph rational functions, identifying zeros and asymptotes when suitable factorizations are available, and showing end behavior.
  - Graph exponential and logarithmic functions, showing intercepts and end behavior, and trigonometric functions, showing period, midline, and amplitude, and using phase shift.

### MAFS.912.G-MG.1.2:
- Apply concepts of density based on area and volume in modeling situations (e.g., persons per square mile, BTUs per cubic foot).

### MAFS.912.N-Q.1.1:
- Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphics and data displays.

### MAFS.912.N-Q.1.3:
- Choose a level of accuracy appropriate to limitations on measurement when reporting quantities.

### MAFS.912.S-ID.2.6:
- Evaluate reports based on data.

<table>
<thead>
<tr>
<th>MAFS.912.S-ID.1.1:</th>
<th>Represent data with plots on the real number line (dot plots, histograms, and box plots).</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Clarifications:</strong></td>
<td>In grades 6 - 8, students describe center and spread in a data distribution. Here they choose a summary statistic appropriate to the characteristics of the data distribution, such as the shape of the distribution or the existence of extreme data points.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>MAFS.912.S-ID.1.2:</th>
<th>Use statistics appropriate to the shape of the data distribution to compare center (median, mean) and spread (interquartile range, standard deviation) of two or more different data sets.</th>
</tr>
</thead>
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</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>MAFS.912.S-ID.1.3:</th>
<th>Interpret differences in shape, center, and spread in the context of the data sets, accounting for possible effects of extreme data points (outliers).</th>
</tr>
</thead>
<tbody>
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</table>

<table>
<thead>
<tr>
<th>MAFS.912.S-ID.1.4:</th>
<th>Use the mean and standard deviation of a data set to fit it to a normal distribution and to estimate population percentages. Recognize that there are data sets for which such a procedure is not appropriate. Use calculators, spreadsheets, and tables to estimate areas under the normal curve.</th>
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<tr>
<th>MAFS.912.S-ID.2.5:</th>
<th>Summarize categorical data for two categories in two-way frequency tables. Interpret relative frequencies in the context of the data (including joint, marginal, and conditional relative frequencies). Recognize possible associations and trends in the data.</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Clarifications:</strong></td>
<td>Represent data on two quantitative variables on a scatter plot, and describe how the variables are related.</td>
</tr>
</tbody>
</table>
  - Fit a function to the data; use functions fitted to data to solve problems in the context of the data. Use given functions or choose a function suggested by the context. Emphasize linear, and exponential models.
  - Informally assess the fit of a function by plotting and analyzing residuals.
  - Fit a linear function for a scatter plot that suggests a linear association.

<p>| MAFS.912.S-ID.2.6: | Students take a more sophisticated look at using a linear function to model the relationship between two numerical variables. In addition to fitting a line to data, students assess how well the model fits by analyzing residuals. |</p>
<table>
<thead>
<tr>
<th>MAFS.K12.MP.1.1:</th>
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<tbody>
<tr>
<td><strong>Make sense of problems and persevere in solving them.</strong></td>
</tr>
<tr>
<td>Mathematically proficient students start by explaining to themselves the meaning of a problem and looking for entry points to its solution. They analyze givens, constraints, relationships, and goals. They make conjectures about the form and meaning of the solution and plan a solution pathway rather than simply jumping into a solution attempt. They consider analogous problems, and try special cases and simpler forms of the original problem in order to gain insight into its solution. They monitor and evaluate their progress and change course if necessary. Older students might, depending on the context of the problem, transform algebraic expressions or change the viewing window on their graphing calculator to get the information they need. Mathematically proficient students can explain correspondences between equations, verbal descriptions, tables, and graphs or draw diagrams of important features and relationships, graph data, and search for regularity or trends. Younger students might rely on using concrete objects or pictures to help conceptualize and solve a problem. Mathematically proficient students check their answers to problems using a different method, and they continually ask themselves, “Does this make sense?” They can understand the approaches of others to solving complex problems and identify correspondences between different approaches.</td>
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| Standard Relation to Course: Supporting |

<table>
<thead>
<tr>
<th>MAFS.K12.MP.2.1:</th>
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<tbody>
<tr>
<td><strong>Reason abstractly and quantitatively.</strong></td>
</tr>
<tr>
<td>Mathematically proficient students make sense of quantities and their relationships in problem situations. They bring two complementary abilities to bear on problems involving quantitative relationships: the ability to decontextualize—to abstract a given situation and represent it symbolically and manipulate the representing symbols as if they have a life of their own, without necessarily attending to their referents—and the ability to contextualize, to pause as needed during the manipulation process in order to probe into the referents for the symbols involved. Quantitative reasoning entails habits of creating a coherent representation of the problem at hand; considering the units involved; attending to the meaning of quantities, not just how to compute them; and knowing and flexibly using different properties of operations and objects.</td>
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| Standard Relation to Course: Supporting |

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<tr>
<th>MAFS.K12.MP.3.1:</th>
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<tr>
<td><strong>Construct viable arguments and critique the reasoning of others.</strong></td>
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<tr>
<td>Mathematically proficient students understand and use stated assumptions, definitions, and previously established results in constructing arguments. They make conjectures and build a logical progression of statements to explore the truth of their conjectures. They are able to analyze situations by breaking them into cases, and can recognize and use counterexamples. They justify their conclusions, communicate them to others, and respond to the arguments of others. They reason inductively about data, making plausible arguments that take into account the context from which the data arose. Mathematically proficient students are also able to compare the effectiveness of two plausible arguments, distinguish correct logic or reasoning from that which is flawed, and—if there is a flaw in an argument—explain what it is. Elementary students can construct arguments using concrete referents such as objects, drawings, diagrams, and actions. Such arguments can make sense and be correct, even though they are not generalized or made formal until later grades. Later, students learn to determine domains to which an argument applies. Students at all grades can listen or read the arguments of others, decide whether they make sense, and ask useful questions to clarify or improve the arguments.</td>
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| Standard Relation to Course: Supporting |

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<tr>
<th>MAFS.K12.MP.4.1:</th>
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<tr>
<td><strong>Model with mathematics.</strong></td>
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<tr>
<td>Mathematically proficient students can apply the mathematics they know to solve problems arising in everyday life, society, and the workplace. In early grades, this might be as simple as writing an addition equation to describe a situation. In middle grades, a student might apply proportional reasoning to plan a school event or analyze a problem in the community. By high school, a student might use geometry software, a graphing calculator, or850 computer algebra system, a statistical package, or dynamic geometry software to solve a design problem, in anatomy, or to explore the beauty of the mathematics involved. Mathematically proficient students consider the available tools when solving a mathematical problem. These tools might include pencil and paper, concrete models, a ruler, a protractor, a calculator, a spreadsheet, a computer algebra system, a statistical package, or dynamic geometry software. They can estimate answers using mental arithmetic or pencil and paper, given that these are available. They can check their answers to problems using different methods. They are able to use concrete objects and pictures to help formulate a problem. They are able to translate reasonable mathematical models to another context. They can explain the conclusions they have reached using mathematical language.</td>
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| Standard Relation to Course: Supporting |

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<tr>
<th>MAFS.K12.MP.5.1:</th>
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<tr>
<td><strong>Use appropriate tools strategically.</strong></td>
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<tr>
<td>Mathematically proficient students consider the available tools when solving a mathematical problem. These tools might include pencil and paper, concrete models, a ruler, a protractor, a calculator, a spreadsheet, a computer algebra system, a statistical package, or dynamic geometry software. Proficient students are sufficiently familiar with tools appropriate for their grade or course to make sound decisions about when each of these tools might be helpful, recognizing both the insight to be gained and their limitations. For example, mathematically proficient high school students analyze graphs of functions and solutions generated using a graphing calculator. They detect possible errors by strategically using estimation and other mathematical knowledge. When making mathematical models, they know that technology can enable them to visualize the results of varying assumptions, explore consequences, and compare predictions with data. Mathematically proficient students at various grade levels are able to identify relevant external mathematical resources, such as digital content located on a website, and use them to pose or solve problems. They are able to use technological tools to explore and deepen their understanding of concepts.</td>
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<tr>
<th>MAFS.K12.MP.6.1:</th>
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<tbody>
<tr>
<td><strong>Attend to precision.</strong></td>
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<tr>
<td>Mathematically proficient students try to communicate precisely to others. They try to use clear definitions in discussion with others and in their own reasoning. They state the meaning of the symbols they choose, including using the equal sign consistently and appropriately. They are careful about specifying units of measure, and labeling axes to clarify the correspondence with quantities in a problem. They calculate accurately and efficiently, express numerical answers with a degree of precision appropriate for the problem context. In the elementary grades, students give carefully formulated explanations to each other. By the time they reach high school they have learned to examine claims and make explicit use of definitions.</td>
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<tr>
<th>MAFS.K12.MP.7.1:</th>
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<tr>
<td><strong>Look for and make use of structure.</strong></td>
</tr>
<tr>
<td>Mathematically proficient students look closely to discern a pattern or structure. Young students, for example, might notice that three and seven more is the same amount as seven and three more, or they may sort a collection of shapes according to how many sides the shapes have. Later, students will see 7 × 8 equals the well remembered 7 × 5 + 7 × 3, in preparation for learning about the distributive property. In the expression x² + 9x + 14, older students can see the 14 as 2 × 7 and the 9 as 2 + 7. They recognize the significance of an existing line in a geometric figure and can use the strategy of drawing an auxiliary line for solving problems. They also can step back for an overview and shift perspective. They can see complicated things, such as some algebraic expressions, as single objects or as being composed of several objects. For example, they can see 5 – 3(x – y²) as 5 minus a positive number times a square and use that to realize that its value cannot be more than 5 for any real numbers x and y.</td>
</tr>
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| Standard Relation to Course: Supporting |
General Course Information and Notes

GENERAL NOTES

While the content focus of this course is consistent with the Nuclear Radiation course, students will explore these concepts in greater depth. In general, the academic pace and rigor will be greatly increased for honors level course work. Laboratory investigations that include the use of scientific inquiry, research, measurement, problem solving, laboratory apparatus and technologies, experimental procedures, and safety procedures are an integral part of this course. The National Science Teachers Association (NSTA) recommends that at the high school level, all students should be in the science lab or field, collecting data every week. School laboratory investigations (labs) are defined by the National Research Council (NRC) as an experience in the laboratory, classroom, or the field that provides students with opportunities to interact directly with natural phenomena or with data collected by others using tools, materials, data collection techniques, and models (NRC, 2006, p. 3). Laboratory investigations in the high school classroom should help all students develop a growing understanding of the complexity and ambiguity of empirical work, as well as the skills to calibrate and troubleshoot equipment used to make observations. Learners should understand measurement error; and have the skills to aggregate, interpret, and present the resulting data (National Research Council, 2006, p. 77; NSTA, 2007).

Special Notes:

Instructional Practices
Teaching from a range of complex text is optimized when teachers in all subject areas implement the following strategies on a routine basis:

1. Ensuring wide reading from complex text that varies in length.
2. Making close reading and rereading of texts central to lessons.
3. Emphasizing text-specific complex questions, and cognitively complex tasks, reinforce focus on the text and cultivate independence.
4. Emphasizing students supporting answers based upon evidence from the text.
5. Providing extensive research and writing opportunities (claims and evidence).


- Asking questions (for science) and defining problems (for engineering).
- Developing and using models.
- Planning and carrying out investigations.
- Analyzing and interpreting data.
- Using mathematics, information and computer technology, and computational thinking.
- Constructing explanations (for science) and designing solutions (for engineering).
- Engaging in argument from evidence.
- Obtaining, evaluating, and communicating information.

Honors and Advanced Level Course Notes: Advanced courses require a greater demand on students through increased academic rigor. Academic rigor is obtained through the application, analysis, evaluation, and creation of complex ideas that are often abstract and multi-faceted. Students are challenged to think and collaborate critically on the content they are learning. Honors level rigor will be achieved by increasing text complexity through text selection, focus on high-level qualitative measures, and complexity of task. Instruction will be structured to give students a deeper understanding of conceptual themes and organization within and across disciplines. Academic rigor is more than simply assigning to students a greater quantity of work.

Literacy Standards in Science
Secondary science courses include reading standards for literacy in science and technical subjects 6-12 and writing standards for literacy in history/social studies, science, and technical subjects 6-12. The courses also include speaking and listening standards. For a complete list of standards required for this course click on the blue tile labeled course standards. You may also download the complete course including all required standards and notes sections using the export function located at the top of this page.

English Language Development ELD Standards Special Notes Section:
Teachers are required to provide listening, speaking, reading and writing instruction that allows English language learners (ELL) to communicate information, ideas and concepts for academic success in the content area of Science. For the given level of English language proficiency and with visual, graphic, or interactive support, students will interact with grade level words, expressions, sentences and discourse to process or produce language necessary for academic success. The ELD standard should specify a relevant content area concept or topic of study chosen by curriculum developers and teachers which maximizes an ELL’s need for communication and social skills. To access an ELL supporting document which delineates performance definitions and descriptors, please click on the following link: https://cpalmsmediaprod.blob.core.windows.net/uploads/docs/standards/eld/sc.pdf

GENERAL INFORMATION
**Course Number:** 2020710

**Number of Credits:** One (1) credit

**Course Type:** Core Academic Course

**Course Status:** Course Approved

**Grade Level(s):** 9,10,11,12

**Graduation Requirement:** Equally Rigorous Science

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### Educator Certifications

- Education Certifications
  - Science (Secondary Grades 7-12)
  - Chemistry (Grades 6-12)
  - Physics (Grades 6-12)
  - Middle Grades General Science (Middle Grades 5-9)
  - Earth/Space Science (Grades 6-12)
  - Biology (Grades 6-12)
**Course Standards**

<table>
<thead>
<tr>
<th>Name</th>
<th>Description</th>
</tr>
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<tbody>
<tr>
<td>SC.912.E.5.1:</td>
<td>Cite evidence used to develop and verify the scientific theory of the Big Bang (also known as the Big Bang Theory) of the origin of the universe.</td>
</tr>
<tr>
<td>SC.912.E.5.2:</td>
<td>Identify patterns in the organization and distribution of matter in the universe and the forces that determine them.</td>
</tr>
<tr>
<td>SC.912.E.5.3:</td>
<td>Describe and predict how the initial mass of a star determines its evolution.</td>
</tr>
<tr>
<td>SC.912.E.5.4:</td>
<td>Explain the physical properties of the Sun and its dynamic nature and connect them to conditions and events on Earth.</td>
</tr>
<tr>
<td>SC.912.E.5.7:</td>
<td>Relate the history of and explain the justification for future space exploration and continuing technology development.</td>
</tr>
<tr>
<td>SC.912.E.5.8:</td>
<td>Connect the concepts of radiation and the electromagnetic spectrum to the use of historical and newly-developed observational tools.</td>
</tr>
<tr>
<td>SC.912.E.6.6:</td>
<td>Analyze past, present, and potential future consequences to the environment resulting from various energy production technologies.</td>
</tr>
<tr>
<td>SC.912.E.7.1:</td>
<td>Analyze the movement of matter and energy through the different biogeochemical cycles, including water and carbon.</td>
</tr>
<tr>
<td>SC.912.L.14.6:</td>
<td>Explain the significance of genetic factors, environmental factors, and pathogenic agents to health from the perspectives of both individual and public health.</td>
</tr>
<tr>
<td>SC.912.L.15.2:</td>
<td>Discuss the use of molecular clocks to estimate how long ago various groups of organisms diverged evolutionarily from one another.</td>
</tr>
<tr>
<td>SC.912.L.16.10:</td>
<td>Evaluate the impact of biotechnology on the individual, society and the environment, including medical and ethical issues.</td>
</tr>
<tr>
<td>SC.912.L.17.13:</td>
<td>Discuss the need for adequate monitoring of environmental parameters when making policy decisions.</td>
</tr>
<tr>
<td>SC.912.L.17.14:</td>
<td>Assess the need for adequate waste management strategies.</td>
</tr>
<tr>
<td>SC.912.L.17.15:</td>
<td>Discuss the effects of technology on environmental quality.</td>
</tr>
<tr>
<td>SC.912.L.17.16:</td>
<td>Discuss the large-scale environmental impacts resulting from human activity, including waste spills, oil spills, runoff, greenhouse gases, ozone depletion, and surface and groundwater pollution.</td>
</tr>
</tbody>
</table>

**SC.912.N.1.1:** Define a problem based on a specific body of knowledge, for example: biology, chemistry, physics, and earth/space science, and do the following:

1. **Pose questions about the natural world.** (Articulate the purpose of the investigation and identify the relevant scientific concepts).
2. **Conduct systematic observations.** (Write procedures that are clear and replicable. Identify observables and examine relationships between test (independent) variable and outcome (dependent) variable. Employ appropriate methods for accurate and consistent observations; conduct and record measurements at appropriate levels of precision. Follow safety guidelines).
3. **Examine books and other sources of information to see what is already known.**
4. **Review what is known in light of empirical evidence.** (Examine whether available empirical evidence can be interpreted in terms of existing knowledge and models, and if not, modify or develop new models).
5. **Plan investigations.** (Design and evaluate a scientific investigation).
6. **Use tools to gather, analyze, and interpret data (this includes the use of measurement in metric and other systems, and also the generation and interpretation of graphical representations of data, including data tables and graphs).** (Collect data or evidence in an organized way. Properly use instruments, equipment, and materials (e.g., scales, probeware, meter sticks, microscopes, computers) including set-up, calibration, technique, maintenance, and storage).
7. **Pose answers, explanations, or descriptions of events,**
8. **Generate explanations that explicate or describe natural phenomena (inferences),**
9. **Use appropriate evidence and reasoning to justify these explanations to others,**
10. **Communicate results of scientific investigations, and**
11. **Evaluate the merits of the explanations produced by others.**

**SC.912.N.1.2:** Describe and explain what characterizes science and its methods.

**SC.912.N.1.3:** Recognize that the strength or usefulness of a scientific claim is evaluated through scientific argumentation, which depends on critical and logical thinking, and the active consideration of alternative scientific explanations to explain the data presented.

**SC.912.N.1.4:** Identify sources of information and assess their reliability according to the strict standards of scientific investigation.

**SC.912.N.1.5:** Describe and provide examples of how similar investigations conducted in many parts of the world result in the same outcome.

**SC.912.N.1.6:** Describe how scientific inferences are drawn from scientific observations and provide examples from the content being studied.

**SC.912.N.1.7:** Recognize the role of creativity in constructing scientific questions, methods, and explanations.

**SC.912.N.2.1:** Identify what is science, what clearly is not science, and what superficially resembles science (but fails to meet the criteria for science).

**SC.912.N.2.2:** Identify which questions can be answered through science and which questions are outside the boundaries of scientific investigation, such as questions addressed by other ways of knowing, such as art, philosophy, and religion.

**SC.912.N.2.3:** Identify examples of pseudoscience (such as astrology, phrenology) in society.

**SC.912.N.2.4:** Explain that scientific knowledge is both durable and robust and open to change. Scientific knowledge can change because it is often examined and re-examined by new investigations and scientific argumentation. Because of these frequent examinations, scientific knowledge becomes stronger, leading to its durability.

**SC.912.N.2.5:** Describe instances in which scientists’ varied backgrounds, talents, interests, and goals influence the inferences and thus the explanations that they make about observations of natural phenomena and describe that competing interpretations (explanations) of scientists are a strength of science as they are a source of new, testable ideas that have the potential to add new evidence to support one or another of the explanations.

**SC.912.N.3.1:** Explain that a scientific theory is the culmination of many scientific investigations drawing together all the current evidence concerning a substantial range of phenomena; thus, a scientific theory represents the most powerful explanation scientists have to offer.

**SC.912.N.3.2:** Describe the role consensus plays in the historical development of a theory in any one of the disciplines of science.

**SC.912.N.3.3:** Explain that scientific laws are descriptions of specific relationships under given conditions in nature, but do not offer explanations for those relationships.

**SC.912.N.3.4:** Recognize that theories do not become laws, nor do laws become theories; theories are well supported explanations and laws are well supported descriptions.
SC.912.N.3.5: Describe the function of models in science, and identify the wide range of models used in science.
SC.912.N.4.1: Explain how scientific knowledge and reasoning provide an empirically-based perspective to inform society's decision making.
SC.912.N.4.2: Weigh the merits of alternative strategies for solving a specific societal problem by comparing a number of different costs and benefits, such as human, economic, and environmental.
SC.912.P.8.3: Explore the scientific theory of atoms (also known as atomic theory) by describing changes in the atomic model over time and why those changes were necessitated by experimental evidence.
SC.912.P.8.4: Explore the scientific theory of atoms (also known as atomic theory) by describing the structure of atoms in terms of protons, neutrons and electrons, and differentiate among these particles in terms of their mass, electrical charges and locations within the atom.
SC.912.P.8.5: Relate properties of atoms and their position in the periodic table to the arrangement of their electrons.
SC.912.P.10.2: Explore the Law of Conservation of Energy by differentiating among open, closed, and isolated systems and explain that the total energy in an isolated system is a conserved quantity.
SC.912.P.10.8: Explain entropy's role in determining the efficiency of processes that convert energy to work.
SC.912.P.10.9: Describe the quantization of energy at the atomic level.
SC.912.P.10.10: Compare the magnitude and range of the four fundamental forces (gravitational, electromagnetic, weak nuclear, strong nuclear).
SC.912.P.10.11: Explain and compare nuclear reactions (radioactive decay, fission and fusion), the energy changes associated with them and their associated safety issues.
SC.912.P.10.12: Differentiate between chemical and nuclear reactions.
SC.912.P.10.16: Explore the relationship between moving charges and magnetic fields, as well as changing magnetic fields and electric fields, and their application to modern technologies.
SC.912.P.10.18: Explore the theory of electromagnetism by comparing and contrasting the different parts of the electromagnetic spectrum in terms of wavelength, frequency, and energy, and relate them to phenomena and applications.
SC.912.P.12.5: Apply the law of conservation of linear momentum to interactions, such as collisions between objects.
SC.912.P.12.7: Recognize that nothing travels faster than the speed of light in vacuum which is the same for all observers no matter how they or the light source are moving.
SC.912.P.12.9: Recognize that time, length, and energy depend on the frame of reference.

Mathematicians who participate in effortful learning both individually and with others:
- Analyze the problem in a way that makes sense given the task.
- Ask questions that will help with solving the task.
- Build perseverance by modifying methods as needed while solving a challenging task.
- Stay engaged and maintain a positive mindset when working to solve tasks.
- Help and support each other when attempting a new method or approach.

Clarifications:
Teachers who encourage students to participate actively in effortful learning both individually and with others:
- Cultivate a community of growth mindset learners.
- Foster perseverance in students by choosing tasks that are challenging.
- Develop students' ability to analyze and problem solve.
- Recognize students' effort when solving challenging problems.

Mathematicians who demonstrate understanding by representing problems in multiple ways:
- Build understanding through modeling and using manipulatives.
- Represent solutions to problems in multiple ways using objects, drawings, tables, graphs and equations.
- Progress from modeling problems with objects and drawings to using algorithms and equations.
- Express connections between concepts and representations.
- Choose a representation based on the given context or purpose.

Clarifications:
Teachers who encourage students to demonstrate understanding by representing problems in multiple ways:
- Help students make connections between concepts and representations.
- Provide opportunities for students to use manipulatives when investigating concepts.
- Guide students from concrete to pictorial to abstract representations as understanding progresses.
- Show students that various representations can have different purposes and can be useful in different situations.

Mathematicians who complete tasks with mathematical fluency:
- Select efficient and appropriate methods for solving problems within the given context.
- Maintain flexibility and accuracy while performing procedures and mental calculations.
- Complete tasks accurately and with confidence.
- Adapt procedures to apply them to a new context.
- Use feedback to improve efficiency when performing calculations.

Clarifications:
Teachers who encourage students to complete tasks with mathematical fluency:
- Provide students with the flexibility to solve problems by selecting a procedure that allows them to solve efficiently and accurately.
- Offer multiple opportunities for students to practice efficient and generalizable methods.
- Provide opportunities for students to reflect on the method they used and determine if a more efficient method could have been used.

Mathematicians who engage in discussions that reflect on the mathematical thinking of self and others:
- Communicate mathematical ideas, vocabulary and methods effectively.
- Analyze the mathematical thinking of others.
- Compare the efficiency of a method to those expressed by others.
- Recognize errors and suggest how to correctly solve the task.

Clarifications:
Teachers who encourage students to engage in discussions that reflect on the mathematical thinking of self and others:
- Help students to engage in discussions that reflect on the mathematical thinking of self and others.
- Provide opportunities for students to reflect on their own and others' mathematical thinking.
- Foster a classroom culture where students are encouraged to think critically about their own and others' mathematical thinking.
- Provide opportunities for students to practice expressing and justifying their mathematical thinking.

Engage in discussions that reflect on the mathematical thinking of self and others.

Clarifications:
Teachers who encourage students to engage in discussions that reflect on the mathematical thinking of self and others:
- Establish a culture in which students ask questions of the teacher and their peers, and error is an opportunity for learning.
- Create opportunities for students to discuss their thinking with peers.
- Select, sequence and present student work to advance and deepen understanding of correct and increasingly efficient methods.
- Develop students' ability to justify methods and compare their responses to the responses of their peers.

MA.K12.MTR.5.1: Use patterns and structure to help understand and connect mathematical concepts. Mathematicians who use patterns and structure to help understand and connect mathematical concepts:
- Focus on relevant details within a problem.
- Create plans and procedures to logically order events, steps or ideas to solve problems.
- Decompose a complex problem into manageable parts.
- Relate previously learned concepts to new concepts.
- Look for similarities among problems.
- Connect solutions of problems to more complicated large-scale situations.

Clarifications:
Teachers who encourage students to use patterns and structure to help understand and connect mathematical concepts:
- Help students recognize the patterns in the world around them and connect these patterns to mathematical concepts.
- Support students to develop generalizations based on the similarities found among problems.
- Provide opportunities for students to create plans and procedures to solve problems.
- Develop students' ability to construct relationships between their current understanding and more sophisticated ways of thinking.

MA.K12.MTR.6.1: Assess the reasonableness of solutions. Mathematicians who assess the reasonableness of solutions:
- Estimate to discover possible solutions.
- Use benchmark quantities to determine if a solution makes sense.
- Check calculations when solving problems.
- Verify possible solutions by explaining the methods used.
- Evaluate results based on the given context.

Clarifications:
Teachers who encourage students to assess the reasonableness of solutions:
- Have students estimate or predict solutions prior to solving.
- Prompt students to continually ask, "Does this solution make sense? How do you know?"
- Reinforce that students check their work as they progress within and after a task.
- Strengthen students' ability to verify solutions through justifications.

MA.K12.MTR.7.1: Apply mathematics to real-world contexts. Mathematicians who apply mathematics to real-world contexts:
- Connect mathematical concepts to everyday experiences.
- Use models and methods to understand, represent and solve problems.
- Perform investigations to gather data or determine if a method is appropriate. • Redesign models and methods to improve accuracy or efficiency.

Clarifications:
Teachers who encourage students to apply mathematics to real-world contexts:
- Provide opportunities for students to create models, both concrete and abstract, and perform investigations.
- Challenge students to question the accuracy of their models and methods.
- Support students as they validate conclusions by comparing them to the given situation.
- Indicate how various concepts can be applied to other disciplines.

Cite evidence to explain and justify reasoning.

Clarifications:
K-1 Students include textual evidence in their oral communication with guidance and support from adults. The evidence can consist of details from the text without naming the text. During 1st grade, students learn how to incorporate the evidence in their writing.
2-3 Students include relevant textual evidence in their written and oral communication. Students should name the text when they refer to it. In 3rd grade, students should use a combination of direct and indirect citations.
4-5 Students continue with previous skills and reference comments made by speakers and peers. Students cite texts that they've directly quoted, paraphrased, or used for information. When writing, students will use the form of citation dictated by the instructor or the style guide referenced by the instructor.
6-8 Students continue with previous skills and use a style guide to create a proper citation.
9-12 Students continue with previous skills and should be aware of existing style guides and the ways in which they differ.

ELA.K12.EE.1.1: Read and comprehend grade-level complex texts proficiently.

Clarifications:
See Text Complexity for grade-level complexity bands and a text complexity rubric.

Make inferences to support comprehension.

Clarifications:
Students will make inferences before the words infer or inference are introduced. Kindergarten students will answer questions like "Why is the
General Course Information and Notes

GENERAL NOTES

While the content focus of this course is consistent with the Nuclear Radiation course, students will explore these concepts in greater depth. In general, the academic pace and rigor will be greatly increased for honors level course work. Laboratory investigations that include the use of scientific inquiry, research, measurement, problem solving, laboratory apparatus and technologies, experimental procedures, and safety procedures are an integral part of this course. The National Science Teachers Association (NSTA) recommends that at the high school level, all students should be in the science lab or field, collecting data every week. School laboratory investigations (labs) are defined by the National Research Council (NRC) as an experience in the laboratory, classroom, or the field that provides students with opportunities to interact directly with natural phenomena or with data collected by others using tools, materials, data collection techniques, and models (NRC, 2006, p. 3). Laboratory investigations in the high school classroom should help all students develop a growing understanding of the complexity and ambiguity of empirical work, as well as the skills to calibrate and troubleshoot equipment used to make observations. Learners should understand measurement error; and have the skills to aggregate, interpret, and present the resulting data (National Research Council, 2006, p. 77; NSTA, 2007).

Special Notes:

Instructional Practices
Teaching from a range of complex text is optimized when teachers in all subject areas implement the following strategies on a routine basis:

1. Ensuring wide reading from complex text that varies in length.
2. Making close reading and rereading of texts central to lessons.
3. Emphasizing text-specific complex questions, and cognitively complex tasks, reinforce focus on the text and cultivate independence.
4. Emphasizing students supporting answers based upon evidence from the text.
5. Providing extensive research and writing opportunities (claims and evidence).

- Asking questions (for science) and defining problems (for engineering).
- Developing and using models.
- Planning and carrying out investigations.
- Analyzing and interpreting data.
- Using mathematics, information and computer technology, and computational thinking.
- Constructing explanations (for science) and designing solutions (for engineering).
- Engaging in argument from evidence.
- Obtaining, evaluating, and communicating information.

Honors and Advanced Level Course Note: Advanced courses require a greater demand on students through increased academic rigor. Academic rigor is obtained through the application, analysis, evaluation, and creation of complex ideas that are often abstract and multi-faceted. Students are challenged to think and collaborate critically on the content they are learning. Honors level rigor will be achieved by increasing text complexity through text selection, focus on high-level qualitative measures, and complexity of task. Instruction will be structured to give students a deeper understanding of conceptual themes and organization within and across disciplines. Academic rigor is more than simply assigning to students a greater quantity of work.

Florida's Benchmarks for Excellent Student Thinking (B.E.S.T.) Standards
This course includes Florida's B.E.S.T. ELA Expectations (EE) and Mathematical Thinking and Reasoning Standards (MTRs) for students. Florida educators should intentionally embed these standards within the content and their instruction as applicable. For guidance on the implementation of the EE and MTRs, please visit https://www.cpalms.org/Standards/BEST_Standards.aspx and select the appropriate B.E.S.T. Standards package.

English Language Development ELD Standards Special Notes Section:
Teachers are required to provide listening, speaking, reading and writing instruction that allows English language learners (ELL) to communicate information, ideas and concepts for academic success in the content area of Science. For the given level of English language proficiency and with visual, graphic, or interactive support, students
The ELD standard should specify a relevant content area concept or topic of study chosen by curriculum developers and teachers which maximizes an ELL's need for communication and social skills. To access an ELL supporting document which delineates performance definitions and descriptors, please click on the following link:
https://cpalmsmediaprod.blob.core.windows.net/uploads/docs/standards/eld/sc.pdf

**Educator Certifications**

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<th>Certification</th>
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<td>Middle Grades General Science (Middle Grades 5-9)</td>
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<td>Earth/Space Science (Grades 6-12)</td>
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<td>Biology (Grades 6-12)</td>
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Identify sources of information and assess their reliability according to the strict standards of scientific investigation.

Describe how scientific inferences are drawn from scientific observations and provide examples from the content being studied.

Analyze the broad effects of space exploration on the economy and culture of Florida.

Describe the function of models in science, and identify the wide range of models used in science.

Describe heat as the energy transferred by convection, conduction, and radiation.

Identify examples of pseudoscience (such as astrology, phrenology) in society.

Connect surface features to surface processes that are responsible for their formation.

Explore the scientific theory of atoms (also known as atomic theory) by examining the models that support it.

Recognize that theories do not become laws, nor do laws become theories; theories are well supported explanations and laws are well supported descriptions.

Describe the function of models in science, and identify the wide range of models used in science.

Weigh the merits of alternative strategies for solving a specific societal problem by comparing a number of different costs and benefits, such as human, economic, and environmental.

Describe and apply the coordinate system used to locate objects in the sky.

Explain how scientific knowledge and reasoning provide an empirically-based perspective to inform society's decision making.

Explain that scientific laws are descriptions of specific relationships under given conditions in nature, but do not offer explanations for those relationships.

Recognize that theories do not become laws, nor do laws become theories; theories are well supported explanations and laws are well supported descriptions.

Describe the function of models in science, and identify the wide range of models used in science.

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Explain that scientific knowledge is both durable and robust and open to change. Scientific knowledge can change because it is often examined and re-examined by new investigations and scientific argumentation. Because of these frequent examinations, scientific knowledge becomes stronger, leading to its durability.

Describe instances in which scientists' varied backgrounds, talents, interests, and goals influence the inferences and thus the explanations that they make about observations of natural phenomena and describe that competing interpretations (explanations) of scientists are a strength of science as they are a source of new, testable ideas that have the potential to add new evidence to support one or another of the explanations.

Examine books and other sources of information to see what is already known, whether available empirical evidence can be interpreted in terms of existing knowledge and models, and if not, modify or develop new models.

Identify answers, explanations, or descriptions of events, evaluate the merits of the explanations produced by others.

Communicate results of scientific investigations, and communicate results of scientific investigations, and explain the connection of heat to change in temperature or states of matter.

Describe and apply the coordinate system used to locate objects in the sky.

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Recognize that theories do not become laws, nor do laws become theories; theories are well supported explanations and laws are well supported descriptions.

Describe the function of models in science, and identify the wide range of models used in science.
Compare the magnitude and range of the four fundamental forces (gravitational, electromagnetic, weak nuclear, strong nuclear).

Analyze the motion of an object in terms of its position, velocity, and acceleration (with respect to a frame of reference) as functions of time.

Interpret and apply Newton's three laws of motion.

Describe how the gravitational force between two objects depends on their masses and the distance between them.

Explain the theory of electromagnetism by comparing and contrasting the different parts of the electromagnetic spectrum in terms of wavelength, frequency, and energy, and relate them to phenomena and applications.

Determine the meaning of symbols, key terms, and other domain-specific content.

Evaluate a speaker's point of view, reasoning, and use of evidence and data.
information and examples appropriate to the audience's knowledge of the topic.
c. Use varied transitions and sentence structures to link the major sections of the text, create cohesion, and clarify the relationships among complex ideas and concepts.
d. Use precise language, domain-specific vocabulary and techniques such as metaphor, simile, and analogy to manage the complexity of the topic; convey a knowledgeable stance in a style that responds to the discipline and context as well as to the expertise of likely readers.
e. Provide a concluding statement or section that follows from and supports the information or explanation provided (e.g., articulating implications or the significance of the topic).

LAFS.1112.WHST.1.2: Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.
LAFS.1112.WHST.2.4: Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience.
LAFS.1112.WHST.2.6: Use technology, including the internet, to produce, publish, and update individual or shared writing products in response to ongoing feedback, including new arguments or information.
LAFS.1112.WHST.3.7: Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry appropriately; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation.
LAFS.1112.WHST.3.8: Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the strengths and limitations of each source in terms of the specific task, purpose, and audience; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and overreliance on any one source and following a standard format for citation.
LAFS.1112.WHST.3.9: Draw evidence from informational texts to support analysis, reflection, and research.
LAFS.1112.WHST.4.10: Write routinely over extended time frames (time for reflection and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences.

MAFS.912.F-IF.2.4: Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases.

MAFS.912.F-IF.3.7: Graph linear and quadratic functions, showing intercepts, maxima, and minima.

MAFS.912.F-IF.3.7: Graph square root, cube root, and piecewise-defined functions, including step functions and absolute value functions.

MAFS.912.F-IF.3.7: Graph polynomial functions, identifying zeros when suitable factorizations are available, and showing end behavior.

MAFS.912.F-IF.3.7: Graph rational functions, identifying zeros and asymptotes when suitable factorizations are available, and showing end behavior.

MAFS.912.F-IF.3.7: Graph exponential and logarithmic functions, showing intercepts and end behavior, and trigonometric functions, showing period, midline, and amplitude, and using phase shift.

MAFS.912.G-MG.1.2: Apply concepts of density based on area and volume in modeling situations (e.g., persons per square mile, BTUs per cubic foot).

MAFS.912.N-Q.1.1: Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays.

MAFS.912.N-Q.1.3: Choose a level of accuracy appropriate to measurements when reporting quantities.

MAFS.912.S-IC.2.6: Evaluate reports based on data.

MAFS.912.S-ID.1.1: Represent data with plots on the real number line (dot plots, histograms, and box plots).

MAFS.912.S-ID.1.1: Clarifications: In grades 6 – 8, students describe center and spread in a data distribution. Here they choose a summary statistic appropriate to the characteristics of the data distribution, such as the shape of the distribution or the existence of extreme data points.

MAFS.912.S-ID.1.2: Use statistics appropriate to the shape of the data distribution to compare center (median, mean) and spread (interquartile range, standard deviation) of two or more different data sets.

MAFS.912.S-ID.1.2: Clarifications: In grades 6 – 8, students describe center and spread in a data distribution. Here they choose a summary statistic appropriate to the characteristics of the data distribution, such as the shape of the distribution or the existence of extreme data points.

MAFS.912.S-ID.1.3: Interpret differences in shape, center, and spread in the context of the data sets, accounting for possible effects of extreme data points (outliers).

MAFS.912.S-ID.1.3: Clarifications: In grades 6 – 8, students describe center and spread in a data distribution. Here they choose a summary statistic appropriate to the characteristics of the data distribution, such as the shape of the distribution or the existence of extreme data points.

MAFS.912.S-ID.1.4: Use the mean and standard deviation of a data set to fit it to a normal distribution and to estimate population percentages. Recognize that there are data sets for which such a procedure is not appropriate. Use calculators, spreadsheets, and tables to estimate areas under the normal curve.

MAFS.912.S-ID.2.5: Summarize categorical data for two categories in two-way frequency tables. Interpret relative frequencies in the context of the data (including joint, marginal, and conditional relative frequencies). Recognize possible associations and trends in the data.

MAFS.912.S-ID.2.5: Represent data on two quantitative variables on a scatter plot, and describe how the variables are related.

MAFS.912.S-ID.2.5: Clarifications: Students take a more sophisticated look at using a linear function to model the relationship between two numerical variables. In addition to fitting a line to data, students assess how well the model fits by analyzing residuals.

MAFS.912.S-ID.2.6: Make sense of problems and persevere in solving them.

Mathematically proficient students start by explaining to themselves the meaning of a problem and looking for entry points to its solution. They analyze givens, constraints, relationships, and goals. They make conjectures about the form and meaning of the solution and plan a solution pathway rather than simply jumping into a solution attempt. They consider analogous problems, and try special cases and simpler forms of the
original problem in order to gain insight into its solution. They monitor and evaluate their progress and change course if necessary. Older students might, depending on the context of the problem, transform algebraic expressions or change the viewing window on their graphing calculator to get the information they need. Mathematically proficient students can explain correspondences between equations, verbal descriptions, tables, and graphs or draw diagrams of important features and relationships, graph data, and search for regularity or trends. Younger students might rely on using concrete objects or pictures to help them conceptualize and solve a problem. Mathematically proficient students check their answers to problems using a different method, and they continually ask themselves, “Does this make sense?” They can understand the approaches of others to solving complex problems and identify correspondences between different approaches.

**Standard Relation to Course: Supporting**

**Reason abstractly and quantitatively.**

Mathematically proficient students make sense of quantities and their relationships in problem situations. They bring two complementary abilities to bear on problems involving quantitative relationships: the ability to decontextualize—to abstract a given situation and represent it symbolically and manipulate the representing symbols as if they have a life of their own, without necessarily attending to their referents—and the ability to contextualize, to pause as needed during the manipulation process in order to probe into the referents for the symbols involved. Quantitative reasoning entails habits of creating a coherent representation of the problem at hand; considering the units involved; attending to the meaning of quantities, not just how to compute them; and knowing and flexibly using different properties of operations and objects.

**Standard Relation to Course: Supporting**

**Construct viable arguments and critique the reasoning of others.**

Mathematically proficient students understand and use stated assumptions, definitions, and previously established results in constructing arguments. They make conjectures and build a logical progression of statements to explore the truth of their conjectures. They are able to analyze situations by breaking them into cases, and can recognize and use counterexamples. They justify their conclusions, communicate them to others, and respond to the arguments of others. They reason inductively about data, making plausible arguments that take into account the context from which the data arose. Mathematically proficient students are also able to compare the effectiveness of two plausible arguments, distinguish correct logic or reasoning from that which is flawed, and—if there is a flaw in an argument—explain what it is. Elementary students can construct arguments using concrete referents such as objects, drawings, diagrams, and actions. Such arguments can make sense and be correct, even though they are not generalized or made formal until later grades. Later, students learn to determine domains to which an argument applies. Students at all grades can listen or read the arguments of others, decide whether they make sense, and ask useful questions to clarify or improve the arguments.

**Standard Relation to Course: Supporting**

**Model with mathematics.**

Mathematically proficient students can apply the mathematics they know to solve problems arising in everyday life, society, and the workplace. In early grades, this might be as simple as writing an addition equation to describe a situation. In middle grades, a student might apply proportional reasoning to plan a school event or analyze a problem in the community. By high school, a student might use geometry, algebra, and statistics to analyze circles in a circle graph or calculate something like the area of a circle from its circumference. Mathematics is a powerful tool for representing and describing the world. Its effectiveness serves as evidence of the power of mathematical ideas, as well as of the need to continue to make connections to reality. Mathematics is the language of science. Mathematics is the foundation of science.

**Standard Relation to Course: Supporting**

**Use appropriate tools strategically.**

Mathematically proficient students consider the available tools when solving a mathematical problem. These tools might include pencil and paper, concrete models, a ruler, a protractor, a calculator, a spreadsheet, a computer algebra system, a statistical package, or dynamic geometry software. Proficient students are sufficiently familiar with tools appropriate for their grade or course to make sound decisions about when each of these tools might be helpful, recognizing both the insight to be gained and their limitations. For example, mathematically proficient high school students analyze graphs of functions and solutions generated using a graphing calculator. They detect possible errors by strategically using estimation and other mathematical knowledge. When making mathematical models, they know that technology can enable them to visualize the results of varying assumptions, explore consequences, and compare predictions with data. Mathematically proficient students at various grade levels are able to identify relevant external mathematical resources, such as digital content located on a website, and use them to pose or solve problems. They are able to use technological tools to explore and deepen their understanding of concepts.

**Standard Relation to Course: Supporting**

**Attend to precision.**

Mathematically proficient students try to communicate precisely to others. They try to use clear definitions in discussion with others and in their own reasoning. They state the meaning of the symbols they choose, including using the equal sign consistently and appropriately. They are careful about specifying units of measure, and labeling axes to clarify the correspondence with quantities in a problem. They calculate accurately and efficiently, express numerical answers with a degree of precision appropriate for the problem context. In the elementary grades, students give exact answers as whole numbers, fractions, or decimals; they learn to deal meaningfully with measurements of continuous quantities. By the time they reach high school they have learned to examine claims and make explicit use of definitions.

**Standard Relation to Course: Supporting**

**Look for and make use of structure.**

Mathematically proficient students look closely to discern a pattern or structure. Young students, for example, might notice that three and seven more is the same amount as seven and three more, or they may sort a collection of shapes according to how many sides the shapes have. Later, students will see 7 + 8 equals the well remembered 7 + 5 + 3, in preparation for learning about the distributive property. In the expression 24 x 14, older students can see the 14 as 2 x 7 and the 9 as 2 + 7. They recognize the significance of an existing line in a geometric figure and can use the strategy of drawing an auxiliary line for solving problems. They also can step back for an overview and shift perspective. They can see complicated things, such as some algebraic expressions, as single objects or as being composed of several objects. For example, they can see 5 – \(3(x – y)^2\) as 5 minus a positive number times a square and use that to realize that its value cannot be more than 5 for any real numbers \(x\) and \(y\).

**Standard Relation to Course: Supporting**

**Look for and express regularity in repeated reasoning.**

Mathematically proficient students notice if calculations are repeated, and look both for general methods and for shortcuts. Upper elementary students might notice when dividing 25 by 11 that they are repeating the same calculations over and over again, and conclude they have a...
MAFS.K12.MP.8.1: repeating decimal. By paying attention to the calculation of slope as they repeatedly check whether points are on the line through (1, 2) with slope 3, middle school students might abstract the equation \((y - 2)(x - 1) = 3\). Noticing the regularity in the way terms cancel when expanding \((x - 1)(x + 1), (x - 1)(x^2 + x + 1), (x - 1)(x^3 + x^2 + x + 1)\) might lead them to the general formula for the sum of a geometric series. As they work to solve a problem, mathematically proficient students maintain oversight of the process, while attending to the details. They continually evaluate the reasonableness of their intermediate results.

Standard Relation to Course: Supporting

ELD.K12.ELL.SI.1: English language learners communicate information, ideas and concepts necessary for academic success in the content area of Science.

ELD.K12.ELL.SC.1: English language learners communicate for social and instructional purposes within the school setting.

General Course Information and Notes

GENERAL NOTES

While the content focus of this course is consistent with the Astronomy Solar/Galactic course, students will explore these concepts in greater depth. In general, the academic pace and rigor will be greatly increased for honors level course work. Laboratory investigations that include the use of scientific inquiry, research, measurement, problem solving, laboratory apparatus and technologies, experimental procedures, and safety procedures are an integral part of this course. The National Science Teachers Association (NSTA) recommends that at the high school level, all students should be in the science lab or field, collecting data every week. School laboratory investigations (labs) are defined by the National Research Council (NRC) as an experience in the laboratory, classroom, or the field that provides students with opportunities to interact directly with natural phenomena or with data collected by others using tools, materials, data collection techniques, and models (NRC, 2006, p. 3). Laboratory investigations in the high school classroom should help all students develop a growing understanding of the complexity and ambiguity of empirical work, as well as the skills to calibrate and troubleshoot equipment used to make observations. Learners should understand measurement error; and have the skills to aggregate, interpret, and present the resulting data (National Research Council, 2006, p.77; NSTA, 2007).

Special Notes:

Instructional Practices Teaching from a range of complex text is optimized when teachers in all subject areas implement the following strategies on a routine basis:

1. Ensuring wide reading from complex text that varies in length.
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4. Emphasizing students supporting answers based upon evidence from the text.
5. Providing extensive research and writing opportunities (claims and evidence).


- Asking questions (for science) and defining problems (for engineering).
- Developing and using models.
- Planning and carrying out investigations.
- Analyzing and interpreting data.
- Using mathematics, information and computer technology, and computational thinking.
- Constructing explanations (for science) and designing solutions (for engineering).
- Engaging in argument from evidence.
- Obtaining, evaluating, and communicating information.

Honors and Advanced Level Course Note: Advanced courses require a greater demand on students through increased academic rigor. Academic rigor is obtained through the application, analysis, evaluation, and creation of complex ideas that are often abstract and multi-faceted. Students are challenged to think and collaborate critically on the content they are learning. Honors level rigor will be achieved by increasing text complexity through text selection, focus on high-level qualitative measures, and complexity of task. Instruction will be structured to give students a deeper understanding of conceptual themes and organization within and across disciplines. Academic rigor is more than simply assigning to students a greater quantity of work.

Literacy Standards in Science

Secondary science courses include reading standards for literacy in science and technical subjects 6-12 and writing standards for literacy in history/social studies, science, and technical subjects 6-12. The courses also include speaking and listening standards. For a complete list of standards required for this course click on the blue tile function located at the top of this page.

English Language Development ELD Standards Special Notes Section:

Teachers are required to provide listening, speaking, reading and writing instruction that allows English language learners (ELL) to communicate information, ideas and concepts for academic success in the content area of Science. For the given level of English language proficiency and with visual, graphic, or interactive support, students will interact with grade level words, expressions, sentences and discourse to process or produce language necessary for academic success. The ELD standard should specify a relevant content area concept or topic of study chosen by curriculum developers and teachers which maximizes an ELL's need for communication and social skills. To access an ELL supporting document which delineates performance definitions and descriptors, please click on the following link:
https://cpalmsmediaprod.blob.core.windows.net/uploads/docs/standards/eld/sc.pdf

GENERAL INFORMATION

Course Numbers: 2020910

Course Path: Section: Grades PreK to 12 Education
Courses > Grade Group: Grades 9 to 12 and Adult Education Courses > Subject: Science > SubSubject: Earth/Space Sciences >

Abbreviated Title: ASTR S/G HON

Number of Credits: One (1) credit

Course Length: Year (Y)
<table>
<thead>
<tr>
<th>Educator Certifications</th>
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<tbody>
<tr>
<td>Science (Secondary Grades 7-12)</td>
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<tr>
<td>Physics (Grades 6-12)</td>
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<tr>
<td>Middle Grades General Science (Middle Grades 5-9)</td>
</tr>
<tr>
<td>Earth/Space Science (Grades 6-12)</td>
</tr>
</tbody>
</table>
## Course Standards

<table>
<thead>
<tr>
<th>Name</th>
<th>Description</th>
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<tbody>
<tr>
<td>SC.912.E.5.7:</td>
<td>Relate the history of and explain the justification for future space exploration and continuing technology development.</td>
</tr>
<tr>
<td>SC.912.E.5.8:</td>
<td>Connect the concepts of radiation and the electromagnetic spectrum to the use of historical and newly-developed observational tools.</td>
</tr>
<tr>
<td>SC.912.E.5.9:</td>
<td>Analyze the broad effects of space exploration on the economy and culture of Florida.</td>
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<tr>
<td>SC.912.E.5.10:</td>
<td>Describe and apply the coordinate system used to locate objects in the sky.</td>
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<tr>
<td>SC.912.E.5.11:</td>
<td>Distinguish the various methods of measuring astronomical distances and apply each in appropriate situations.</td>
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<tr>
<td>SC.912.E.6.2:</td>
<td>Connect surface features to surface processes that are responsible for their formation.</td>
</tr>
<tr>
<td>SC.912.E.7.7:</td>
<td>Identify, analyze, and relate the internal (Earth system) and external (astronomical) conditions that contribute to global climate change.</td>
</tr>
<tr>
<td>SC.912.N.1.1:</td>
<td>Define a problem based on a specific body of knowledge, for example: biology, chemistry, physics, and earth/space science, and do the following:</td>
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<tr>
<td></td>
<td>1. Pose questions about the natural world, (Articulate the purpose of the investigation and identify the relevant scientific concepts).</td>
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<td></td>
<td>2. Conduct systematic observations, (Write procedures that are clear and replicable. Identify observables and examine relationships between</td>
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<td>test (independent) variable and outcome (dependent) variable. Employ appropriate methods for accurate and consistent observations;</td>
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<td>conduct and record measurements at appropriate levels of precision. Follow safety guidelines).</td>
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<td></td>
<td>3. Examine books and other sources of information to see what is already known,</td>
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<td>4. Review what is known in light of empirical evidence, (Examine whether available empirical evidence can be interpreted in terms of the</td>
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<td>existing knowledge and models, and if not, modify or develop new models).</td>
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<td>5. Plan investigations, (Design and evaluate a scientific investigation).</td>
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<td>6. Use tools to gather, analyze, and interpret data (this includes the use of measurement in metric and other systems, and also the</td>
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<td>generation and interpretation of graphical representations of data, including data tables and graphs), (Collect data or evidence in an</td>
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<td></td>
<td>organized way. Properly use instruments, equipment, and materials (e.g., scales, probeware, meter sticks, microscopes, computers) including</td>
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<td></td>
<td>set-up, calibration, technique, maintenance, and storage).</td>
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<td></td>
<td>7. Pose answers, explanations, or descriptions of events,</td>
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<td></td>
<td>8. Generate explanations that explicate or describe natural phenomena (inferences),</td>
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<td></td>
<td>9. Use appropriate evidence and reasoning to justify these explanations to others,</td>
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<td></td>
<td>10. Communicate results of scientific investigations, and</td>
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<td></td>
<td>11. Evaluate the merits of the explanations produced by others.</td>
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<tr>
<td>SC.912.N.1.2:</td>
<td>Describe and explain what characterizes science and its methods.</td>
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<tr>
<td>SC.912.N.1.3:</td>
<td>Recognize that the strength or usefulness of a scientific claim is evaluated through scientific argumentation, which depends on critical and</td>
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<td>logical thinking, and the active consideration of alternative scientific explanations to explain the data presented.</td>
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<tr>
<td>SC.912.N.1.4:</td>
<td>Identify sources of information and assess their reliability according to the strict standards of scientific investigation.</td>
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<tr>
<td>SC.912.N.1.5:</td>
<td>Describe and provide examples of how similar investigations conducted in many parts of the world result in the same outcome.</td>
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<tr>
<td>SC.912.N.1.6:</td>
<td>Describe how scientific inferences are drawn from scientific observations and provide examples from the content being studied.</td>
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<tr>
<td>SC.912.N.1.7:</td>
<td>Recognize the role of creativity in constructing scientific questions, methods and explanations.</td>
</tr>
<tr>
<td>SC.912.N.2.1:</td>
<td>Identify what is science, what clearly is not science, and what superficially resembles science (but fails to meet the criteria for science).</td>
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<tr>
<td>SC.912.N.2.2:</td>
<td>Identify which questions can be answered through science and which questions are outside the boundaries of scientific investigation, such as</td>
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<td>questions addressed by other ways of knowing, such as art, philosophy, and religion.</td>
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<td>SC.912.N.2.3:</td>
<td>Identify examples of pseudoscience (such as astrology, phrenology) in society.</td>
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<tr>
<td>SC.912.N.2.4:</td>
<td>Explain that scientific knowledge is both durable and robust and open to change. Scientific knowledge can change because it is often examined and</td>
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<td>re-examined by new investigations and scientific argumentation. Because of these frequent examinations, scientific knowledge becomes stronger,</td>
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<td>leading to its durability.</td>
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<td>SC.912.N.2.5:</td>
<td>Describe instances in which scientists’ varied backgrounds, talents, interests, and goals influence the inferences and thus the explanations</td>
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<td></td>
<td>that they make about observations of natural phenomena and describe that competing interpretations (explanations) of scientists are a strength</td>
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<td>of science as they are a source of new, testable ideas that have the potential to add new evidence to support one or another of the</td>
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<td>explanations.</td>
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<td>SC.912.N.3.1:</td>
<td>Explain that a scientific theory is the culmination of many scientific investigations drawing together all the current evidence concerning a</td>
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<td>substantial range of phenomena; thus, a scientific theory represents the most powerful explanation scientists have to offer.</td>
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<tr>
<td>SC.912.N.3.2:</td>
<td>Describe the role consensus plays in the historical development of a theory in any one of the disciplines of science.</td>
</tr>
<tr>
<td>SC.912.N.3.3:</td>
<td>Explain that scientific laws are descriptions of specific relationships under given conditions in nature, but do not offer explanations for those</td>
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<tr>
<td></td>
<td>relationships.</td>
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<tr>
<td>SC.912.N.3.4:</td>
<td>Recognize that theories do not become laws, nor do laws become theories; theories are well supported explanations and laws are well supported</td>
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<tr>
<td></td>
<td>descriptions.</td>
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<tr>
<td>SC.912.N.3.5:</td>
<td>Describe the function of models in science, and identify the wide range of models used in science.</td>
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<tr>
<td>SC.912.N.4.1:</td>
<td>Explain how scientific knowledge and reasoning provide an empirically-based perspective to inform society's decision making.</td>
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<tr>
<td>SC.912.N.4.2:</td>
<td>Weigh the merits of alternative strategies for solving a specific societal problem by comparing a number of different costs and benefits, such</td>
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<td>as human, economic, and environmental.</td>
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<td>SC.912.P.8.1:</td>
<td>Differentiate among the four states of matter.</td>
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<tr>
<td>SC.912.P.8.4:</td>
<td>Explore the scientific theory of atoms (also known as atomic theory) by describing the structure of atoms in terms of protons, neutrons and</td>
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<td>electrons, and differentiate among these particles in terms of their mass, electrical charges and locations within the atom.</td>
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<tr>
<td>SC.912.P.10.4:</td>
<td>Describe heat as the energy transferred by convection, conduction, and radiation, and explain the connection of heat to change in temperature</td>
</tr>
<tr>
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<td>or states of matter.</td>
</tr>
<tr>
<td>SC.912.P.10.9:</td>
<td>Describe the quantization of energy at the atomic level.</td>
</tr>
</tbody>
</table>
Compare the magnitude and range of the four fundamental forces (gravitational, electromagnetic, weak nuclear, strong nuclear).

Explain and compare nuclear reactions (radioactive decay, fission and fusion), the energy changes associated with them and their associated safety issues.

Explore the theory of electromagnetism by comparing and contrasting the different parts of the electromagnetic spectrum in terms of wavelength, frequency, and energy, and relate them to phenomena and issues.

Explain that all objects emit and absorb electromagnetic radiation and distinguish between objects that are blackbody radiators and those that are not.

Describe the measurable properties of waves and explain the relationships among them and how these properties change when the wave moves from one medium to another.

Qualitatively describe the shift in frequency in sound or electromagnetic waves due to the relative motion of a source or a receiver.

Analyze the motion of an object in terms of its position, velocity, and acceleration (with respect to a frame of reference) as functions of time.

Interpret and apply Newton's three laws of motion.

Recognize the gravitational force between two objects depends on their masses and the distance between them.

Qualitatively apply the concept of angular momentum.

Recognize that nothing travels faster than the speed of light in vacuum which is the same for all observers no matter how they or the light source are moving.

Recognize that Newton's Laws are a limiting case of Einstein's Special Theory of Relativity at speeds that are much smaller than the speed of light.

Recognize that time, length, and energy depend on the frame of reference.

Mathematicians who participate in effortful learning both individually and with others:
- Analyze the problem in a way that makes sense given the task.
- Ask questions that will help with solving the task.
- Build perseverance by modifying methods as needed while solving a challenging task.
- Stay engaged and maintain a positive mindset when working to solve tasks.
- Help and support each other when attempting a new method or approach.

Teachers who encourage students to participate actively in effortful learning both individually and with others:
- Cultivate a community of growth mindset learners.
- Foster perseverance in students by choosing tasks that are challenging.
- Develop students' ability to analyze and problem solve.
- Recognize students' effort when solving challenging problems.

Mathematicians who demonstrate understanding by representing problems in multiple ways:
- Build understanding through modeling and using manipulatives.
- Represent solutions to problems in multiple ways using objects, drawings, tables, graphs and equations.
- Progress from modeling problems with objects and drawings to using algorithms and equations.
- Express connections between concepts and representations.
- Choose a representation based on the given context or purpose.

Teachers who encourage students to demonstrate understanding by representing problems in multiple ways:
- Help students make connections between concepts and representations.
- Provide opportunities for students to use manipulatives when investigating concepts.
- Guide students from concrete to pictorial to abstract representations as understanding progresses.
- Show students that various representations can have different purposes and can be useful in different situations.

Complete tasks with mathematical fluency.

Mathematicians who complete tasks with mathematical fluency:
- Select efficient and appropriate methods for solving problems within the given context.
- Maintain flexibility and accuracy while performing procedures and mental calculations.
- Complete tasks accurately and with confidence.
- Adapt procedures to apply them to a new context.
- Use feedback to improve efficiency when performing calculations.

Teachers who encourage students to complete tasks with mathematical fluency:
- Provide students with the flexibility to solve problems by selecting a procedure that allows them to solve efficiently and accurately.
- Offer multiple opportunities for students to practice efficient and generalizable methods.
- Provide opportunities for students to reflect on the method they used and determine if a more efficient method could have been used.

Engage in discussions that reflect on the mathematical thinking of self and others.

Mathematicians who engage in discussions that reflect on the mathematical thinking of self and others:
- Communicate mathematical ideas, vocabulary and methods effectively.
- Analyze the mathematical thinking of others.
- Compare the efficiency of a method to those expressed by others.
- Recognize errors and suggest how to correctly solve the task.
- Justify results by explaining methods and processes.
- Construct possible arguments based on evidence.

Teachers who encourage students to engage in discussions that reflect on the mathematical thinking of self and others:
- Establish a culture in which students ask questions of the teacher and their peers, and error is an opportunity for learning.
• Create opportunities for students to discuss their thinking with peers.
• Select, sequence and present student work to advance and deepen understanding of correct and increasingly efficient methods.
• Develop students' ability to justify methods and compare their responses to the responses of their peers.

Use patterns and structure to help understand and connect mathematical concepts.
Mathematicians who use patterns and structure to help understand and connect mathematical concepts:
• Focus on relevant details within a problem.
• Create plans and procedures to logically order events, steps or ideas to solve problems.
• Decompose a complex problem into manageable parts.
• Relate previously learned concepts to new concepts.
• Look for similarities among problems.
• Connect solutions of problems to more complicated large-scale situations.

MA.K12.MTR.5.1:
Clarifications:
Teachers who encourage students to use patterns and structure to help understand and connect mathematical concepts:
• Help students recognize the patterns in the world around them and connect these patterns to mathematical concepts.
• Support students to develop generalizations based on the similarities found among problems.
• Provide opportunities for students to create plans and procedures to solve problems.
• Develop students' ability to construct relationships between their current understanding and more sophisticated ways of thinking.

Assess the reasonableness of solutions.
Mathematicians who assess the reasonableness of solutions:
• Estimate to discover possible solutions.
• Use benchmark quantities to determine if a solution makes sense.
• Check calculations when solving problems.
• Verify possible solutions by explaining the methods used.
• Evaluate results based on the given context.

MA.K12.MTR.6.1:
Clarifications:
Teachers who encourage students to assess the reasonableness of solutions:
• Have students estimate or predict solutions prior to solving.
• Prompt students to continually ask, "Does this solution make sense? How do you know?"
• Reinforce that students check their work as they progress within and after a task.
• Strengthen students' ability to verify solutions through justifications.

Apply mathematics to real-world contexts.
Mathematicians who apply mathematics to real-world contexts:
• Connect mathematical concepts to everyday experiences.
• Use models and methods to understand, represent and solve problems.
• Perform investigations to gather data or determine if a method is appropriate.
• Redesign models and methods to improve accuracy or efficiency.

MA.K12.MTR.7.1:
Clarifications:
Teachers who encourage students to apply mathematics to real-world contexts:
• Provide opportunities for students to create models, both concrete and abstract, and perform investigations.
• Challenge students to question the accuracy of their models and methods.
• Support students as they validate conclusions by comparing them to the given situation.
• Indicate how various concepts can be applied to other disciplines.

Cite evidence to explain and justify reasoning.

ELA.K12.EE.1.1:
Clarifications:
K-1 Students include textual evidence in their oral communication with guidance and support from adults. The evidence can consist of details from the text without naming the text. During 1st grade, students learn how to incorporate the evidence in their writing.
2-3 Students include relevant textual evidence in their written and oral communication. Students should name the text when they refer to it. In 3rd grade, students should use a combination of direct and indirect citations.
4-5 Students continue with previous skills and reference comments made by speakers and peers. Students cite texts that they’ve directly quoted, paraphrased, or used for information. When writing, students will use the form of citation dictated by the instructor or the style guide referenced by the instructor.
6-8 Students continue with previous skills and use a style guide to create a proper citation.
9-12 Students continue with previous skills and should be aware of existing style guides and the ways in which they differ.

ELA.K12.EE.2.1:
Clarifications:
See Text Complexity for grade-level complexity bands and a text complexity rubric.

Read and comprehend grade-level complex texts proficiently.

ELA.K12.EE.3.1:
Clarifications:
Students will make inferences before the words infer or inference are introduced. Kindergarten students will answer questions like "Why is the girl smiling?" or make predictions about what will happen based on the title page. Students will use the terms and apply them in 2nd grade and beyond.

Make inferences to support comprehension.

Use appropriate collaborative techniques and active listening skills when engaging in discussions in a variety of situations.

Clarifications:
In kindergarten, students learn to listen to one another respectfully.
General Course Information and Notes

GENERAL NOTES

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Florida's Benchmarks for Excellent Student Thinking (B.E.S.T.) Standards

This course includes Florida’s B.E.S.T. ELA Expectations (EE) and Mathematical Thinking and Reasoning Standards (MTRs) for students. Florida educators should intentionally embed these standards within the content and their instruction as applicable. For guidance on the implementation of the EEs and MTRs, please visit https://www.cpalms.org/Standards/BEST_Standards.aspx and select the appropriate B.E.S.T. Standards package.

English Language Development ELD Standards Special Notes Section:

Teachers are required to provide listening, speaking, reading and writing instruction that allows English language learners (ELL) to communicate information, ideas and concepts for academic success in the content area of Science. For the given level of English language proficiency and with visual, graphic, or interactive support, students will interact with grade level words, expressions, sentences and discourse to process or produce language necessary for academic success. The ELD standard should specify a relevant content area concept or topic of study chosen by curriculum developers and teachers which maximizes an ELL’s need for communication and social skills.

To access an ELL supporting document which delineates performance definitions and descriptors, please click on the following link:
https://cpalmsmediaprod.blob.core.windows.net/uploads/docs/standards/eld/sc.pdf
Course Number: 2020910

Number of Credits: One (1) credit

Course Type: Core Academic Course
Course Status: State Board Approved
Grade Level(s): 9,10,11,12
Graduation Requirement: Equally Rigorous Science

Course Path: Section: Grades PreK to 12 Education Courses > Grade Group: Grades 9 to 12 and Adult Education Courses > Subject: Science > SubSubject: Earth/Space Sciences

Abbreviated Title: ASTR S/G HON
Course Length: Year (Y)
Course Attributes:
- Honors

Course Level: 3

Educator Certifications

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7. Pose answers, explanations, or descriptions of events,
8. Generate explanations that explicate or describe natural phenomena (inferences),
9. Use appropriate evidence and reasoning to justify these explanations to others,
10. Communicate results of scientific investigations, and
11. Evaluate the merits of the explanations produced by others.

SC.912.N.1.2: Describe and explain what characterizes science and its methods.
SC.912.N.1.3: Recognize that the strength or usefulness of a scientific claim is evaluated through scientific argumentation, which depends on critical and logical thinking, and the active consideration of alternative scientific explanations to explain the data presented.
SC.912.N.1.4: Identify sources of information and assess their reliability according to the strict standards of scientific investigation.
SC.912.N.1.6: Describe how scientific inferences are drawn from scientific observations and provide examples from the content being studied.
SC.912.N.2.1: Identify what is science, what clearly is not science, and what superficially resembles science (but fails to meet the criteria for science).
SC.912.N.2.2: Identify which questions can be answered through science and which questions are outside the boundaries of scientific investigation, such as questions addressed by other ways of knowing, such as art, philosophy, and religion.
SC.912.N.3.1: Explain that a scientific theory is the culmination of many scientific investigations drawing together all the current evidence concerning a substantial range of phenomena; thus, a scientific theory represents the most powerful explanation scientists have to offer.
SC.912.N.3.4: Recognize that theories do not become laws, nor do laws become theories; theories are well supported explanations and laws are well supported descriptions.
SC.912.N.4.1: Explain how scientific knowledge and reasoning provide an empirically-based perspective to inform society's decision making.
SC.912.N.4.2: Weigh the merits of alternative strategies for solving a specific societal problem by comparing a number of different costs and benefits, such as human, economic, and environmental.
SC.912.P.8.12: Describe the properties of the carbon atom that make the diversity of carbon compounds possible.
SC.912.P.10.15: Investigate and explain the relationships among current, voltage, resistance, and power.
SC.912.P.12.12: Explain how various factors, such as concentration, temperature, and presence of a catalyst affect the rate of a chemical reaction.
ELD.K12.ELI.SC.1: English language learners communicate information, ideas and concepts necessary for academic success in the content area of Science.
ELD.K12.ELI.SI.1: English language learners communicate for social and instructional purposes within the school setting.

The student will organize information to show understanding or relationships among facts, ideas, and events (e.g., representing key points within text through charting, mapping, paraphrasing, summarizing, comparing, contrasting, or outlining).

**Clarifications:**

SS.912.C.4.3: Assess human rights policies of the United States and other countries.

LA.910.2.2.3 (Archived Standard): The student will record information and ideas from primary and/or secondary sources accurately and coherently, noting the validity and reliability of these sources and attributing sources of information;

**Clarifications:**

MA.912.S.1.2 (Archived Standard): Collect, organize, and analyze data sets, determine the best format for the data and present visual summaries from the following:

- bar graphs
- line graphs
- stem and leaf plots
- circle graphs
- histograms
- box and whisker plots
- scatter plots
- cumulative frequency (ogive) graphs

**Clarifications:**

HE.912.C.1.3: Evaluate how environment and personal health are interrelated.

**Clarifications:**

Food options within a community; prenatal-care services; availability of recreational facilities; air quality; weather-safety awareness; and weather, air, and water conditions.

HE.912.C.1.4 (Archived Standard): Analyze how heredity and family history can impact personal health.

**Clarifications:**

Some examples may include drug use, family obesity, heart disease, mental health, and non-communicable illness or disease.

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General Course Information and Notes

**GENERAL NOTES**

Credits: 0.5 Science/0.5 CTE
Notes: Laboratory investigations which include the use of scientific inquiry, research, measurement, problem solving, laboratory apparatus and technologies, experimental procedures, and safety procedures are an integral part of this course.

Special Notes:

Instructional Practices

Teaching from a range of complex text is optimized when teachers in all subject areas implement the following strategies on a routine basis:

1. Ensuring wide reading from complex text that varies in length.
2. Making close reading and rereading of texts central to lessons.
3. Emphasizing text-specific complex questions, and cognitively complex tasks, reinforce focus on the text and cultivate independence.
4. Emphasizing students supporting answers based upon evidence from the text.
5. Providing extensive research and writing opportunities (claims and evidence).


- Asking questions (for science) and defining problems (for engineering).
- Developing and using models.
- Planning and carrying out investigations.
- Analyzing and interpreting data.
- Using mathematics, information and computer technology, and computational thinking.
- Constructing explanations (for science) and designing solutions (for engineering).
- Engaging in argument from evidence.
- Obtaining, evaluating, and communicating information.

English Language Development ELD Standards Special Notes Section:

Teachers are required to provide listening, speaking, reading and writing instruction that allows English language learners (ELL) to communicate information, ideas and concepts for academic success in the content area of Science. For the given level of English language proficiency and with visual, graphic, or interactive support, students will interact with grade level words, expressions, sentences and discourse to process or produce language necessary for academic success. The ELD standard should specify a relevant content area concept or topic of study chosen by curriculum developers and teachers which maximizes an ELL's need for communication and social skills.

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GENERAL INFORMATION

Course Number: 3027010
Course Path: Subject: Science > SubSubject: Integrated Sciences >
Abbreviated Title: BIOTECH 1
Course Length: Year (Y)
Course Type: Core Academic Course
Course Status: Course Approved
Grade Level(s): 9,10,11,12
Course Level: 3
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Define a problem based on a specific body of knowledge, for example: biology, chemistry, physics, and earth/space science, and do the following:
1. Pose questions about the natural world. (Articulate the purpose of the investigation and identify the relevant scientific concepts.)
2. Conduct systematic observations. (Write procedures that are clear and replicable. Identify observables and examine relationships between test (independent) variable and outcome (dependent) variable. Employ appropriate methods for accurate and consistent observations; conduct and record measurements at appropriate levels of precision. Follow safety guidelines.)
3. Examine books and other sources of information to see what is already known.
4. Review what is known in light of empirical evidence. (Examine whether available empirical evidence can be interpreted in terms of existing knowledge and models, and if not, modify or develop new models.)
5. Plan investigations. (Design and evaluate a scientific investigation.)
6. Use tools to gather, analyze, and interpret data (this includes the use of measurement in metric and other systems, and also the generation and interpretation of graphical representations of data, including data tables and graphs). (Collect data or evidence in an
Describe and explain what characterizes science and its methods.

8. Generate explanations that explicate or describe natural phenomena (inferences).

9. Use appropriate evidence and reasoning to justify these explanations to others.

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MA.K12.MTR.6.1: Explain that a scientific theory is the culmination of many scientific investigations drawing together all the current evidence concerning a substantial range of phenomena; thus, a scientific theory represents the most powerful explanation scientists have to offer.

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MA.K12.MTR.8.1: Recognize that scientific knowledge and reasoning provide an empirically-based perspective to inform society's decision making.

MA.K12.MTR.9.1: Weigh the merits of alternative strategies for solving a specific societal problem by comparing a number of different costs and benefits, such as human, economic, and environmental.

MA.K12.MTR.10.1: Investigate and explain the relationships among current, voltage, resistance, and power.

MA.K12.MTR.11.1: Describe the properties of the carbon atom that make the diversity of carbon compounds possible.

MA.K12.MTR.12.1: Explain how various factors, such as concentration, temperature, and presence of a catalyst affect the rate of a chemical reaction.

MA.K12.MTR.13.1: Communicate results of scientific investigations, and use appropriate evidence and reasoning to justify these explanations to others.

Clarifications:
Mathematicians who participate in effortful learning both individually and with others:

- Analyze the problem in a way that makes sense given the task.
- Ask questions that will help with solving the task.
- Build perseverance by modifying methods as needed while solving a challenging task.
- Stay engaged and maintain a positive mindset when working to solve tasks.
- Help and support each other when attempting a new method or approach.

Clarifications:
Teachers who encourage students to participate actively in effortful learning both individually and with others:

- Cultivate a community of growth mindset learners.
- Foster perseverance in students by choosing tasks that are challenging.
- Develop students' ability to analyze and problem solve.
- Recognize students' effort when solving challenging problems.

Clarifications:
Mathematicians who complete tasks with mathematical fluency:

- Select efficient and appropriate methods for solving problems within the given context.
- Maintain flexibility and accuracy while performing procedures and mental calculations.
- Complete tasks accurately and with confidence.
- Adapt procedures to apply them to a new context.
- Use feedback to improve efficiency when performing calculations.

Clarifications:
Teachers who encourage students to complete tasks with mathematical fluency:

- Provide students with the flexibility to solve problems by selecting a procedure that allows them to solve efficiently and accurately.
- Offer multiple opportunities for students to practice efficient and generalizable methods.
- Provide opportunities for students to reflect on the method they used and determine if a more efficient method could have been used.

Clarifications:
Mathematicians who engage in discussions that reflect on the mathematical thinking of self and others:

- Communicate mathematical ideas, vocabulary and methods effectively.
- Analyze the mathematical thinking of others.
- Compare the efficiency of a method to those expressed by others.
MA.K12.MTR.4.1:
- Recognize errors and suggest how to correctly solve the task.
- Justify results by explaining methods and processes.
- Construct possible arguments based on evidence.

**Clarifications:**
Teachers who encourage students to engage in discussions that reflect on the mathematical thinking of self and others:
- Establish a culture in which students ask questions of the teacher and their peers, and error is an opportunity for learning.
- Create opportunities for students to discuss their thinking with peers.
- Select, sequence and present student work to advance and deepen understanding of correct and increasingly efficient methods.
- Develop students' ability to justify methods and compare their responses to the responses of their peers.

MA.K12.MTR.5.1:
Use patterns and structure to help understand and connect mathematical concepts.
Mathematicians who use patterns and structure to help understand and connect mathematical concepts:
- Focus on relevant details within a problem.
- Create plans and procedures to logically order events, steps or ideas to solve problems.
- Decompose a complex problem into manageable parts.
- Relate previously learned concepts to new concepts.
- Look for similarities among problems.
- Connect solutions of problems to more complicated large-scale situations.

**Clarifications:**
Teachers who encourage students to use patterns and structure to help understand and connect mathematical concepts:
- Help students recognize the patterns in the world around them and connect these patterns to mathematical concepts.
- Support students to develop generalizations based on the similarities found among problems.
- Provide opportunities for students to create plans and procedures to solve problems.
- Develop students' ability to construct relationships between their current understanding and more sophisticated ways of thinking.

MA.K12.MTR.6.1:
Assess the reasonableness of solutions.
Mathematicians who assess the reasonableness of solutions:
- Estimate to discover possible solutions.
- Use benchmark quantities to determine if a solution makes sense.
- Check calculations when solving problems.
- Verify possible solutions by explaining the methods used.
- Evaluate results based on the given context.

**Clarifications:**
Teachers who encourage students to assess the reasonableness of solutions:
- Have students estimate or predict solutions prior to solving.
- Prompt students to continually ask, "Does this solution make sense? How do you know?"
- Reinforce that students check their work as they progress within and after a task.
- Strengthen students' ability to verify solutions through justifications.

MA.K12.MTR.7.1:
Apply mathematics to real-world contexts.
Mathematicians who apply mathematics to real-world contexts:
- Connect mathematical concepts to everyday experiences.
- Use models and methods to understand, represent and solve problems.
- Perform investigations to gather data or determine if a method is appropriate. • Redesign models and methods to improve accuracy or efficiency.

**Clarifications:**
Teachers who encourage students to apply mathematics to real-world contexts:
- Provide opportunities for students to create models, both concrete and abstract, and perform investigations.
- Challenge students to question the accuracy of their models and methods.
- Support students as they validate conclusions by comparing them to the given situation.
- Indicate how various concepts can be applied to other disciplines.

ELA.K12.EE.1.1:
Cite evidence to explain and justify reasoning.

**Clarifications:**
K-1 Students include textual evidence in their oral communication with guidance and support from adults. The evidence can consist of details from the text without naming the text. During 1st grade, students learn how to incorporate the evidence in their writing.
2-3 Students include relevant textual evidence in their written and oral communication. Students should name the text when they refer to it. In 3rd grade, students should use a combination of direct and indirect citations.
4-5 Students continue with previous skills and reference comments made by speakers and peers. Students cite texts that they've directly quoted, paraphrased, or used for information. When writing, students will use the form of citation dictated by the instructor or the style guide referenced by the instructor.
6-8 Students continue with previous skills and use a style guide to create a proper citation.
9-12 Students continue with previous skills and should be aware of existing style guides and the ways in which they differ.

ELA.K12.EE.2.1:
Read and comprehend grade-level complex texts proficiently.

**Clarifications:**
See Text Complexity for grade-level complexity bands and a text complexity rubric.

**Clarifications:**
Make inferences to support comprehension.
Students English language learners communicate information, ideas and concepts for social and instructional purposes within the school setting.

**ELA.K12.EE.3.1:** Students will make inferences before the words infer or inference are introduced. Kindergarten students will answer questions like "Why is the girl smiling?" or make predictions about what will happen based on the title page. Students will use the terms and apply them in 2nd grade and beyond.

**Use appropriate collaborative techniques and active listening skills when engaging in discussions in a variety of situations.**

**Clarifications:**
- In kindergarten, students learn to listen to one another respectfully.
- In grades 1-2, students build upon these skills by justifying what they are thinking. For example: "I think _____ because _____." The collaborative conversations are becoming academic conversations.
- In grades 3-12, students engage in academic conversations discussing claims and justifying their reasoning, refining and applying skills. Students build on ideas, propel the conversation, and support claims and counterclaims with evidence.

**ELA.K12.EE.4.1:**

**Use the accepted rules governing a specific format to create quality work.**

**Clarifications:**
- Students will incorporate skills learned into work products to produce quality work. For students to incorporate these skills appropriately, they must receive instruction. A 3rd grade student creating a poster board display must have instruction in how to effectively present information to do quality work.

**ELA.K12.EE.5.1:**

**Use appropriate voice and tone when speaking or writing.**

**Clarifications:**
- In kindergarten and 1st grade, students learn the difference between formal and informal language. For example, the way we talk to our friends differs from the way we speak to adults. In 2nd grade and beyond, students practice appropriate social and academic language to discuss texts.

**ELA.K12.EE.6.1:**

**Evaluate environment and personal health are interrelated.**

**HE.912.C.1.3:**

**Analyze how heredity and family history can impact personal health.**

**Clarifications:**
- Food options within a community; prenatal-care services; availability of recreational facilities; air quality; weather-safety awareness; and weather, air, and water conditions.

**General Course Information and Notes**

**GENERAL NOTES**

**Credits:** 0.5 Science/0.5 CTE

**Notes:** Laboratory investigations which include the use of scientific inquiry, research, measurement, problem solving, laboratory apparatus and technologies, experimental procedures, and safety procedures are an integral part of this course.

**Special Notes:**

**Instructional Practices**

Teaching from a range of complex text is optimized when teachers in all subject areas implement the following strategies on a routine basis:

1. Ensuring wide reading from complex text that varies in length.
2. Making close reading and rereading of texts central to lessons.
3. Emphasizing text-specific complex questions, and cognitively complex tasks, reinforce focus on the text and cultivate independence.
4. Emphasizing students supporting answers based upon evidence from the text.
5. Providing extensive research and writing opportunities (claims and evidence).

**Science and Engineering Practices** (NRC Framework for K-12 Science Education, 2010)

- Asking questions (for science) and defining problems (for engineering).
- Developing and using models.
- Planning and carrying out investigations.
- Analyzing and interpreting data.
- Using mathematics, information and computer technology, and computational thinking.
- Constructing explanations (for science) and designing solutions (for engineering).
- Engaging in argument from evidence.
- Obtaining, evaluating, and communicating information.

**English Language Development ELD Standards Special Notes Section:**

Teachers are required to provide listening, speaking, reading and writing instruction that allows English language learners (ELL) to communicate information, ideas and concepts for academic success in the content area of Science. For the given level of English language proficiency and with visual, graphic, or interactive support, students will interact with grade level words, expressions, sentences and discourse to process or produce language necessary for academic success. The ELD standard should specify a relevant content area concept or topic of study chosen by curriculum developers and teachers which maximizes an ELL's need for communication and social skills.

To access an ELL supporting document which delineates performance definitions and descriptors, please click on the following link:

https://cpalmsmediaprod.blob.core.windows.net/uploads/docs/standards/eld/sc.pdf
<table>
<thead>
<tr>
<th><strong>Course Number:</strong></th>
<th>3027010</th>
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<tbody>
<tr>
<td><strong>Course Path:</strong></td>
<td>Section: Grades PreK to 12 Education Courses &gt; Grade Group: Grades 9 to 12 and Adult Education Courses &gt; Subject: Science &gt; SubSubject: Integrated Sciences &gt; Section: Career and Technical Education » Cluster: Manufacturing » Career Path: Secondary Programs » Program: 8736000 » Program Version: Industrial Biotechnology » Abbreviated Title: BIOTECH 1</td>
</tr>
<tr>
<td><strong>Course Type:</strong></td>
<td>Core Academic Course</td>
</tr>
<tr>
<td><strong>Course Status:</strong></td>
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<tr>
<td><strong>Course Level:</strong></td>
<td>3</td>
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<tr>
<td><strong>Course Length:</strong></td>
<td>Year (Y)</td>
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<tr>
<td><strong>Grade Level(s):</strong></td>
<td>9,10,11,12</td>
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</table>
Course Standards

<table>
<thead>
<tr>
<th>Name</th>
<th>Description</th>
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<tbody>
<tr>
<td>SC.912.E.6.6</td>
<td>Analyze past, present, and potential future consequences to the environment resulting from various energy production technologies.</td>
</tr>
<tr>
<td>SC.912.E.7.1</td>
<td>Analyze the movement of matter and energy through the different biogeochemical cycles, including water and carbon.</td>
</tr>
<tr>
<td>SC.912.L.14.1</td>
<td>Describe the scientific theory of cells (cell theory) and relate the history of its discovery to the process of science.</td>
</tr>
<tr>
<td>SC.912.L.14.2</td>
<td>Relate structure to function for the components of plant and animal cells. Explain the role of cell membranes as a highly selective barrier (passive and active transport).</td>
</tr>
<tr>
<td>SC.912.L.14.3</td>
<td>Compare and contrast the general structures of plant and animal cells. Compare and contrast the general structures of prokaryotic and eukaryotic cells.</td>
</tr>
<tr>
<td>SC.912.L.14.4</td>
<td>Compare and contrast structure and function of various types of microscopes.</td>
</tr>
<tr>
<td>SC.912.L.14.6</td>
<td>Explain the significance of genetic factors, environmental factors, and pathogenic agents to health from the perspectives of both individual and public health.</td>
</tr>
<tr>
<td>SC.912.L.14.7</td>
<td>Relate the structure of each of the major plant organs and tissues to physiological processes.</td>
</tr>
<tr>
<td>SC.912.L.14.26</td>
<td>Identify the major parts of the brain on diagrams or models.</td>
</tr>
<tr>
<td>SC.912.L.14.36</td>
<td>Describe the factors affecting blood flow through the cardiovascular system.</td>
</tr>
<tr>
<td>SC.912.L.14.37</td>
<td>Explain the components of an electrophogram.</td>
</tr>
<tr>
<td>SC.912.L.14.52</td>
<td>Explain the basic functions of the human immune system, including specific and nonspecific immune response, vaccines, and antibiotics.</td>
</tr>
<tr>
<td>SC.912.L.15.1</td>
<td>Explain how the scientific theory of evolution is supported by the fossil record, comparative anatomy, comparative embryology, molecular biology, and observed evolutionary change.</td>
</tr>
<tr>
<td>SC.912.L.15.10</td>
<td>Identify basic trends in hominin evolution from early ancestors six million years ago to modern humans, including brain size, jaw size, language, and manufacture of tools.</td>
</tr>
<tr>
<td>SC.912.L.15.13</td>
<td>Describe the conditions required for natural selection, including: overproduction of offspring, inherited variation, and the struggle to survive, which result in differential reproductive success.</td>
</tr>
<tr>
<td>SC.912.L.15.14</td>
<td>Discuss mechanisms of evolutionary change other than natural selection such as genetic drift and gene flow.</td>
</tr>
<tr>
<td>SC.912.L.16.3</td>
<td>Describe the basic process of DNA replication and how it relates to the transmission and conservation of the genetic information.</td>
</tr>
<tr>
<td>SC.912.L.16.4</td>
<td>Explain how mutations in the DNA sequence may or may not result in phenotypic change. Explain how mutations in gametes may result in phenotypic changes in offspring.</td>
</tr>
<tr>
<td>SC.912.L.16.5</td>
<td>Explain the basic processes of transcription and translation, and how they result in the expression of genes.</td>
</tr>
<tr>
<td>SC.912.L.16.6</td>
<td>Discuss the mechanisms for regulation of gene expression in prokaryotes and eukaryotes at transcription and translation level.</td>
</tr>
<tr>
<td>SC.912.L.16.7</td>
<td>Describe how viruses and bacteria transfer genetic material between cells and the role of this process in biotechnology.</td>
</tr>
<tr>
<td>SC.912.L.16.10</td>
<td>Evaluate the impact of biotechnology on the individual, society and the environment, including medical and ethical issues.</td>
</tr>
<tr>
<td>SC.912.L.16.11</td>
<td>Discuss the technologies associated with forensic medicine and DNA identification, including restriction fragment length polymorphism (RFLP) analysis.</td>
</tr>
<tr>
<td>SC.912.L.16.12</td>
<td>Describe how basic DNA technology (restriction digestion by endonucleases, gel electrophoresis, polymerase chain reaction, ligation, and transformation) is used to construct recombinant DNA molecules (DNA cloning).</td>
</tr>
<tr>
<td>SC.912.L.16.13</td>
<td>Describe the basic anatomy and physiology of the human reproductive system. Describe the process of human development from fertilization to birth and major changes that occur in each trimester of pregnancy.</td>
</tr>
<tr>
<td>SC.912.L.17.2</td>
<td>Explain the general distribution of life in aquatic systems as a function of chemistry, geography, light, depth, salinity, and temperature.</td>
</tr>
<tr>
<td>SC.912.L.17.3</td>
<td>Discuss how various oceanic and freshwater processes, such as currents, tides, and waves, affect the abundance of aquatic organisms.</td>
</tr>
<tr>
<td>SC.912.L.17.4</td>
<td>Describe changes in ecosystems resulting from seasonal variations, climate change and succession.</td>
</tr>
<tr>
<td>SC.912.L.17.5</td>
<td>Analyze how population size is determined by births, deaths, immigration, emigration, and limiting factors (biotic and abiotic) that determine carrying capacity.</td>
</tr>
<tr>
<td>SC.912.L.17.8</td>
<td>Recognize the consequences of the losses of biodiversity due to catastrophic events, climate changes, human activity, and the introduction of invasive, non-native species.</td>
</tr>
<tr>
<td>SC.912.L.17.9</td>
<td>Use a food web to identify and distinguish producers, consumers, and decomposers. Explain the pathway of energy transfer through trophic levels and the reduction of available energy at successive trophic levels.</td>
</tr>
<tr>
<td>SC.912.L.17.10</td>
<td>Diagram and explain the biogeochemical cycles of an ecosystem, including water, carbon, and nitrogen cycle.</td>
</tr>
<tr>
<td>SC.912.L.17.11</td>
<td>Evaluate the costs and benefits of renewable and nonrenewable resources, such as water, energy, fossil fuels, wildlife, and forests.</td>
</tr>
<tr>
<td>SC.912.L.17.12</td>
<td>Discuss the political, social, and environmental consequences of sustainable use of land.</td>
</tr>
<tr>
<td>SC.912.L.17.13</td>
<td>Discuss the need for adequate waste management strategies.</td>
</tr>
<tr>
<td>SC.912.L.17.14</td>
<td>Assess the need for adequate waste management strategies.</td>
</tr>
<tr>
<td>SC.912.L.17.15</td>
<td>Discuss the effects of technology on environmental quality.</td>
</tr>
<tr>
<td>SC.912.L.17.16</td>
<td>Discuss the large-scale environmental impacts resulting from human activity, including waste spills, oil spills, runoff, greenhouse gases, ozone depletion, and surface and groundwater pollution.</td>
</tr>
<tr>
<td>SC.912.L.17.20</td>
<td>Predict the impact of individuals on environmental systems and examine how human lifestyles affect sustainability.</td>
</tr>
<tr>
<td>SC.912.L.18.1</td>
<td>Describe the basic molecular structures and primary functions of the four major categories of biological macromolecules.</td>
</tr>
<tr>
<td>SC.912.L.18.6</td>
<td>Discuss the role of anaerobic respiration in living things and in human society.</td>
</tr>
<tr>
<td>SC.912.L.18.9</td>
<td>Explain the interrelated nature of photosynthesis and cellular respiration.</td>
</tr>
<tr>
<td>SC.912.L.18.11</td>
<td>Explain the role of enzymes as catalysts that lower the activation energy of biochemical reactions. Identify factors, such as pH and temperature, and their effect on enzyme activity.</td>
</tr>
</tbody>
</table>

Define a problem based on a specific body of knowledge, for example: biology, chemistry, physics, and earth/space science, and do the following:
1. Pose questions about the natural world, (Articulate the purpose of the investigation and identify the relevant scientific concepts).
2. Conduct systematic observations, (Write procedures that are clear and replicable. Identify observables and examine relationships between
SC.912.N.1.2: Examine books and other sources of information to see what is already known, and conduct and record measurements at appropriate levels of precision. Follow safety guidelines.

SC.912.N.1.3: Review what is known in light of empirical evidence. (Examine whether available empirical evidence can be interpreted in terms of existing knowledge and models, and if not, modify or develop new models).

SC.912.N.1.4: Plan investigations. (Design and evaluate a scientific investigation).

SC.912.N.1.5: Use tools to gather, analyze, and interpret data (this includes the use of measurement in metric and other systems, and also the generation and interpretation of graphical representations of data, including data tables and graphs). (Collect data or evidence in an organized way. Properly use instruments, equipment, and materials (e.g., scales, probeware, meter sticks, microscopes, computers) including set-up, calibration, technique, maintenance, and storage).

SC.912.N.1.6: Pose answers, explanations, or descriptions of events.

SC.912.N.1.7: Generate explanations that explicate or describe natural phenomena (inferences).

SC.912.N.1.8: Communicate results of scientific investigations, and

SC.912.N.1.9: Evaluate the merits of the explanations produced by others.

SC.912.N.1.10: Recognize that the strength or usefulness of a scientific claim is evaluated through scientific argumentation, which depends on critical and logical thinking, and the active consideration of alternative scientific explanations to explain the data presented.

SC.912.N.1.11: Identify sources of information and assess their reliability according to the strict standards of scientific investigation.

SC.912.N.1.12: Describe how scientific inferences are drawn from scientific observations and provide examples from the content being studied.

SC.912.N.1.13: Recognize the role of creativity in constructing scientific questions, methods and explanations.

SC.912.N.1.14: Explain how scientific knowledge and reasoning provide an empirically-based perspective to inform society's decision making.

SC.912.P.12.12: Explain how various factors, such as concentration, temperature, and presence of a catalyst affect the rate of a chemical reaction.

ELD.K12.ELL.SC.1: English language learners communicate information, ideas and concepts necessary for academic success in the content area of Science.

ELD.K12.ELL.SI.1: English language learners communicate for social and instructional purposes within the school setting.

The student will organize information to show understanding or relationships among facts, ideas, and events (e.g., representing key points within text through charting, mapping, paraphrasing, summarizing, comparing, contrasting, or outlining).

**Clarifications:**

- Assess human rights policies of the United States and other countries.

The student will record information and ideas from primary and/or secondary sources accurately and coherently, noting the validity and reliability of these sources and attributing sources of information;

**Clarifications:**

- Example: A student is designing a survey to gauge levels of stress in a population of high schools students. Is "stress" something that can be directly measured? How should the student define "stress" so that it can be objectively and consistently measured?

Collect, organize, and analyze data sets, determine the best format for the data and present visual summaries from the following:

- bar graphs
- line graphs
- stem and leaf plots
- circle graphs
- histograms
- box and whisker plots
- scatter plots
- cumulative frequency (ogive) graphs

**Clarifications:**

- Example: Gather data to answer the question: which area of the country has the highest dropout rate? Display your dropout data in appropriate formats. Example: given a set of data, use appropriate technology to sort the data and to display a histogram or other chart.

Evaluate how environment and personal health are interrelated.

**Clarifications:**

- Food options within a community; prenatal-care services; availability of recreational facilities; air quality; weather-safety awareness; and weather, air, and water conditions.

Analyze how heredity and family history can impact personal health.

**Clarifications:**

- Some examples may include drug use, family obesity, heart disease, mental health, and non-communicable illness or disease.
GENERAL NOTES

Credits: 0.5 Science/0.5 CTE

Notes: Laboratory investigations which include the use of scientific inquiry, research, measurement, problem solving, laboratory apparatus and technologies, experimental procedures, and safety procedures are an integral part of this course.

Special Notes:

Instructional Practices

Teaching from a range of complex text is optimized when teachers in all subject areas implement the following strategies on a routine basis:

1. Ensuring wide reading from complex text that varies in length.
2. Making close reading and rereading of texts central to lessons.
3. Emphasizing text-specific complex questions, and cognitively complex tasks, reinforce focus on the text and cultivate independence.
4. Emphasizing students supporting answers based upon evidence from the text.
5. Providing extensive research and writing opportunities (claims and evidence).


- Asking questions (for science) and defining problems (for engineering).
- Developing and using models.
- Planning and carrying out investigations.
- Analyzing and interpreting data.
- Using mathematics, information and computer technology, and computational thinking.
- Constructing explanations (for science) and designing solutions (for engineering).
- Engaging in argument from evidence.
- Obtaining, evaluating, and communicating information.

English Language Development ELD Standards Special Notes Section:

Teachers are required to provide listening, speaking, reading and writing instruction that allows English language learners (ELL) to communicate information, ideas and concepts for academic success in the content area of Science. For the given level of English language proficiency and with visual, graphic, or interactive support, students will interact with grade level words, expressions, sentences and discourse to process or produce language necessary for academic success. The ELD standard should specify a relevant content area concept or topic of study chosen by curriculum developers and teachers which maximizes an ELL's need for communication and social skills. To access an ELL supporting document which delineates performance definitions and descriptors, please click on the following link:

https://cpalmsmediaprod.blob.core.windows.net/uploads/docs/standards/eld/sc.pdf

QUALIFICATIONS

As well as any certification requirements listed on the course description, the following qualifications may also be acceptable for the course:

Biology Grades 6-12 Certification AND Biotechnology District-issued Employment Certificate

OR

Chemistry Grades 6-12 Certification AND Biotechnology District-issued Employment Certificate

GENERAL INFORMATION

Course Number: 3027020

Course Type: Core Academic Course

Course Status: Draft - Course Pending Approval

Grade Level(s): 9,10,11,12

Course Path: Section: Grades PreK to 12 Education Courses > Grade Group: Grades 9 to 12 and Adult Education Courses > Subject: Science > SubSubject: Integrated Sciences > Section: Career and Technical Education > Cluster: Manufacturing > Program: 8736000 > Program Version: Industrial Biotechnology > Abbreviated Title: BIOTECH 2

Course Length: Year (Y)

Course Level: 3
The curriculum description for this IB course is provided at http://www.ibo.org/en/programmes/.

### GENERAL INFORMATION

**Course Number:** 3028300  
**Number of Credits:** One (1) credit  
**Course Type:** Elective Course  
**Course Status:** Draft - Course Pending Approval  
**Grade Level(s):** 9,10,11,12

**Course Path:** Section: Grades PreK to 12 Education  
Courses > Grade Group: Grades 9 to 12 and Adult Education Courses > Subject: Science > SubSubject: Integrated Sciences  
**Abbreviated Title:** IB FOOD SCI & TECH 1  
**Course Length:** Year (Y)  
**Course Attributes:**  
- International Baccalaureate (IB)  
**Course Level:** 3

### Educator Certifications

| Science (Secondary Grades 7-12) |  
| Family and Consumer Science (Grades 6-12) |  
| School Food Service (Career & Technical) |  
| School Food Service (District-issued Employment Certificate) |  
| Home Economics Occupations (Career & Technical) |  
| Home Economics Occupations (District-issued Employment Certificate) |  
| Culinary Operations (Career & Technical) |  
| Culinary Operations (District-issued Employment Certificate) |
The curriculum description for this IB course is provided at http://www.ibo.org/en/programmes/.

**GENERAL INFORMATION**

Course Number: 3028310

Number of Credits: One (1) credit

Course Type: Elective Course

Course Status: Draft - Course Pending Approval

Grade Level(s): 9,10,11,12

**Course Path: Section:** Grades PreK to 12 Education Courses > Grade Group: Grades 9 to 12 and Adult Education Courses > Subject: Science > SubSubject: Integrated Sciences

**Abbreviated Title:** IB FOOD SCI & TECH 2

**Course Length:** Year (Y)

**Course Attributes:**
- International Baccalaureate (IB)

**Course Level:** 3

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**Educator Certifications**

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