Florida Interim Assessment Item Bank and Test Platform

Item Specifications

Science
Grades 6–8

FLORIDA DEPARTMENT OF EDUCATION
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Tallahassee, Florida
32399-0400

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I. Introduction

The U.S. Department of Education awarded a Race to the Top grant to Florida in August 2010. An important component of this grant focused on the development of high-quality assessment items and balanced assessments for use by districts, schools, and teachers. The assessment items will be stored in the Florida Interim Assessment Item Bank and Test Platform (IBTP), a statewide secure system which allows Florida educators to search the item bank, export test items, and generate customized high-quality assessments for computer-based delivery or paper-and-pencil delivery. The IBTP allows Florida educators to determine what students know and are able to do relative to instruction on Florida's Next Generation Sunshine State Standards and the Common Core State Standards (CCSS).

A. Purpose of the Item Specifications

The *Item Specifications* define the expectations for content, standards alignment, and format of assessment items for the Item Bank and Test Platform. The *Item Specifications* are intended for use by item writers and reviewers in the development of high-quality assessment items.

B. Scope

The *Item Specifications* provide general and grade-specific guidelines for the development of all Grades 6–8 Science assessment items available in the Florida Interim Assessment Item Bank.

C. Standards Alignment

Items developed for the Florida Interim Assessment Item Bank and Test Platform will align to the Next Generation Sunshine State Standards for Science and, where appropriate and applicable, the Common Core State Standards for Mathematics and Literacy in Science and Technical Subjects.

1. Next Generation Sunshine State Standards

Florida's Next Generation Sunshine State Standards (NGSSS) for Science provide the basis for science teaching and learning in Florida's public schools. For Grades K–8, the NGSSS are divided into benchmarks that identify what a student should know and be able to do at each grade level. The NGSSS are available at *http://www.floridastandards.org/homepage/index.aspx*.

2. Common Core State Standards

Appendix B of this document provides a list of the CCSS Mathematics and Literacy Standards associated with the Grades 6–8 science courses. Assessment items for science should be aligned to one or more of the associated CCSS, whenever appropriate, in addition to the targeted science benchmark.

II. Criteria for Item Development

Science item writers for the Florida Interim Assessment Item Bank must have a comprehensive knowledge of science curriculum based on the Next Generation Sunshine State Standards and an understanding of the range of cognitive abilities of the target student population. Item writers should understand and consistently apply the guidelines established in this document. Item writers are expected to use their best judgment in writing items that measure the science benchmarks of the NGSSS and the CCSS, where appropriate, without introducing extraneous elements that reflect bias for or against a group of students.

A. Overall Considerations for Item Development

These guidelines are provided to ensure the development of high-quality assessment items for the Florida Interim Assessment Item Bank.

1. Each item should be written to measure primarily one NGSSS benchmark; however, other benchmarks may also be addressed for some item types.
2. Whenever possible, each item will also be aligned to a secondary CCSS Mathematics and/or Literacy standard applicable to a particular grade.
3. Items should be appropriate for students in terms of grade-level instruction, experience and difficulty, cognitive development, and reading level. The reading level of the test items should be on grade level. (Refer to the glossaries in CPALMS for each course.)
4. Of the assessment items associated with a given benchmark, 50% or more should meet or exceed the cognitive level (DOK) of the benchmark.
5. Each item should be written clearly and unambiguously to elicit the desired response.
6. Items should not disadvantage or exhibit disrespect to anyone in regard to age, gender, race, ethnicity, language, religion, socioeconomic status, disability, occupation, or geographic region.

B. Item Contexts

The context in which an item is presented is called the item context or scenario. These guidelines are provided to assist item writers with development of items within an appropriate context.

1. The item context should be designed to interest students at the targeted level. Scenarios should be appropriate for students in terms of grade-level experience and difficulty, cognitive development, and reading level.
2. The context should be directly related to the question asked. The context should lead the student cognitively to the question. Every effort should be made to keep items as concise as possible without losing cognitive flow or missing the overall idea or concept.
3. Information and/or data in items must be accurate and verifiable using reliable sources. Source documentation should accompany items as needed.

4. All item scenarios, graphics, diagrams, and illustrations must be age-, grade-, and experience-appropriate.
5. Item contexts and illustrations depicting individuals conducting laboratory investigations should include proper safety equipment and model safe laboratory procedures.
6. Scenarios describing scientific investigations should model current science methodology and adhere to the Intel International Science and Engineering Fair Rules and Guidelines unless otherwise noted in the benchmark clarification statements. These rules and guidelines can be found using the Document Library link at: *http://www.societyforscience.org/ISEF*.
7. Grades 6–8 items and illustrations may use common primary school tools, including balances, batteries, beakers, compasses, eyedroppers, flashlights, globes, graduated cylinders, light bulbs, magnets, magnifying glasses or hand lenses, metric measuring tapes, metric rulers, microscopes, microscope slides, mirrors, models, safety goggles, spring scales, stopwatches, telescopes, test tubes, thermometers, topographic maps, and tuning forks.
8. The item content should be timely but not likely to become dated.

C. Use of Media

Media can be used to provide either necessary or supplemental information—that is, some media contain information that is necessary for answering the question, while other media support the context of the question. Items may include diagrams, illustrations, charts, tables, audio files, or video files unless otherwise noted in the Individual Benchmark Specifications.

1. Items should not begin with media. Media in items is always preceded by text.
2. All visual media (tables, charts, graphs, photographs, etc.) should be titled. Titles should be in all caps, boldfaced, and centered, and may be placed above or below the visual media.

D. Item Style and Format

This section presents stylistic guidelines and formatting directions that should be followed while developing items.

1. Items should be clear and concise and should use vocabulary and sentence structure appropriate for the assessed grade level. Writers should refer to the resources provided during item writer training and to the glossaries in CPALMS.
2. The words *most likely* or *best* should be used only when appropriate to the question.
3. At Grades 6–8, temperatures should be given in degrees Celsius unless otherwise noted in the Individual Benchmark Specifications.
4. Metric units of measure should be used in scenarios addressing mass, length, weight, and/or volume. International System of Units (SI) should be used unless otherwise noted in the Individual Benchmark Specifications.

5. The first occurrence of units of measure should be written out in the item stem, e.g., kilograms (kg). In graphics, an abbreviation may be used (e.g., g or cm). To avoid confusion between the preposition *in* and the abbreviation for inches, only units of measure in graphics should be presented, e.g., height (cm) NOT height (in cm).
6. In titles of tables and charts and in labels for axes, the unit of measure should be included, preferably in lowercase and in parentheses, e.g., height (m).
7. Items requiring art should be to scale whenever possible. If not possible, a not-to-scale text box should be included at the bottom left of the art.
8. Graphics in items should be clearly labeled and contain all necessary information.
9. Items referring to new developments or discoveries should include phrases similar to *according to current knowledge* or *based on current knowledge*.
10. Items using the word *not* should emphasize the word *not* using all uppercase letters (e.g., Which of the following is NOT an example of . . .). The word *not* should be used sparingly.
11. As appropriate, boldface type should be used to emphasize key words in the item (e.g., **least**, **most**, **greatest**, **percent**, **best**).
12. Masculine pronouns should NOT be used to refer to both sexes. Name(s) should be used whenever possible to avoid gender-specific pronouns (e.g., instead of "The student will make changes so that he . . .", use "John and Maria will make changes so that they . . .").
13. Decimal numbers between –1 and 1 should have a leading zero.
14. SI units should be expressed in a single type of unit when possible (e.g., 1.4 kilograms instead of 1 kilogram 400 grams).
15. Commas should be used in numbers greater than or equal to 1,000 except for numbers having an SI unit. In this case, numbers with four digits should be presented without a comma or a space (e.g., 9960 meters). Numbers with more than four digits should be presented with a thin space inserted in place of a comma (e.g., 10 123 kilograms).
16. In most cases, scenarios involving elements, chemical formulas, or chemical symbols and/or equations should be written out followed by the abbreviation, e.g., carbon dioxide (CO_2).
17. In the item stem, values needed to compute answers should be presented as numerals.

E. Item Types

This section presents guidelines for development of the following types of items:

- Selected Response (SR)—1 point
- Gridded Response (GR)—1 point
- Short Response (SHR)—1 point
- Constructed Response (CR)—2 points
- Extended Response (ER)—4 points
- Essay Response (ESR)—6 points
- Performance Task (PT)—1–10 points

1. Selected Response (SR) Items (1 point)

Selected response items require students to choose an answer from the choices given. Each item consists of a stem and either three or four answer options, depending on the grade level (see #3 below). One of the answer options is the correct answer, and the remaining options are called distractors. Selected response items may also include a stimulus and/or passage.

1. SR items should take approximately one minute per item to answer.
2. SR items are worth one point each.
3. SR items for grades K, 1, and 2 should have three answer options (A, B, and C). SR items for all other grades and courses should have four answer options (A, B, C, and D).
4. SR items must have only one correct answer option.
5. During item development and review, the correct response should be indicated.
6. During item development and review, the rationale for distractors (incorrect answer choices) should be indicated. The rationale should include information explaining why a student would select that distractor.
7. Distractor rationales should represent computational or conceptual errors or misconceptions commonly made by students who have not mastered the assessed concepts.
8. Each distractor should be a believable answer (i.e., plausible, but incorrect).
9. All answer options should be written in a style appropriate to the question asked. For example, a "how" question should have answer options that explain how.
10. Options should have parallel structure whenever possible. Test item options should not have an outlier (e.g., an answer option that is significantly longer than or different from the other options).
11. Items should not be clued or answered by information in the stem or other options.

12. Options such as *none of the above*, *all of the above*, *not here*, *not enough information*, or *cannot be determined* should not be used as answer options.
13. If an option is a single word or a phrase, the option should start with a lowercase letter. If an option is a sentence, the sentence should be conventionally capitalized and punctuated. Options that are imperatives should be treated as sentences.
14. Answer options that are single words should be arranged in alphabetical or reverse alphabetical order.
15. Answer options that are phrases or sentences should be arranged from shortest to longest or longest to shortest.
16. Numerical answer options should be arranged in ascending or descending order.
17. Numerical answer options that represent relative magnitude or size should be arranged as they are shown in the stem or in some other logical order.
18. When the item requires the identification of a choice from the item stem, table, chart, or illustration, the options should be arranged as they are presented in the item stem, table, chart, or illustration.
19. If the answer options for an item are neither strictly numerical nor denominate numbers, the options should be arranged by the logic presented in the item, by alphabetical order, or by length.

2. Gridded Response (GR) Items (1 point)

Gridded response questions are worth 1 point each. The questions require students to solve problems and mark their answers by filling in the appropriate bubbles for the numbers on answer grids. Students must accurately complete the grid to receive credit for their answers.

3. Short Response (SHR) Items (1 point)

Short Response items usually include a scenario and instructions on how to respond. The recommended time allotment for a student to respond is 3 minutes. A complete answer is worth 1 point. There are no partial points for this item type.

4. Constructed Response (CR) Items (2 points)

Constructed response items usually include a scenario and instructions on how to respond. The recommended time allotment for a student to respond is 5 minutes. A complete answer is worth 2 points and a partial answer is worth

1 point. The constructed response holistic rubric and exemplar specific to each item are used for scoring as follows:

SCORING RUBRIC	
2	A score of two indicates that the student has demonstrated a thorough understanding of the scientific concepts and/or procedures embodied in the task. The student has completed the task correctly, in a scientifically sound manner. When required, student explanations and/or interpretations are clear and complete. The response may contain minor flaws that do not detract from the demonstration of a thorough understanding.
1	A score of one indicates that the student has provided a response that is only partially correct. For example, the student may arrive at an acceptable conclusion or provide an adequate interpretation, but may demonstrate some misunderstanding of the underlying scientific concepts and/or procedures. Conversely, a student may arrive at an unacceptable conclusion or provide a faulty interpretation, but could have applied appropriate and scientifically sound concepts and/or procedures.
0	A score of zero indicates that the student has not provided a response or has provided a response that does not demonstrate an understanding of the scientific concepts and/or procedures embodied in the task. The student's explanation may be uninterpretable, lack sufficient information to determine the student's understanding, contain clear misunderstandings of the underlying scientific concepts and/or procedures, or may be incorrect.

Exemplars: A specific exemplar should be developed for each constructed response item. Exemplars will be used as scoring guides and should be specific to the item, but not so specific as to discount multiple correct answers. Exemplars should include a clear and defensible description of the top score point, and contain straightforward language that is accurate, complete, and easy to interpret.

5. **Extended Response (ER) Items (4 points)**

Extended response items include a scenario and instructions on how to respond and are worth 4 score points. However, ER items are usually more complex than SHR items and 2-point CR items. The recommended time allotment for a student to respond is 10–15 minutes. The extended response holistic rubric and exemplar specific to each item are used for scoring as follows:

SCORING RUBRIC	
4	A score of four indicates that the student has demonstrated a thorough understanding of the scientific concepts and/or procedures embodied in the task. The student has completed the task correctly, used scientifically sound procedures, and provided clear and complete explanations and interpretations. The response may contain minor flaws that do not detract from a demonstration of a thorough understanding.
3	A score of three indicates that the student has demonstrated an understanding of the scientific concepts and/or procedures embodied in the task. The student's response to the task is essentially correct, but the scientific procedures, explanations, and/or interpretations provided are not thorough. The response may contain minor flaws that reflect inattentiveness or indicate some misunderstanding of the underlying scientific concepts and/or procedures.
2	A score of two indicates that the student has demonstrated only a partial understanding of the scientific concepts and/or procedures embodied in the task. Although the student may have arrived at an acceptable conclusion or provided an adequate interpretation of the task, the student's work lacks an essential understanding of the underlying scientific concepts and/or procedures. The response may contain errors related to misunderstanding important aspects of the task, misuse of scientific procedures/processes, or faulty interpretations of results.
1	A score of one indicates that the student has demonstrated a very limited understanding of the scientific concepts and/or procedures embodied in the task. The student's response is incomplete and exhibits many flaws. Although the student's response has addressed some of the conditions of the task, the student has reached an inadequate conclusion and/or provided reasoning that is faulty or incomplete. The response exhibits many flaws or may be incomplete.
0	A score of zero indicates that the student has not provided a response or has provided a response that does not demonstrate an understanding of the scientific concepts and/or procedures embodied in the task. The student's explanation may be uninterpretable, lack sufficient information to determine the student's understanding, contain clear misunderstandings of the underlying scientific concepts and/or procedures, or may be incorrect.

Exemplars: A specific exemplar should be developed for each extended response item. Exemplars will be used as scoring guides and should be specific to the item, but not so specific as to discount multiple correct answers. Exemplars should include a clear and defensible description of the top score point, and contain straightforward language that is accurate, complete, and easy to interpret.

6. **Essay Response (ESR) Items (6 points)**

   Essay response items consist of asking a general question or providing a stimulus (such as an article or research paper on a relevant topic), and asking the students to express their thoughts or provide facts about the topic using logic and reason. Essay response items encompass a higher level of thinking and a broader range of skills that includes CCSS literacy standards, both of which are critical to future success in higher education and the workforce.

   In most cases, essay responses will go beyond a single paragraph in length, with a distinct introduction, body, and conclusion. An essay response will be worth a total of 6 points, with a rubric structure similar to that of the 4-point extended response. Students should be given about 20 to 30 minutes to complete each item.

   Exemplars: A specific exemplar should be developed for each essay response item. Exemplars will be used as scoring guides and should be specific to the item, but not so specific as to discount multiple correct answers. Exemplars should include a clear and defensible description of the top score point, and contain straightforward language that is accurate, complete, and easy to interpret.

7. **Performance Task (PT) Items (1–10 points)**

   Performance tasks are used to measure students' ability to *demonstrate* knowledge and skills from one or more benchmarks of the NGSSS and the CCSS. Specifically, performance tasks may require students to create a product, demonstrate a process, or perform an activity that demonstrates proficiency in science. They are evaluated using customized scoring rubrics, and each task may be worth 1–10 points. Performance tasks may have the following characteristics:

   1. Performance tasks may cover a short time period or may cover an extended period of time.
   2. Performance tasks must contain clear and explicit directions for understanding and completing the required component tasks and producing the objective output.
   3. All tasks, skills, and/or behaviors required by the performance tasks must be objective, observable, and measurable.
   4. All necessary equipment, materials, and resources should be referenced within the text of the performance task.
   5. Performance tasks should elicit a range of score points.
   6. Performance tasks generally require students to organize, apply, analyze, synthesize, and/or evaluate concepts.

7. Performance tasks may measure performance in authentic situations and outside the classroom, where appropriate and practical.
8. Typical response formats include demonstrations, laboratory performance, oral presentations, exhibits, or other products.
9. Every performance task requires a companion rubric to be used for scoring purposes. Rubrics should meet the following criteria:
    a. The rubrics and performance tasks should be developed in tandem to ensure compatibility.
    b. Rubrics must be specific to the individual requirements of each performance task; generic rubrics are not acceptable.
    c. The rubric must allow for efficient and consistent scoring.
    d. The customized rubric will also serve as an exemplar and should include a clear and defensible description of the top score point, and contain straightforward language that is accurate, complete, and easy to interpret.
    e. The highest score descriptor should allow for all foreseeable methods of correctly and thoroughly completing all requirements of the performance task.

A performance task may address one or more benchmarks or standards and may be composed of multiple items. The expectation is the performance tasks will include a demonstration of the student's mastery of the benchmark or standard. Items are expected to have rubrics.

F. Complex Stimuli and Reading Passages

The cross-curricular focus on aligning Florida IBTP items with the Common Core State Standards for mathematics and literacy make complex reading passages important components of the item bank. A passage is a segment of written work, followed by a series of questions that assess the student's comprehension of reading and the content presented. Some science items will be associated with a reading passage, while others will be standalone items.

G. Readability

Items must be written with readability in mind. In addition, vocabulary must be appropriate for the grade level being tested. The following sources provide information about the reading level of individual words:

Taylor, Stanford E. *EDL Core Vocabularies: Reading, Mathematics, Science, and Social Studies*. Austin, TX: Steck-Vaughn-EDL, 1989.

Mogilner, Alijandra. *Children's Writer's Word Book*. Cincinnati, OH: Writer's Digest Books, 1992.

H. Cognitive Complexity

1. Overview

Florida's adoption of the Common Core State Standards (CCSS) for Mathematics and English Language Arts & Literacy in History/Social Studies, Science, and Technical Subjects presents Florida with an opportunity to revise its current Depth of Knowledge (DOK) Model of Cognitive Complexity. More information about Florida's Depth of Knowledge levels is available online at http://www.cpalms.org/cpalms/dok.aspx.

2. Levels of Depth of Knowledge for Science

Interpreting and assigning Depth of Knowledge levels to objectives within science standards and assessment items is an essential requirement of alignment analysis. Please note that, in science, "knowledge" can refer to content knowledge, knowledge of science processes, and nature of science.

Level 1 (Recall) is the recall of information such as a fact, definition, or term, as well as performing a simple science process or procedure. Level 1 only requires students to demonstrate a rote response; use a well-known formula; follow a set, well-defined procedure (like a recipe); or perform a clearly defined series of steps. Standards that lend themselves to simple word problems that can be directly translated into and solved by a formula are considered Level 1. Some examples that represent but do not constitute all of Level 1 performance are:

- Recall or recognize a fact, term, or property.
- Represent in words or diagrams a scientific concept or relationship.
- Provide or recognize a standard scientific representation for simple phenomena.
- Perform a routine procedure, such as measuring length.
- Identify familiar forces (e.g., pushes, pulls, gravitation, friction, etc.)
- Identify objects and materials as solids, liquids, or gases.

Level 2 (Basic Application of Concepts & Skills) includes the engagement of some mental processing beyond recalling or reproducing a response. The content knowledge or process involved is more complex than in Level 1. Level 2 requires that students make some decisions as to how to approach the question or problem. Level 2 activities include making observations and collecting data; classifying, organizing, and comparing data; and representing and displaying data in tables, graphs, and charts.

Some action verbs, such as "explain," "describe," or "interpret," may be classified at different DOK levels, depending on the complexity of the action. For example, interpreting information from a simple graph, which requires reading information from the graph, is at Level 2. An activity that requires interpretation from a complex graph, such as making decisions regarding features of the graph that should be considered and how

information from the graph can be aggregated, is at Level 3. Some examples that represent but do not constitute all of Level 2 performance are:

- Specify and explain the relationships among facts, terms, properties, and variables.
- Identify variables, including controls, in simple experiments.
- Distinguish between experiments and systematic observations.
- Describe and explain examples and non-examples of science concepts.
- Select a procedure according to specified criteria, and perform it.
- Formulate a routine problem given data and conditions.
- Organize and represent data.

Level 3 (Strategic Thinking & Complex Reasoning) requires reasoning, planning, using evidence, and a higher level of thinking than the previous two levels. The cognitive demands at Level 3 are complex and abstract. The complexity results not only from the fact that there could be multiple answers, a possibility for both Levels 1 and 2, but also because the multi-step task requires more demanding reasoning. In most instances, requiring students to explain their thinking is at Level 3; requiring a very simple explanation or a word or two should be at Level 2. An activity that has more than one possible answer and requires students to justify the response they give would most likely be at Level 3.

Experimental designs in Level 3 typically involve more than one dependent variable. Other Level 3 activities include drawing conclusions from observations; citing evidence and developing a logical argument for concepts; explaining phenomena in terms of concepts; and using concepts to solve non-routine problems. Some examples that represent but do not constitute all of Level 3 performance are:

- Identify research questions and design investigations for a scientific problem.
- Design and execute an experiment or systematic observation to test a hypothesis or research question.
- Develop a scientific model for a complex situation.
- Form conclusions from experimental data.
- Cite evidence that living systems follow the laws of conservation of mass and energy.
- Explain how political, social, and economic concerns can affect science, and vice versa.
- Create a conceptual or mathematical model to explain the key elements of a scientific theory or concept.
- Explain the physical properties of the Sun and its dynamic nature and connect them to conditions and events on Earth.

- Analyze past, present, and potential future consequences to the environment resulting from various energy production technologies.

Level 4 (Extended Thinking & Complex Reasoning) standards and assessment items have the same high cognitive demands as Level 3 with the additional requirement that students work over an extended period of time or with extended effort. Students are required to make several connections—relating ideas within the content area or among content areas—and have to select or devise one approach among many alternatives for how the situation or problem can be solved. Standards, goals, and objectives can be stated in such a way as to expect students to perform extended thinking. Many, but not all, performance assessments and open-ended assessment activities requiring significant thought will be at Level 4.

Level 4 requires complex reasoning and an extended period of time either for a science investigation relevant to a standard or for carrying out the complex analysis and synthesis required of an assessment item. For example, a standard or performance task that calls for the student to use evidence from multiple fields of scientific inquiry in supporting a scientific claim might be classified at Level 4, depending upon the complexity of the analysis. In any event, an activity or performance task associated with a Level 4 standard will require an extended period of time for a student to accomplish.

It is important to reiterate that the extended time period is not a distinguishing factor if the required work is only repetitive and does not require the application of significant conceptual understanding and higher-order thinking. For example, an activity that calls upon a student to measure the water temperature from a river each day for a month before constructing a graph would be classified as at Level 2. On the other hand, an activity that calls upon a student to conduct a complex river study that requires taking into consideration a number of variables would be at Level 4. Some examples that represent but do not constitute all of a Level 4 performance are:

- Based on provided data from a complex experiment that is novel to the student, deduce the fundamental relationships among several variables.
- Conduct an investigation, from specifying a problem to designing and carrying out an experiment and analyzing data and forming conclusions.
- Explain how a particular scientific theory (e.g., evolution, plate tectonics, atomic theory, etc.) is supported by evidence from multiple lines of inquiry.
- Produce a detailed report of a scientific experiment or systematic observation, and infer conclusions based upon evidence obtained.
- Write a detailed history of the development of an important scientific concept (e.g., atomic theory, gravitation) and explain how current conceptions developed from prior ones.

I. Item Difficulty

Item writers will not be expected to make a prediction of difficulty for each item created. However, item writers should develop items that reflect a range of difficulty levels.

J. Universal Design

The application of universal design principles helps develop assessments that are usable to the greatest number of students, including students with disabilities and nonnative speakers of English. To support the goal of providing access to all students, the items in the Florida Interim Assessment Item Bank maximize readability, legibility, and compatibility with accommodations, and item development includes a review for potential bias and sensitivity issues.

Items must allow for the widest possible range of student participation. Item writers must attend to the best practices suggested by universal design, including, but not limited to,

- reduction in wordiness;
- avoidance of ambiguity;
- selection of reader-friendly construction and terminology; and
- consistently applied concept names and graphic conventions.

Universal design principles also inform decisions about item layout and design, including, but not limited to, type size, line length, spacing, and graphics.

K. Sample Items

Appendix A of this document contains a selection of sample items. The sample items represent a range of cognitive complexities and item types.

III. Review Procedures for Florida Interim Assessment Item Bank Items

Prior to being included in the Florida Interim Assessment Item Bank, items must pass several levels of review as part of the item development process.

A. Review for Item Quality

Assessment items developed for the Florida Interim Assessment Item Bank are reviewed by Florida educators, the FDOE, and the Item Bank contractors to ensure the quality of the items, including grade-level appropriateness, standards alignment, accuracy, and other criteria for overall item quality.

B. Review for Bias and Sensitivity

Items are reviewed by groups of Florida educators generally representative of Florida's geographic regions and culturally diverse population. Items are reviewed for the following kinds of bias: gender, racial, ethnic, linguistic, religious, geographic, and socioeconomic. Item reviews also include consideration of issues related to individuals with disabilities.

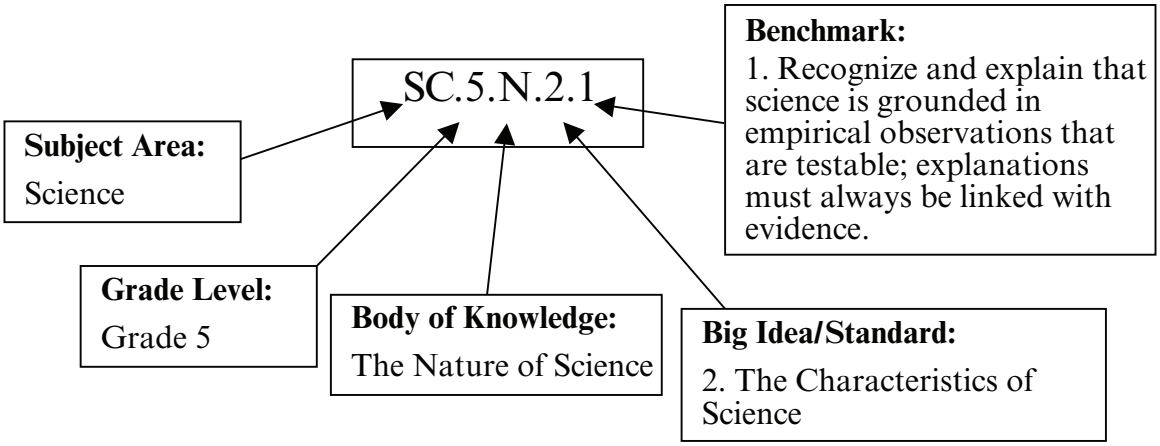
This review is to ensure that the primary purpose of assessing student achievement is not undermined by inadvertently including in the item bank any material that students, parents, or other stakeholders may deem inappropriate. Reviewers are asked to consider the variety of cultural, regional, philosophical, political, and religious backgrounds throughout Florida and to determine whether the subject matter will be acceptable to Florida students, their parents, and other members of Florida communities.

IV. Guide to the Individual Benchmark Specifications

A. Benchmark Classification System

Each benchmark in the NGSSS is labeled with a system of numbers and letters.

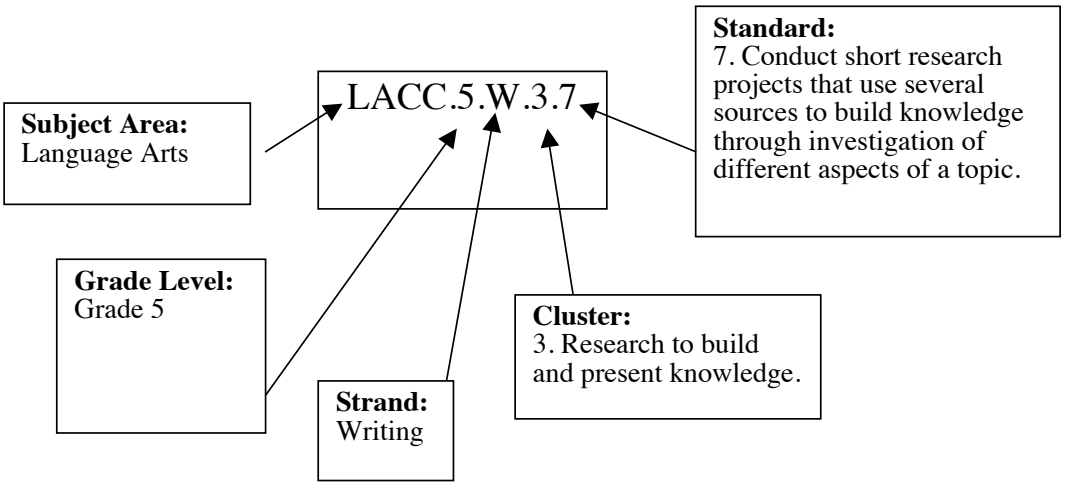
- The two letters in the *first position* of the code identify the **Subject Area**.
- The number(s) in the *second position* represent the **Grade Level**.
- The letter in the *third position* represents the **Body of Knowledge**.
- The number in the *fourth position* represents the **Big Idea/Standard**.
- The number in the *last position* identifies the specific **Benchmark**.



B. Common Core State Standard Classification System

Each standard in the CCSS is also labeled with a system of numbers and letters.

- The four letters in the *first position* of the code identify the **Subject Area**.
- The number(s) in the *second position* represent the **Grade Level**.
- The letter in the *third position* represents the **Strand**.
- The number in the *fourth position* represents the **Cluster**.
- The number in the *last position* identifies the specific **Standard**.



V. Definitions of Benchmark Specifications

The *Item Specifications* identify how the benchmarks in Florida's NGSSS and the CCSS are assessed by items in the Florida Interim Assessment Item Bank. For each assessed benchmark, the following information is provided in the Individual Benchmark Specifications section.

Body of Knowledge/ Strand	refers to the general category of science knowledge (Earth/Space Science, Life Science, Physical Science, and Nature of Science).
Standard/Big Idea	refers to a main idea or description statement of general expectations regarding knowledge and skill development.
Benchmark	refers to specific statements of expected student achievement.
Common Core State Standard Connections	refers to the Common Core Literacy and Mathematics Standards that are closely related to the benchmark. (See Appendix B for a list of CCSS standards associated with this course/grade band.)
Benchmark Clarifications	explain how achievement of the benchmark will be demonstrated by students. The clarification statements explain what students are expected to do when responding to the question.
Content Limits	define the range of content knowledge and degree of difficulty that should be assessed in the items for the benchmark. Content limits may be used to identify content beyond the scope of the targeted benchmark if the content is more appropriately assessed by another benchmark. These statements help to provide validity by ensuring the test items are clearly aligned to the targeted benchmark.

VI. Individual Benchmark Specifications

This section of the *Item Specifications* provides benchmark-specific guidance for assessment item development based on the NGSSS science benchmarks for grades 6–8. Each grade level includes benchmarks from the four Bodies of Knowledge (Nature of Science, Life Science, Earth and Space Science, and Physical Science). Eighteen Big Ideas thread throughout the K–8 grade levels and build in rigor and depth as students advance.

A. Grade 6 Item Specifications

Course Number: 2002040

Benchmark HE.6.C.1.3	
Body of Knowledge/ Strand	**Health Education Concepts**
Standard	**Health Standard 1: Comprehend concepts related to health promotion and disease prevention to enhance health.**
Benchmark	**HE.6.C.1.3: Identify environmental factors that affect personal health.**
Common Core State Standard Connections	Indicate appropriate alignments to the Grade 6 CCSS Mathematics and/or Literacy Standards for Science whenever applicable. (See Appendix B.)
Benchmark Clarifications	Students will identify environmental factors that can affect personal health (e.g., air quality, water quality, food quality, and soil contamination).
Content Limits	Items for this benchmark should address only environmental factors that are familiar to students at this grade level (in line with the examples listed above).

Benchmark HE.6.C.1.8	
Body of Knowledge/ Strand	**Health Education Concepts**
Standard	**Health Standard 1: Comprehend concepts related to health promotion and disease prevention to enhance health.**
Benchmark	**HE.6.C.1.8: Explain how body systems are impacted by hereditary factors and infectious agents.**
Common Core State Standard Connections	Indicate appropriate alignments to the Grade 6 CCSS Mathematics and/or Literacy Standards for Science whenever applicable. (See Appendix B.)
Benchmark Clarifications	Students will describe or explain how body systems (primary focus on circulatory, respiratory, and digestive systems) are impacted by hereditary factors and infectious agents (e.g., cystic fibrosis affects respiratory and digestive systems, sickle cell anemia affects the circulatory system, influenza affects the respiratory system).
Content Limits	Items for this benchmark may include general symptoms of conditions but must be grade appropriate. Items for this benchmark will not address a specific genetic cause of an inherited condition or how a disease is contracted. Items for this benchmark will not ask students to determine whether a disease is inherited or caused by an infectious agent.

Benchmark SC.6.E.6.1	
Body of Knowledge/ Strand	**Earth and Space Science**
Standard	**Big Idea 6: Earth Structures**
Benchmark	**SC.6.E.6.1: 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.**
Common Core State Standard Connections	Indicate appropriate alignments to the Grade 6 CCSS Mathematics and/or Literacy Standards for Science whenever applicable. (See Appendix B.)
Benchmark Clarifications	Students will • compare and contrast physical and chemical weathering of Earth's surface; • differentiate between erosion and deposition of Earth's surface; • give examples of how Earth's surface is built up and torn down by physical and chemical weathering, erosion, and deposition; and • apply their knowledge to identify the effects of ice, oxidation, precipitation, wind, water, glaciers, beaches, and deltas in reshaping Earth.
Content Limits	Items for this benchmark may include diagrams of surface changes, physical and chemical weathering, erosion, and deposition. Items for this benchmark will not require students to examine buildup or teardown of Earth's surface due to human or animal populations.

Benchmark SC.6.E.6.2	
Body of Knowledge/ Strand	**Earth and Space Science**
Standard	**Big Idea 6: Earth Structures**
Benchmark	**SC.6.E.6.2: 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.**
Common Core State Standard Connections	Indicate appropriate alignments to the Grade 6 CCSS Mathematics and/or Literacy Standards for Science whenever applicable. (See Appendix B.)
Benchmark Clarifications	Students will list a variety of landforms on Earth's surface. Students will identify and label pictures of a variety of Earth landforms. Students will use their knowledge to identify and discuss • the landforms found in Florida; and • how landforms affect living and nonliving components in Florida ecosystems and environments.
Content Limits	Items for this benchmark may include diagrams of landforms and maps of landforms in Florida.

Benchmark SC.6.E.7.1	
Body of Knowledge/ Strand	**Earth and Space Science**
Standard	**Big Idea 7: Earth Systems and Patterns**
Benchmark	**SC.6.E.7.1: Differentiate among radiation, conduction, and convection, the three mechanisms by which heat is transferred through Earth's system.**
Common Core State Standard Connections	Indicate appropriate alignments to the Grade 6 CCSS Mathematics and/or Literacy Standards for Science whenever applicable. (See Appendix B.)
Benchmark Clarifications	Students will • compare and contrast radiation, conduction, and convection; • explain how heat is transferred through radiation, conduction, and convection; • give real-life examples of radiation, conduction, and convection; and • use their knowledge to describe how weather is related to convection and radiation, including the creation of wind.
Content Limits	Items for this benchmark may include diagrams and descriptions of heat transfer. Items for this benchmark will not require students to investigate the causes of global warming.

Benchmark SC.6.E.7.2	
Body of Knowledge/ Strand	**Earth and Space Science**
Standard	**Big Idea 7: Earth Systems and Patterns**
Benchmark	**SC.6.E.7.2: Investigate and apply how the cycling of water between the atmosphere and hydrosphere has an effect on weather patterns and climate.**
Common Core State Standard Connections	Indicate appropriate alignments to the Grade 6 CCSS Mathematics and/or Literacy Standards for Science whenever applicable. (See Appendix B.)
Benchmark Clarifications	Students will • create and explain a diagram of the water cycle; • explain the concepts of evaporation and condensation in relation to the water cycle; and • use their knowledge to identify the relationships among the cycling of water, cloud formation, precipitation, wind, weather, and climate.
Content Limits	Items for this benchmark may include diagrams of the water cycle and cloud formation. Items for this benchmark will not require students to discuss • the atmospheres of planets other than Earth; or • the causes of global warming.

Benchmark SC.6.E.7.3	
Body of Knowledge/ Strand	**Earth and Space Science**
Standard	**Big Idea 7: Earth Systems and Patterns**
Benchmark	**SC.6.E.7.3: 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.**
Common Core State Standard Connections	Indicate appropriate alignments to the Grade 6 CCSS Mathematics and/or Literacy Standards for Science whenever applicable. (See Appendix B.)
Benchmark Clarifications	Students will • define the terms associated with weather data collection; • explain the concept of global wind patterns; • identify the global winds; • label wind patterns on a global map; and • use their knowledge of global patterns and convection to identify the relationships among wind and water movement and weather.
Content Limits	Items for this benchmark may include diagrams and scenarios of wind patterns, jet streams, and high and low pressure areas.

Benchmark SC.6.E.7.4	
Body of Knowledge/ Strand	**Earth and Space Science**
Standard	**Big Idea 7: Earth Systems and Patterns**
Benchmark	**SC.6.E.7.4: Differentiate and show interactions among the geosphere, hydrosphere, cryosphere, atmosphere, and biosphere.**
Common Core State Standard Connections	Indicate appropriate alignments to the Grade 6 CCSS Mathematics and/or Literacy Standards for Science whenever applicable. (See Appendix B.)
Benchmark Clarifications	Students will • identify the characteristics of the geosphere, hydrosphere, cryosphere, atmosphere, and biosphere; • identify ways in which these spheres are linked to one another; and • describe how these interactions affect erosion, evaporation, transpiration, condensation, precipitation, atmospheric gases, flooding, and the entrance of sunlight into the atmosphere.
Content Limits	Items for this benchmark will not require students to recall the layers of the atmosphere.

Benchmark SC.6.E.7.5	
Body of Knowledge/ Strand	**Earth and Space Science**
Standard	**Big Idea 7: Earth Systems and Patterns**
Benchmark	**SC.6.E.7.5: Explain how energy provided by the Sun influences global patterns of atmospheric movement and the temperature differences between air, water, and land.**
Common Core State Standard Connections	Indicate appropriate alignments to the Grade 6 CCSS Mathematics and/or Literacy Standards for Science whenever applicable. (See Appendix B.)
Benchmark Clarifications	Students will • identify solar radiation as the transfer of energy from the Sun; • explain that the global air circulation is affected by the uneven heating of Earth's surface by solar energy, as well as by the properties of air, water, and land; • identify causes of the uneven heating of Earth (seasons, Earth's tilted axis, and rotation of Earth); • explain how the uneven heating of the atmosphere contributes to wind and weather; and • identify convection as a cause of uneven heating in the air and water.
Content Limits	Items for this benchmark may include diagrams of wind and water movement.

Benchmark SC.6.E.7.6	
Body of Knowledge/ Strand	**Earth and Space Science**
Standard	**Big Idea 7: Earth Systems and Patterns**
Benchmark	**SC.6.E.7.6: Differentiate between weather and climate.**
Common Core State Standard Connections	Indicate appropriate alignments to the Grade 6 CCSS Mathematics and/or Literacy Standards for Science whenever applicable. (See Appendix B.)
Benchmark Clarifications	Students will • associate weather with terms such as rain, sunshine, temperature, snow, storm, air pressure, humidity, and precipitation; and • describe the climate in the region where they live and compare it with at least one other region with a different climate.
Content Limits	Items for this benchmark may include descriptions of weather and statements that describe either a weather pattern or a climate type.

Benchmark SC.6.E.7.7	
Body of Knowledge/ Strand	**Earth and Space Science**
Standard	**Big Idea 7: Earth Systems and Patterns**
Benchmark	**SC.6.E.7.7: Investigate how natural disasters have affected human life in Florida.**
Common Core State Standard Connections	Indicate appropriate alignments to the Grade 6 CCSS Mathematics and/or Literacy Standards for Science whenever applicable. (See Appendix B.)
Benchmark Clarifications	Students will • discuss Florida's history of natural disasters; • identify factors that make Florida susceptible to a variety of natural disasters; • describe the effect that hurricanes and tropical storms have on Florida's economy; • identify the effects of storm surges and flooding on property and beaches in Florida; • identify the dangers and effects of sinkholes in Florida; • explain how Florida droughts lead to water restriction and how wildfires damage property; and • apply their knowledge to discuss the actions Floridians have taken to better prepare themselves and their property against natural disasters.
Content Limits	Items for this benchmark will not require students to discuss natural disasters outside of Florida.

Benchmark SC.6.E.7.8	
Body of Knowledge/ Strand	**Earth and Space Science**
Standard	**Big Idea 7: Earth Systems and Patterns**
Benchmark	**SC.6.E.7.8: Describe ways human beings protect themselves from hazardous weather and sun exposure.**
Common Core State Standard Connections	Indicate appropriate alignments to the Grade 6 CCSS Mathematics and/or Literacy Standards for Science whenever applicable. (See Appendix B.)
Benchmark Clarifications	Students will • identify methods to protect human skin from sun damage; • identify the warning signs and alerts for hazardous weather; • describe steps to take to protect themselves during severe storms and flooding; and • describe the safest locations during hazardous weather.
Content Limits	Items for this benchmark will not require students to describe the causes of hazardous weather. Items for this benchmark will address a variety of scenarios in which students are faced with hazardous weather or sun exposure.

Benchmark SC.6.E.7.9	
Body of Knowledge/ Strand	**Earth and Space Science**
Standard	**Big Idea 7: Earth Systems and Patterns**
Benchmark	**SC.6.E.7.9: Describe how the composition and structure of the atmosphere protects life and insulates the planet.**
Common Core State Standard Connections	Indicate appropriate alignments to the Grade 6 CCSS Mathematics and/or Literacy Standards for Science whenever applicable. (See Appendix B.)
Benchmark Clarifications	Students will • describe the importance of the greenhouse effect; and • discuss the effects of damaging the atmosphere.
Content Limits	Items for this benchmark may include diagrams of the atmosphere and scenarios of protection by the atmosphere.

Benchmark SC.6.L.14.1	
Body of Knowledge/ Strand	**Life Science**
Standard	**Big Idea 14: Organization and Development of Living Organisms**
Benchmark	**SC.6.L.14.1: 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.**
Common Core State Standard Connections	Indicate appropriate alignments to the Grade 6 CCSS Mathematics and/or Literacy Standards for Science whenever applicable. (See Appendix B.)
Benchmark Clarifications	Students will apply their knowledge of the hierarchical organization of organisms to discuss how they relate in size and composition.
Content Limits	Items for this benchmark may include, but are not limited to, diagrams of atoms, molecules, cells, tissues, organs, organ systems, and organisms. Items for this benchmark will not require students to • distinguish between cells of different organisms; or • discuss the functions of the body's organ systems.

Benchmark SC.6.L.14.2	
Body of Knowledge/ Strand	**Life Science**
Standard	**Big Idea 14: Organization and Development of Living Organisms**
Benchmark	**SC.6.L.14.2: 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.**
Common Core State Standard Connections	Indicate appropriate alignments to the Grade 6 CCSS Mathematics and/or Literacy Standards for Science whenever applicable. (See Appendix B.)
Benchmark Clarifications	N/A
Content Limits	Items for this benchmark will not require students to discuss the stages or process of cell division.

Benchmark SC.6.L.14.3	
Body of Knowledge/ Strand	**Life Science**
Standard	**Big Idea 14: Organization and Development of Living Organisms**
Benchmark	**SC.6.L.14.3: 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.**
Common Core State Standard Connections	Indicate appropriate alignments to the Grade 6 CCSS Mathematics and/or Literacy Standards for Science whenever applicable. (See Appendix B.)
Benchmark Clarifications	Students will understand *homeostasis* as maintaining a stable internal environment to sustain life regardless of external conditions.
Content Limits	Items for this benchmark may give descriptions of actions taken by cells to maintain homeostasis.

Benchmark SC.6.L.14.4	
Body of Knowledge/ Strand	**Life Science**
Standard	**Big Idea 14: Organization and Development of Living Organisms**
Benchmark	**SC.6.L.14.4: 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.**
Common Core State Standard Connections	Indicate appropriate alignments to the Grade 6 CCSS Mathematics and/or Literacy Standards for Science whenever applicable. (See Appendix B.)
Benchmark Clarifications	Students will • describe the function and importance of the cell wall, cell membrane, nucleus, cytoplasm, chloroplasts, mitochondria, and vacuoles; and • discuss why some organelles are found in both plant and animal cells, while some are found only in either plant or animal cells.
Content Limits	Items for this benchmark may include diagrams of cells and cell organelles.

Benchmark SC.6.L.14.5	
Body of Knowledge/ Strand	**Life Science**
Standard	**Big Idea 14: Organization and Development of Living Organisms**
Benchmark	**SC.6.L.14.5: 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.**
Common Core State Standard Connections	Indicate appropriate alignments to the Grade 6 CCSS Mathematics and/or Literacy Standards for Science whenever applicable. (See Appendix B.)
Benchmark Clarifications	Students will locate and identify the major systems of the human body.
Content Limits	Items for this benchmark may include diagrams of systems and human body outlines.

Benchmark SC.6.L.14.6	
Body of Knowledge/ Strand	**Life Science**
Standard	**Big Idea 14: Organization and Development of Living Organisms**
Benchmark	**SC.6.L.14.6: Compare and contrast types of infectious agents that may infect the human body, including viruses, bacteria, fungi, and parasites.**
Common Core State Standard Connections	Indicate appropriate alignments to the Grade 6 CCSS Mathematics and/or Literacy Standards for Science whenever applicable. (See Appendix B.)
Benchmark Clarifications	Students will • examine the modes of transmission of these pathogens to humans; and • identify an example of a virus, bacterium, fungus, and parasite.
Content Limits	Items for this benchmark may include descriptions and scenarios involving viruses, bacteria, fungi, and parasites.

Benchmark SC.6.L.15.1	
Body of Knowledge/ Strand	**Life Science**
Standard	**Big Idea 15: Diversity and Evolution of Living Organisms**
Benchmark	**SC.6.L.15.1: 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.**
Common Core State Standard Connections	Indicate appropriate alignments to the Grade 6 CCSS Mathematics and/or Literacy Standards for Science whenever applicable. (See Appendix B.)
Benchmark Clarifications	Students will • identify some characteristics that are used to put common organisms into categories; • analyze shared characteristics among organisms; • use a pneumonic device to recall the seven levels of the Linnaean classification system (kingdom, phylum, class, order, family, genus, and species); • explain that an organism's scientific name is made up of two Latin words, one for its genus and the other for its species; • describe domains as being a more inclusive (larger) category than kingdoms; • identify the three domains as Archaea, Eubacteria, and Eukarya; • discuss that organisms are placed into domains based on their genetic similarities; and • recognize that the organisms in the three domains are divided into six kingdoms.
Content Limits	Items for this benchmark may give descriptions of organisms in domains and kingdoms. Items for this benchmark will not require students to identify the specific phylum, class, order, family, genus, or species of an organism.

Benchmark SC.6.N.1.1	
Body of Knowledge/ Strand	**Nature of Science**
Standard	**Big Idea 1: The Practice of Science**
Benchmark	**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.**
Common Core State Standard Connections	Indicate appropriate alignments to the Grade 6 CCSS Mathematics and/or Literacy Standards for Science whenever applicable. (See Appendix B.)
Benchmark Clarifications	N/A
Content Limits	Items for this benchmark may give descriptions of problems, experiments, data, and conclusions.

Benchmark SC.6.N.1.2	
Body of Knowledge/ Strand	**Nature of Science**
Standard	**Big Idea 1: The Practice of Science**
Benchmark	**SC.6.N.1.2: Explain why scientific investigations should be replicable.**
Common Core State Standard Connections	Indicate appropriate alignments to the Grade 6 CCSS Mathematics and/or Literacy Standards for Science whenever applicable. (See Appendix B.)
Benchmark Clarifications	N/A
Content Limits	Items for this benchmark will not require students to discuss investigation steps.

Benchmark SC.6.N.1.3	
Body of Knowledge/ Strand	**Nature of Science**
Standard	**Big Idea 1: The Practice of Science**
Benchmark	**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.**
Common Core State Standard Connections	Indicate appropriate alignments to the Grade 6 CCSS Mathematics and/or Literacy Standards for Science whenever applicable. (See Appendix B.)
Benchmark Clarifications	Students will • explain that some types of scientific investigations are conducted to collect and analyze data without forming an initial hypothesis; • discuss the benefits of these types of investigations, including not requiring a preconceived notion (hypothesis) and collecting a variety of data; • explain that an investigation may lead to an experiment; • explain that an experiment tests a hypothesis; • discuss that an experiment can be conducted only after some research, thought, and reasoning have been put into forming a hypothesis; and • discuss the benefits of conducting experiments, including answering a specific question and collecting more focused data.
Content Limits	Items for this benchmark may give scenarios of scientific investigations and experiments.

Benchmark SC.6.N.1.4	
Body of Knowledge/ Strand	**Nature of Science**
Standard	**Big Idea 1: The Practice of Science**
Benchmark	**SC.6.N.1.4: Discuss, compare, and negotiate methods used, results obtained, and explanations among groups of students conducting the same investigation.**
Common Core State Standard Connections	Indicate appropriate alignments to the Grade 6 CCSS Mathematics and/or Literacy Standards for Science whenever applicable. (See Appendix B.)
Benchmark Clarifications	Students will • recognize that there are different methods for data collection; • compare and contrast different methods, results, and explanations of investigations conducted by different groups of students; and • discuss that common results will most likely be obtained in properly conducted investigations despite differences in methods.
Content Limits	Items for this benchmark may give descriptions and scenarios of methods, data, and explanations carried out by groups of students conducting the same investigation.

Benchmark SC.6.N.1.5	
Body of Knowledge/ Strand	**Nature of Science**
Standard	**Big Idea 1: The Practice of Science**
Benchmark	**SC.6.N.1.5: Recognize that science involves creativity, not just in designing experiments, but also in creating explanations that fit evidence.**
Common Core State Standard Connections	Indicate appropriate alignments to the Grade 6 CCSS Mathematics and/or Literacy Standards for Science whenever applicable. (See Appendix B.)
Benchmark Clarifications	Students will describe how creativity allows for explanations of things that cannot be seen or touched.
Content Limits	Items for this benchmark may give descriptions and scenarios of experiments and investigations in which creativity is used. Items for this benchmark will not require students to design experiments.

Benchmark SC.6.N.2.1	
Body of Knowledge/ Strand	**Nature of Science**
Standard	**Big Idea 2: The Characteristics of Scientific Knowledge**
Benchmark	**SC.6.N.2.1: Distinguish science from other activities involving thought.**
Common Core State Standard Connections	Indicate appropriate alignments to the Grade 6 CCSS Mathematics and/or Literacy Standards for Science whenever applicable. (See Appendix B.)
Benchmark Clarifications	Students will • compare and contrast scientific activities with other activities using thought; • discuss how scientific activities are continuous processes that are always being evaluated and possibly changed; • explain that though scientific activities commonly use the scientific method, many scientific discoveries have not followed all these steps; • describe how scientific activities are based on factual and testable evidence; and • discuss that scientific activities require objectivity and limited bias, in contrast with other activities that may involve subjective thought and considerable bias.
Content Limits	Items for this benchmark will not require students to conduct a scientific activity.

Benchmark SC.6.N.2.2	
Body of Knowledge/ Strand	**Nature of Science**
Standard	**Big Idea 2: The Characteristics of Scientific Knowledge**
Benchmark	**SC.6.N.2.2: Explain that scientific knowledge is durable because it is open to change as new evidence or interpretations are encountered.**
Common Core State Standard Connections	Indicate appropriate alignments to the Grade 6 CCSS Mathematics and/or Literacy Standards for Science whenever applicable. (See Appendix B.)
Benchmark Clarifications	N/A
Content Limits	Items for this benchmark will not require students to identify specific scientific theories or laws.

Benchmark SC.6.N.2.3	
Body of Knowledge/ Strand	**Nature of Science**
Standard	**Big Idea 2: The Characteristics of Scientific Knowledge**
Benchmark	**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.**
Common Core State Standard Connections	Indicate appropriate alignments to the Grade 6 CCSS Mathematics and/or Literacy Standards for Science whenever applicable. (See Appendix B.)
Benchmark Clarifications	Students will describe different fields of science (e.g., biology, chemistry, physics, astronomy, geology, and microbiology).
Content Limits	Items for this benchmark will not require students to recall dates from the history of science.

Benchmark SC.6.N.3.1	
Body of Knowledge/ Strand	**Nature of Science**
Standard	**Big Idea 3: The Role of Theories, Laws, Hypotheses, and Models**
Benchmark	**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.**
Common Core State Standard Connections	Indicate appropriate alignments to the Grade 6 CCSS Mathematics and/or Literacy Standards for Science whenever applicable. (See Appendix B.)
Benchmark Clarifications	Students will • define *theory* as a scientific explanation for an observation of a phenomenon or pattern in the natural world; • discuss the process of careful and repeated data collection necessary for a theory to be valid; • acknowledge that a theory may change based on new evidence; and • give examples of some well-known theories, such as the Big Bang theory, cell theory, and plate tectonic theory.
Content Limits	Items for this benchmark will not require students to explain specific theories.

Benchmark SC.6.N.3.2	
Body of Knowledge/ Strand	**Nature of Science**
Standard	**Big Idea 3: The Role of Theories, Laws, Hypotheses, and Models**
Benchmark	**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.**
Common Core State Standard Connections	Indicate appropriate alignments to the Grade 6 CCSS Mathematics and/or Literacy Standards for Science whenever applicable. (See Appendix B.)
Benchmark Clarifications	Students will • discuss that laws are based on numerous experiments pertaining to natural phenomena; • acknowledge that a scientific law is valid everywhere; and • compare and contrast scientific and societal laws.
Content Limits	Items for this benchmark will not require students to explain specific scientific laws.

Benchmark SC.6.N.3.3	
Body of Knowledge/ Strand	**Nature of Science**
Standard	**Big Idea 3: The Role of Theories, Laws, Hypotheses, and Models**
Benchmark	**SC.6.N.3.3: Give several examples of scientific laws.**
Common Core State Standard Connections	Indicate appropriate alignments to the Grade 6 CCSS Mathematics and/or Literacy Standards for Science whenever applicable. (See Appendix B.)
Benchmark Clarifications	N/A
Content Limits	Items for this benchmark will not require students to explain the process by which a hypothesis becomes a law.

Benchmark SC.6.N.3.4	
Body of Knowledge/ Strand	**Nature of Science**
Standard	**Big Idea 3: The Role of Theories, Laws, Hypotheses, and Models**
Benchmark	**SC.6.N.3.4: Identify the role of models in the context of the sixth grade science benchmarks.**
Common Core State Standard Connections	Indicate appropriate alignments to the Grade 6 CCSS Mathematics and/or Literacy Standards for Science whenever applicable. (See Appendix B.)
Benchmark Clarifications	Students will • define a scientific model as a visual representation that helps people gain a greater understanding of a scientific concept; • explain how models can be used to study things that are too large or too small to see; • discuss that models can be used to study objects from the past; • compare and contrast mathematical and physical models; and • apply knowledge to discuss the benefits and limitations of using models to study science.
Content Limits	N/A

Benchmark SC.6.P.11.1	
Body of Knowledge/ Strand	**Physical Science**
Standard	**Big Idea 11: Energy Transfer and Transformations**
Benchmark	**SC.6.P.11.1: 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.**
Common Core State Standard Connections	Indicate appropriate alignments to the Grade 6 CCSS Mathematics and/or Literacy Standards for Science whenever applicable. (See Appendix B.)
Benchmark Clarifications	Students will • describe the differences between kinetic and potential energy; and • investigate and identify examples of kinetic and potential energy.
Content Limits	Items for this benchmark may include diagrams of situations illustrating potential and kinetic energy.

Benchmark SC.6.P.12.1	
Body of Knowledge/ Strand	**Physical Science**
Standard	**Big Idea 12: Motion of Objects**
Benchmark	**SC.6.P.12.1: Measure and graph distance versus time for an object moving at a constant speed. Interpret this relationship.**
Common Core State Standard Connections	Indicate appropriate alignments to the Grade 6 CCSS Mathematics and/or Literacy Standards for Science whenever applicable. (See Appendix B.)
Benchmark Clarifications	Students will • collect data that examine the distance traveled by an object moving at a constant speed over a period of time; • identify the *x* and *y* axes on a distance versus time graph; and • predict how the graph would change if the object were moving at a faster or slower speed.
Content Limits	Items for this benchmark may include data tables and graphs of moving objects over a period of time.

Benchmark SC.6.P.13.1	
Body of Knowledge/ Strand	**Physical Science**
Standard	**Big Idea 13: Forces and Changes in Motion**
Benchmark	**SC.6.P.13.1: Investigate and describe types of forces including contact forces and forces acting at a distance, such as electrical, magnetic, and gravitational.**
Common Core State Standard Connections	Indicate appropriate alignments to the Grade 6 CCSS Mathematics and/or Literacy Standards for Science whenever applicable. (See Appendix B.)
Benchmark Clarifications	Students will • define a force as a push or pull that results from an object's interaction with another object; and • observe and identify changes that occur when objects come into close contact with each other.
Content Limits	Items for this benchmark may include examples such as the heat that is produced when one object rubs against another (friction), the action of a spring, or the impact of two toy cars moving toward each other.

Benchmark SC.6.P.13.2	
Body of Knowledge/ Strand	**Physical Science**
Standard	**Big Idea 13: Forces and Changes in Motion**
Benchmark	**SC.6.P.13.2: 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.**
Common Core State Standard Connections	Indicate appropriate alignments to the Grade 6 CCSS Mathematics and/or Literacy Standards for Science whenever applicable. (See Appendix B.)
Benchmark Clarifications	Students will • associate Isaac Newton with the development of the law of gravity; • investigate the gravitational pull on objects of various mass; • explain that the greater the mass of an object, the greater the gravitational force; and • explain that the distance between two objects affects the gravitational force.
Content Limits	Items for this benchmark may include videos that demonstrate the gravitational force of objects with various sizes and distances. Items for this benchmark will not require students to describe Newton's laws.

Benchmark SC.6.P.13.3	
Body of Knowledge/ Strand	**Physical Science**
Standard	**Big Idea 13: Forces and Changes in Motion**
Benchmark	**SC.6.P.13.3: Investigate and describe that an unbalanced force acting on an object changes its speed, direction of motion, or both.**
Common Core State Standard Connections	Indicate appropriate alignments to the Grade 6 CCSS Mathematics and/or Literacy Standards for Science whenever applicable. (See Appendix B.)
Benchmark Clarifications	Students will • observe and identify that when an unbalanced force is not present, an object is at equilibrium and does not change speed or direction of motion; • observe and describe how an object moves in the same direction of a stronger force; and • apply their knowledge to describe the changes that occur in an object when an unbalanced force acts with or against the motion of the object.
Content Limits	Item for this benchmark may include • descriptions and/or illustrations of students performing simple experiments with forces (such as two students pulling a rope in opposite directions with different amounts of force); or • other diagrams and scenarios of unbalanced forces acting upon objects.

B. Grade 7 Item Specifications

Course Number: 2002070

Benchmark HE.7.C.1.4	
Body of Knowledge/ Strand	**Health Education Concepts**
Standard	**Health Standard 1: Comprehend concepts related to health promotion and disease prevention to enhance health.**
Benchmark	**HE.7.C.1.4: Describe how heredity can affect personal health.**
Common Core State Standard Connections	Indicate appropriate alignments to the Grade 7 CCSS Mathematics and/or Literacy Standards for Science whenever applicable. (See Appendix B.)
Benchmark Clarifications	Students will describe/explain how inherited conditions or factors can impact personal health (e.g., sickle cell anemia, diabetes, acne, Huntington's chorea, cystic fibrosis, hemophilia).
Content Limits	Items for this benchmark will not address • genetic probabilities or crosses; or • infectious types of diseases that are not inherited (e.g., colds, influenza). Items for this benchmark may include general symptoms of conditions but must be grade appropriate.

Benchmark SC.7.E.6.1	
Body of Knowledge/ Strand	**Earth and Space Science**
Standard	**Big Idea 6: Earth Structures**
Benchmark	**SC.7.E.6.1: Describe the layers of the solid Earth, including the lithosphere, the hot convecting mantle, and the dense metallic liquid and solid cores.**
Common Core State Standard Connections	Indicate appropriate alignments to the Grade 7 CCSS Mathematics and/or Literacy Standards for Science whenever applicable. (See Appendix B.)
Benchmark Clarifications	Students will • recognize that heat flow and material movement in the liquid (molten) layers of Earth cause both slow and rapid changes in the surface layers; and • identify surface events that are caused by sub-surface events.
Content Limits	Items for this benchmark may use • the context of the rock cycle to assess the layers of the solid Earth (but will not directly assess the rock cycle); • the context of plate tectonics to assess the layers of the solid Earth (but will not directly assess plate tectonics); and • the context of heat flow and material movement within Earth to assess the layers of the solid Earth (but will not directly assess the causes of heat flow or material movement). Items for this benchmark may assess the *existence* of relationships among heat flow and material movement, sub-surface events, and surface event, but will not directly assess the relationships themselves. Items for this benchmark may include diagrams of a cross-section of the layers of Earth.

Benchmark SC.7.E.6.2	
Body of Knowledge/ Strand	**Earth and Space Science**
Standard	**Big Idea 6: Earth Structures**
Benchmark	**SC.7.E.6.2: Identify patterns within the rock cycle and relate them to surface events (weathering and erosion) and sub-surface events (plate tectonics and mountain building).**
Common Core State Standard Connections	Indicate appropriate alignments to the Grade 7 CCSS Mathematics and/or Literacy Standards for Science whenever applicable. (See Appendix B.)
Benchmark Clarifications	Students will recognize • the difference between physical change (e.g., weathering) and movement (e.g., erosion); • that rock is created, transformed, and destroyed as part of the rock cycle; and • that human activities can impact the rock cycle and other surface events. Students will apply knowledge of the layers of Earth to describe the rock cycle, including identifying the different types of rock (igneous, sedimentary, and metamorphic) and the large-scale Earth processes by which each is formed.
Content Limits	Items for this benchmark may use the context of plate tectonics to assess the rock cycle but will not directly assess plate tectonics.

Benchmark SC.7.E.6.3	
Body of Knowledge/ Strand	**Earth and Space Science**
Standard	**Big Idea 6: Earth Structures**
Benchmark	**SC.7.E.6.3: Identify current methods for measuring the age of Earth and its parts, including the law of superposition and radioactive dating.**
Common Core State Standard Connections	Indicate appropriate alignments to the Grade 7 CCSS Mathematics and/or Literacy Standards for Science whenever applicable. (See Appendix B.)
Benchmark Clarifications	Students will provide an approximate age of Earth. Students will apply knowledge of the rock cycle to explain superposition. Students will recognize that the evolution of Earth is a result of natural and human-impacted processes.
Content Limits	Items for this benchmark may assess • superposition directly; and • the evolution of Earth over geologic time within the context of superposition, radioactive dating, and other methods for measuring the age of Earth (but will not directly assess the evolution of Earth or evidence for Earth's evolution).

Benchmark SC.7.E.6.4	
Body of Knowledge/ Strand	**Earth and Space Science**
Standard	**Big Idea 6: Earth Structures**
Benchmark	**SC.7.E.6.4: Explain and give examples of how physical evidence supports scientific theories that Earth has evolved over geologic time due to natural processes.**
Common Core State Standard Connections	Indicate appropriate alignments to the Grade 7 CCSS Mathematics and/or Literacy Standards for Science whenever applicable. (See Appendix B.)
Benchmark Clarifications	Students will • apply knowledge of the layers of the solid Earth to explain how physical evidence supports theories of the evolution of Earth; • apply knowledge of superposition to explain how physical evidence supports theories of the evolution of Earth; and • identify and/or describe other examples of physical evidence supporting theories of the evolution of Earth. Students will identify natural geologic processes (e.g., weathering, erosion, plate tectonics, sub-surface heat and material flow). Students will understand that the evolution of Earth over geologic time, as supported by evidence, is caused largely by natural processes.
Content Limits	Items for this benchmark may use • the context of plate tectonics to assess the evolution of Earth (but will not directly assess plate tectonics); and • the context of sub-surface heat flow and material movement to assess the evolution of Earth (but will not directly assess heat or material flow).

Benchmark SC.7.E.6.5	
Body of Knowledge/ Strand	**Earth and Space Science**
Standard	**Big Idea 6: Earth Structures**
Benchmark	**SC.7.E.6.5: 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.**
Common Core State Standard Connections	Indicate appropriate alignments to the Grade 7 CCSS Mathematics and/or Literacy Standards for Science whenever applicable. (See Appendix B.)
Benchmark Clarifications	Students will describe folding and faulting. Students will describe the relationship between plate tectonics and the rock cycle. Students will identify the liquid layers of Earth as the source of crustal plate motion.
Content Limits	Items for this benchmark may • use the context of sub-surface heat flow and material movement to assess plate tectonics (but will not address heat and material flow directly); • use the context of the rock cycle to assess plate tectonics; • assess the rock cycle directly; • assess the different causes of volcanoes (but will not assess the types of volcanoes); and • assess the identification of the liquid layers of Earth as the source of crustal plate motion (but will not assess the causes of the motion directly).

Benchmark SC.7.E.6.6	
Body of Knowledge/ Strand	**Earth and Space Science**
Standard	**Big Idea 6: Earth Structures**
Benchmark	**SC.7.E.6.6: Identify the impact that humans have had on Earth, such as deforestation, urbanization, desertification, erosion, air and water quality, and changing the flow of water.**
Common Core State Standard Connections	Indicate appropriate alignments to the Grade 7 CCSS Mathematics and/or Literacy Standards for Science whenever applicable. (See Appendix B.)
Benchmark Clarifications	Students will apply knowledge of the rock cycle to evaluate the effects of human activity on Earth. Students will identify human activities that affect geologic processes. Students will describe how human activities such as deforestation, urbanization, and diverting the flow of water can cause geologic effects such as desertification and erosion. Students will apply knowledge of the lithosphere and other layers of the solid Earth to describe how human activities such as deforestation, urbanization, and diverting the flow of water can affect air and water quality.
Content Limits	N/A

Benchmark SC.7.E.6.7	
Body of Knowledge/ Strand	**Earth and Space Science**
Standard	**Big Idea 6: Earth Structures**
Benchmark	**SC.7.E.6.7: Recognize that heat flow and movement of material within Earth causes earthquakes and volcanic eruptions, and creates mountains and ocean basins.**
Common Core State Standard Connections	Indicate appropriate alignments to the Grade 7 CCSS Mathematics and/or Literacy Standards for Science whenever applicable. (See Appendix B.)
Benchmark Clarifications	Students will • describe the characteristics of the molten layers of the solid Earth; • identify convection as causing heat and material to flow within Earth; • analyze how heat and material flow within Earth causes the movement of crustal plates; and • recognize that the movement of crustal plates causes changes in Earth's surface.
Content Limits	Items for this benchmark may • assess the different causes of volcanic activity but will not assess the types of volcanoes; • assess the flow of heat and material by convection but will not assess the mechanism of convection directly; and • use the concepts of folding and faulting to assess the movements of plates that can cause these effects but will not assess folding and faulting directly.

Benchmark SC.7.L.15.1	
Body of Knowledge/ Strand	**Life Science**
Standard	**Big Idea 15: Diversity and Evolution of Living Organisms**
Benchmark	**SC.7.L.15.1: Recognize that fossil evidence is consistent with the scientific theory of evolution that living things evolved from earlier species.**
Common Core State Standard Connections	Indicate appropriate alignments to the Grade 7 CCSS Mathematics and/or Literacy Standards for Science whenever applicable. (See Appendix B.)
Benchmark Clarifications	Students will understand how the principles of superposition and radioactive dating are used to analyze fossils to support evidence of evolution.
Content Limits	Items for this benchmark may use the concepts of superposition and radioactive dating to assess the fossil record but will not assess these concepts directly.

Benchmark SC.7.L.15.2	
Body of Knowledge/ Strand	**Life Science**
Standard	**Big Idea 15: Diversity and the Evolution of Living Organisms**
Benchmark	**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.**
Common Core State Standard Connections	Indicate appropriate alignments to the Grade 7 CCSS Mathematics and/or Literacy Standards for Science whenever applicable. (See Appendix B.)
Benchmark Clarifications	Students will • explain the differences in species Charles Darwin observed by describing genetic mutation and variation; • explain the concept of natural selection (survival of the fittest); • describe Darwin's study of Galapagos finches that led to the theory of evolution; and • define biodiversity and identify the main reasons it is beneficial to organisms.
Content Limits	Items for this benchmark may • assess the theory of evolution and genetic variation in the context of Darwin's observations; • assess the environmental factors that influence evolution (but will not directly assess the causes of the factors); • assess genetic variation in the context of evolution (but will not directly assess genetic variation, heredity, or DNA); • use the concept of biodiversity to assess the theory of evolution (but will not test biodiversity directly); • use the context of adaptation and extinction to assess the theory of evolution and the influence of genetic variation and environmental factors (but will not assess adaptation or extinction directly); and • use depictions of finch beaks to assess genetic variation and natural selection.

Benchmark SC.7.L.15.3	
Body of Knowledge/ Strand	**Life Science**
Standard	**Big Idea 15: Diversity and Evolution of Living Organisms**
Benchmark	**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.**
Common Core State Standard Connections	Indicate appropriate alignments to the Grade 7 CCSS Mathematics and/or Literacy Standards for Science whenever applicable. (See Appendix B.)
Benchmark Clarifications	Students will • describe the concept of adaptation by applying knowledge of genetic variation and environmental factors; • describe ways in which human activities have impacted the environments of other living things; and • explain the difference between successful and unsuccessful adaptations.
Content Limits	Items for this benchmark may • assess the theory of evolution and genetic variation in the context of Darwin's observations (but will not assess the observations directly); • assess the environmental effects on evolution caused by human activity (but should not assess other effects of those activities or the activities themselves); • assess the environmental factors that influence evolution (but will not assess the causes of the factors or how evolution is influenced directly); • assess that inability to adapt can lead to extinction (but should not assess other factors leading to extinction); • assess genetic variation in the context of evolution (but will not directly assess genetic variation, heredity, or DNA); and • use depictions of finch beaks to assess genetic variation and natural selection.

Benchmark SC.7.L.16.1	
Body of Knowledge/ Strand	**Life Science**
Standard	**Big Idea 16: Heredity and Reproduction**
Benchmark	**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.**
Common Core State Standard Connections	Indicate appropriate alignments to the Grade 7 CCSS Mathematics and/or Literacy Standards for Science whenever applicable. (See Appendix B.)
Benchmark Clarifications	Students will explain that the traits of every organism are specified by a set of chemical instructions.
Content Limits	Items for this benchmark may • assess DNA and its role in heredity but will not assess (a)sexual reproduction, mitosis, or meiosis; and • assess the concepts of genotype and phenotype and the relationship between them but will not use the terms *genotype* or *phenotype*.

Benchmark SC.7.L.16.2	
Body of Knowledge/ Strand	**Life Science**
Standard	**Big Idea 16: Heredity and Reproduction**
Benchmark	**SC.7.L.16.2: Determine the probabilities for genotype and phenotype combinations using Punnett Squares and pedigrees.**
Common Core State Standard Connections	Indicate appropriate alignments to the Grade 7 CCSS Mathematics and/or Literacy Standards for Science whenever applicable. (See Appendix B.)
Benchmark Clarifications	Students will • understand the difference between dominant and recessive traits or alleles; • understand that hereditary information is passed from one generation to the next through genes; • explain genotype as the collective sum of all alleles and their specifying traits; and • explain phenotype as the physical expression of the genotype, the total of all evidenced traits.
Content Limits	Items for this benchmark will use Punnett squares and pedigrees to directly assess both genotype/phenotype probabilities and common parent combination probabilities. Items for this benchmark will not assess selective breeding or genetic engineering.

Benchmark SC.7.L.16.3	
Body of Knowledge/ Strand	**Life Science**
Standard	**Heredity and Reproduction**
Benchmark	**SC.7.L.16.3: Compare and contrast the general processes of sexual reproduction requiring meiosis and asexual reproduction requiring mitosis.**
Common Core State Standard Connections	Indicate appropriate alignments to the Grade 7 CCSS Mathematics and/or Literacy Standards for Science whenever applicable. (See Appendix B.)
Benchmark Clarifications	Students will understand that genetic instructions are passed from one generation to the next through the DNA in chromosomes. Students will describe mitosis and meiosis. Students will describe sexual and asexual reproduction.
Content Limits	Items for this benchmark may assess the general processes of sexual and asexual reproduction but may not assess the specific phases of cellular division. Items for this benchmark may assess whether species utilize sexual or asexual reproduction but will not assess the reproductive behaviors of different organisms. Items for this benchmark may require students to identify the cellular division process and/or type of reproduction (e.g., whether a/sexual) shown in diagrams of the stages of cell division. Items for this benchmark will not address ploidy, gametes, stem cells, or fertilization at a cellular level.

Benchmark SC.7.L.16.4	
Body of Knowledge/ Strand	**Life Science**
Standard	**Big Idea 16: Heredity and Reproduction**
Benchmark	**SC.7.L.16.4: Recognize and explore the impact of biotechnology (cloning, genetic engineering, artificial selection) on the individual, society, and the environment.**
Common Core State Standard Connections	Indicate appropriate alignments to the Grade 7 CCSS Mathematics and/or Literacy Standards for Science whenever applicable. (See Appendix B.)
Benchmark Clarifications	Students will recognize biotechnology as a larger field composed of cloning, genetic engineering, and artificial selection. Students will analyze the possible uses of biotechnology and possible consequences of the use of biotechnology. Students will explore and evaluate the benefits and drawbacks of biotechnology.
Content Limits	Items for this benchmark may assess genetic engineering and cloning in broad terms (i.e., not on a molecular level). Items for this benchmark may assess the existence of ethical concerns over the use of biotechnology but will not assess ethical standards, such as eco- or bio- centrism, directly. Items for this benchmark may require students to respond to an argument for or against the use of biotechnology. Items for this benchmark may require determining whether the use of (or evaluating the likelihood of) biotechnology could have caused a described change in the environment. Items for this benchmark may include answer choices *selective breeding* or *artificial selection* but will not include both.

Benchmark SC.7.L.17.1	
Body of Knowledge/ Strand	**Life Science**
Standard	**Big Idea 17: Interdependence**
Benchmark	**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.**
Common Core State Standard Connections	Indicate appropriate alignments to the Grade 7 CCSS Mathematics and/or Literacy Standards for Science whenever applicable. (See Appendix B.)
Benchmark Clarifications	Students will identify and describe producers, consumers, and decomposers. Students will explain the concepts of food chains and food webs and how they differ. Students will understand that energy is transferred between trophic levels through consumption.
Content Limits	Items for this benchmark may assess the role of producers, consumers, and decomposers, and specific examples of each. Items for this benchmark may assess the transfer of energy between trophic levels. Items for this benchmark may include a diagram of a food web, with students either completing labels or describing the relationships among organisms having different functions. Answer choices written for items for this benchmark may include *food web* or *food chain* but will not include both terms. Items for this benchmark will not assess energy pyramids.

Benchmark SC.7.L.17.2	
Body of Knowledge/ Strand	**Life Science**
Standard	**Big Idea 17: Interdependence**
Benchmark	**SC.7.L.17.2: Compare and contrast the relationships among organisms such as mutualism, predation, parasitism, competition, and commensalism.**
Common Core State Standard Connections	Indicate appropriate alignments to the Grade 7 CCSS Mathematics and/or Literacy Standards for Science whenever applicable. (See Appendix B.)
Benchmark Clarifications	Students will identify and describe mutualism, parasitism, and commensalism as types of symbiosis. Students will identify and describe predation and parasitism. Students will relate these relationships to those between members of food webs. Students will relate these relationships among organisms to the transfer of energy between levels of consumption.
Content Limits	Items for this benchmark may assess the transfer of energy between levels of consumption. Items for this benchmark may require discussion of the relationships among organisms occupying different places (performing different functions) in a food web. For example, students may be required to identify organisms in competition, predation, or commensalism; correctly place a new organism in the food web based on a prescribed relationship to an existing one; or describe the relationship between two given organisms in the web. Items for this benchmark may require discussion of the relationship between two organisms as described or depicted (e.g., fleas or ticks on a mammal, a remora on a shark, birds and grazing livestock).

Benchmark SC.7.L.17.3	
Body of Knowledge/ Strand	**Life Science**
Standard	**Big Idea 17: Interdependence**
Benchmark	**SC.7.L.17.3: 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.**
Common Core State Standard Connections	Indicate appropriate alignments to the Grade 7 CCSS Mathematics and/or Literacy Standards for Science whenever applicable. (See Appendix B.)
Benchmark Clarifications	Students will describe and predict how particular ecosystem factors might affect different organism relationships, including mutualism, predation, competition, and commensalism. Students will describe how, depending on the situation, parasitism could be both a stable species relationship adversely affected by other ecosystem factors *and* an external factor adversely affecting other relationships (for example, by contributing to the spread of disease). Students will describe how particular ecosystem factors might influence each other. For example, a shortage of space or nesting sites might increase the likelihood of disease and parasitism. Students will describe how ecosystem factors might affect the ability of organisms to adapt or evolve. Students will apply knowledge of the impacts of human activity on Earth and the environment to describe how that activity impacts native populations.
Content Limits	Items for this benchmark may assess how the consequences of human activity impact native populations. Items for this benchmark may include requiring students to evaluate the impact on a population due to a particular change (e.g., changing the flow of water through a habitat as diagrammed, adding a predator or competitor). Items for this benchmark may include requiring students to analyze what may have produced a change in population and/or distribution as indicated by before and after diagrams. Items for this benchmark will not assess knowledge specific to a particular species.

Benchmark SC.7.N.1.1	
Body of Knowledge/ Strand	**Nature of Science**
Standard	**Big Idea 1: The Practice of Science**
Benchmark	**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.**
Common Core State Standard Connections	Indicate appropriate alignments to the Grade 7 CCSS Mathematics and/or Literacy Standards for Science whenever applicable. (See Appendix B.)
Benchmark Clarifications	N/A
Content Limits	Items for this benchmark may require students to make conclusions based on provided graphs or charts.

Benchmark SC.7.N.1.2	
Body of Knowledge/ Strand	**Nature of Science**
Standard	**Big Idea 1: The Practice of Science**
Benchmark	**SC.7.N.1.2: Differentiate replication (by others) from repetition (multiple trials).**
Common Core State Standard Connections	Indicate appropriate alignments to the Grade 7 CCSS Mathematics and/or Literacy Standards for Science whenever applicable. (See Appendix B.)
Benchmark Clarifications	N/A
Content Limits	N/A

Benchmark SC.7.N.1.3	
Body of Knowledge/ Strand	**Nature of Science**
Standard	**Big Idea 1: The Practice of Science**
Benchmark	**SC.7.N.1.3: 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.**
Common Core State Standard Connections	Indicate appropriate alignments to the Grade 7 CCSS Mathematics and/or Literacy Standards for Science whenever applicable. (See Appendix B.)
Benchmark Clarifications	Students will differentiate between experiment and other types of investigation, such as • systematic observation without controlled variables; • reviewing and interpreting charts, tables, and graphs; and • making theoretical predictions. Students will recognize that not all scientific knowledge is derived from experiment and will recognize the importance of theoretical predictions and hypotheses. Students will explain that such investigation is not possible in all circumstances, such as evolutionary biology or astronomy.
Content Limits	Items for this benchmark may require brainstorming or identifying variables of interest for a particular experiment. Items for this benchmark may include evaluating how well a reported experiment meets the requirements of scientific experimentation. Items for this benchmark may include identifying the best scientific investigation method for a given inquiry.

Benchmark SC.7.N.1.4	
Body of Knowledge/ Strand	**Nature of Science**
Standard	**Big Idea 1: The Practice of Science**
Benchmark	**SC.7.N.1.4: Identify test variables (independent variables) and outcome variables (dependent variables) in an experiment.**
Common Core State Standard Connections	Indicate appropriate alignments to the Grade 7 CCSS Mathematics and/or Literacy Standards for Science whenever applicable. (See Appendix B.)
Benchmark Clarifications	N/A
Content Limits	Items for this benchmark may include identifying test (independent) and outcome (dependent) variables from a chart, graph, or proposed or reported experiment.

Benchmark SC.7.N.1.5	
Body of Knowledge/ Strand	**Nature of Science**
Standard	**Big Idea 1: The Practice of Science**
Benchmark	**SC.7.N.1.5: Describe the methods used in the pursuit of a scientific explanation as seen in different fields of science such as biology, geology, and physics.**
Common Core State Standard Connections	Indicate appropriate alignments to the Grade 7 CCSS Mathematics and/or Literacy Standards for Science whenever applicable. (See Appendix B.)
Benchmark Clarifications	N/A
Content Limits	Items for this benchmark may require students to brainstorm or identify plausible methods of scientific investigation for a particular inquiry or field, such as astronomy.

Benchmark SC.7.N.1.6	
Body of Knowledge/ Strand	**Nature of Science**
Standard	**Big Idea 1: The Practice of Science**
Benchmark	**SC.7.N.1.6: Explain that empirical evidence is the cumulative body of observations of a natural phenomenon on which scientific explanations are based.**
Common Core State Standard Connections	Indicate appropriate alignments to the Grade 7 CCSS Mathematics and/or Literacy Standards for Science whenever applicable. (See Appendix B.)
Benchmark Clarifications	N/A
Content Limits	Items for this benchmark may include differentiating between the results of empirical observation and the results of theoretical calculation. Items for this benchmark may require students to draw conclusions about empirical evidence for an explanation of a phenomenon for which no controlled experimentation has been done.

Benchmark SC.7.N.1.7	
Body of Knowledge/ Strand	**Nature of Science**
Standard	**Big Idea 1: The Practice of Science**
Benchmark	**SC.7.N.1.7: Explain that scientific knowledge is the result of a great deal of debate and confirmation within the science community.**
Common Core State Standard Connections	Indicate appropriate alignments to the Grade 7 CCSS Mathematics and/or Literacy Standards for Science whenever applicable. (See Appendix B.)
Benchmark Clarifications	N/A
Content Limits	N/A

Benchmark SC.7.N.2.1	
Body of Knowledge/ Strand	**Nature of Science**
Standard	**Big Idea 2: The Characteristics of Scientific Knowledge**
Benchmark	**SC.7.N.2.1: Identify an instance from the history of science in which scientific knowledge changed when new evidence or new interpretations were encountered.**
Common Core State Standard Connections	Indicate appropriate alignments to the Grade 7 CCSS Mathematics and/or Literacy Standards for Science whenever applicable. (See Appendix B.)
Benchmark Clarifications	N/A
Content Limits	N/A

Benchmark SC.7.N.3.1	
Body of Knowledge/ Strand	**Nature of Science**
Standard	**Big Idea 3: The Role of Theories, Laws, Hypotheses, and Models**
Benchmark	**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.**
Common Core State Standard Connections	Indicate appropriate alignments to the Grade 7 CCSS Mathematics and/or Literacy Standards for Science whenever applicable. (See Appendix B.)
Benchmark Clarifications	Students will relate experimentation to empirical evidence and empirical evidence to scientific law. Students will recognize the importance of non-experimental (theoretical) scientific investigation in establishing scientific theories. Students will recognize that theories can sometimes become empirically verified and become laws.
Content Limits	N/A

Benchmark SC.7.N.3.2	
Body of Knowledge/ Strand	**Nature of Science**
Standard	**Big Idea 3: The Role of Theories, Laws, Hypotheses, and Models**
Benchmark	**SC.7.N.3.2: Identify the benefits and limitations of the use of scientific models.**
Common Core State Standard Connections	Indicate appropriate alignments to the Grade 7 CCSS Mathematics and/or Literacy Standards for Science whenever applicable. (See Appendix B.)
Benchmark Clarifications	N/A
Content Limits	Items for this benchmark may include evaluating change in scientific knowledge through the presentation of evolving models.

Benchmark SC.7.P.10.1	
Body of Knowledge/ Strand	**Physical Science**
Standard	**Big Idea 10: Forms of Energy**
Benchmark	**SC.7.P.10.1: 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.**
Common Core State Standard Connections	Indicate appropriate alignments to the Grade 7 CCSS Mathematics and/or Literacy Standards for Science whenever applicable. (See Appendix B.)
Benchmark Clarifications	Students will describe • describe wavelength (and/or frequency) as a classifiable feature of waves; • recognize infrared and ultraviolet light as light with slightly smaller or larger wavelengths than visible light; • recognize that white light is separable into many different colors, e.g., by a prism; and • explain that the various colors of light correspond to light of slightly different wavelengths.
Content Limits	Items for this benchmark will not assess wavelength or frequency in terms of the periodicity of waves, nor will items assess amplitude. Items for this benchmark will not assess reflection, refraction, or absorption of light, nor will items assess other wave behaviors (e.g., interference, diffraction). Items for this benchmark may assess the ability of light to travel in (the vacuum of) space but will not assess the change in speed in different media. Items for this benchmark may refer to diagrams showing any of the following: • solar radiation reaching Earth • the region of the electromagnetic spectrum between infrared and ultraviolet (inclusive) • white light being separated into spectrum components by a prism

Benchmark SC.7.P.10.2	
Body of Knowledge/ Strand	**Physical Science**
Standard	**Big Idea 10: Forms of Energy**
Benchmark	**SC.7.P.10.2: Observe and explain that light can be reflected, refracted, and/or absorbed.**
Common Core State Standard Connections	Indicate appropriate alignments to the Grade 7 CCSS Mathematics and/or Literacy Standards for Science whenever applicable. (See Appendix B.)
Benchmark Clarifications	Students will • provide examples of common instances of refraction, including the glare of sunlight reflected off the surface of water; • recognize that absorption and reflection are together responsible for objects having different colors when white light shines on them; and • identify white objects as the most reflective of visible light and black objects as the most absorptive.
Content Limits	Items for this benchmark may assess the occurrence of absorption and reflection and that they are responsible for the apparent colors of objects but will not assess either mechanism at a molecular level. Items for this benchmark may require analysis of a scenario in terms of reflection, refraction, and/or absorption. For example, a diagram might show white light incident on the surface of a blue liquid. Items for this benchmark may require identification of light behavior (e.g., a student looking in a mirror). Items for this benchmark will not assess • the relationship between refraction and the change of wavespeed in different media; • indices of refraction, Snell's law, or the amount of bending the light experiences; • the law of reflection; or • black body radiation or the absorption of other wavelengths of light besides visible light.

Benchmark SC.7.P.10.3	
Body of Knowledge/ Strand	**Physical Science**
Standard	**Big Idea 10: Forms of Energy**
Benchmark	**SC.7.P.10.3: Recognize that light waves, sound waves, and other waves move at different speeds in different materials.**
Common Core State Standard Connections	Indicate appropriate alignments to the Grade 7 CCSS Mathematics and/or Literacy Standards for Science whenever applicable. (See Appendix B.)
Benchmark Clarifications	Students will recognize that sound waves travel faster in liquids than in gases (air) and faster still in solids, and cannot travel in (the vacuum of) space. Students will recognize that light waves travel fastest in a vacuum, a little slower in gases (air), slower still in liquids, and slowest in solids. Students will explain that though sound waves travel faster in solids, more energy is lost and they cannot travel as far.
Content Limits	Items for this benchmark may assess wavespeed in different media but not in the context of the periodicity of waves or as related to frequency or wavelength. Items for this benchmark may assess the difference in wavespeed in different media but not in the context of refraction. Items for this benchmark may assess the existence of the relationship between wave energy and loudness (for sound) or brightness (for light) but will not assess the nature of the relationship. Items for this benchmark may include ranking the speed of light or sound in different pictured media.

Benchmark SC.7.P.11.1	
Body of Knowledge/ Strand	**Physical Science**
Standard	**Big Idea 11: Energy Transfer and Transformations**
Benchmark	**SC.7.P.11.1: Recognize that adding heat to or removing heat from a system may result in a temperature change and possibly a change of state.**
Common Core State Standard Connections	Indicate appropriate alignments to the Grade 7 CCSS Mathematics and/or Literacy Standards for Science whenever applicable. (See Appendix B.)
Benchmark Clarifications	Students will describe the three main states of matter, including large-scale common physical properties of each state. Students will understand that substances can change from one state to another at particular temperatures.
Content Limits	Items for this benchmark may include identifying the state of a substance from a description of its properties. Items for this benchmark may include diagrams of adding or removing heat (e.g., a block of ice in the Sun, a pot of cold water over a burner, a hot metal spoon in an ice bath). Items for this benchmark will not assess • plasma; • specific heat; • heat of fusion; • heat of vaporization; • radiation (including blackbody radiation), convection, or conduction as modes of heat transfer; or • how heat flows. Items for this benchmark will provide temperatures in Celsius (°C) only.

Benchmark SC.7.P.11.2	
Body of Knowledge/ Strand	**Physical Science**
Standard	**Big Idea 11: Energy Transfer and Transformations**
Benchmark	**SC.7.P.11.2: Investigate and describe the transformation of energy from one form to another.**
Common Core State Standard Connections	Indicate appropriate alignments to the Grade 7 CCSS Mathematics and/or Literacy Standards for Science whenever applicable. (See Appendix B.)
Benchmark Clarifications	Students will observe and identify different forms of energy, including mechanical (kinetic and potential), electrical, heat, sound, light, and chemical energy. Students will describe friction and the kinds of energy observed as its byproducts.
Content Limits	Items for this benchmark will not assess nuclear energy. Items for this benchmark may assess the transformation of chemical energy into heat and light energy (e.g., lighting a match). Items for this benchmark may include identifying the different forms of energy involved in a scenario (e.g., adding vinegar to baking soda, connecting a simple battery circuit to a light bulb or simple motor, using sandpaper).

Benchmark SC.7.P.11.3	
Body of Knowledge/ Strand	**Physical Science**
Standard	**Big Idea 11: Energy Transfer and Transformations**
Benchmark	**SC.7.P.11.3: Cite evidence to explain that energy cannot be created nor destroyed, only changed from one form to another.**
Common Core State Standard Connections	Indicate appropriate alignments to the Grade 7 CCSS Mathematics and/or Literacy Standards for Science whenever applicable. (See Appendix B.)
Benchmark Clarifications	Students will observe and investigate scenarios in which energy is transformed to demonstrate that energy cannot be created or destroyed. Students will recognize energy is sometimes transferred (e.g., to friction) but is never destroyed (i.e., friction causes the emission of heat and sound energy).
Content Limits	Items for this benchmark may include simple instances of harmonic motion (e.g., the release of a pendulum bob showing the pendulum swinging back to the starting position or the oscillation of a mass hanging from a vertical spring).

Benchmark SC.7.P.11.4	
Body of Knowledge/ Strand	**Physical Science**
Standard	**Big Idea 11: Energy Transfer and Transformation**
Benchmark	**SC.7.P.11.4: Observe and describe that heat flows in predictable ways, moving from warmer objects to cooler ones until they reach the same temperature.**
Common Core State Standard Connections	Indicate appropriate alignments to the Grade 7 CCSS Mathematics and/or Literacy Standards for Science whenever applicable. (See Appendix B.)
Benchmark Clarifications	Students will recognize that a net increase/decrease in heat energy will increase/decrease the temperature and/or change the state. Students will identify and describe the condition of thermal equilibrium. Students will explain the three modes of heat transfer.
Content Limits	Items for this benchmark may assess modes of heat transfer: conduction, convection, and radiation. Items for this benchmark may include diagrams to show the direction and mode of heat transfer between objects or substances. Items for this benchmark will provide temperatures in Celsius (°C) only. Items for this benchmark will not assess entropy or the law of entropy. Items for this benchmark will not assess specific heat, heat of fusion, heat of vaporization, or chemical changes.

C. Grade 8 Item Specifications

Course Number: 2002100

Benchmark SC.8.E.5.1	
Body of Knowledge/ Strand	**Earth and Space Science**
Standard	**Big Idea 5: Earth in Space and Time**
Benchmark	**SC.8.E.5.1: Recognize that there are enormous distances between objects in space and apply our knowledge of light and space travel to understand this distance.**
Common Core State Standard Connections	Indicate appropriate alignments to the Grade 8 CCSS Mathematics and/or Literacy Standards for Science whenever applicable. (See Appendix B.)
Benchmark Clarifications	Students will explain how we use knowledge of light and other forms of energy to calculate distances between objects in space.
Content Limits	Items for this benchmark will not require memorization of quantitative astronomical data. Items for this benchmark will provide distances in units of astronomical units (AU) or light-years.

Benchmark SC.8.E.5.2	
Body of Knowledge/ Strand	**Earth and Space Science**
Standard	**Big Idea 5: Earth in Space and Time**
Benchmark	**SC.8.E.5.2: Recognize that the universe contains many billions of galaxies and that each galaxy contains many billions of stars.**
Common Core State Standard Connections	Indicate appropriate alignments to the Grade 8 CCSS Mathematics and/or Literacy Standards for Science whenever applicable. (See Appendix B.)
Benchmark Clarifications	Students will recognize that the universe contains many galaxies and galaxies contain many stars.
Content Limits	Items for this benchmark will • assess stars and galaxies only; and • provide distances in units of astronomical units (AU) or light-years. • Items for this benchmark will not • assess the specific chemical composition of stars; • require memorization of quantitative astronomical data; or • require calculations but may require comparison or use of quantitative data, including tables.

Benchmark SC.8.E.5.3	
Body of Knowledge/ Strand	**Earth and Space Science**
Standard	**Big Idea 5: Earth in Space and Time**
Benchmark	**SC.8.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.**
Common Core State Standard Connections	Indicate appropriate alignments to the Grade 8 CCSS Mathematics and/or Literacy Standards for Science whenever applicable. (See Appendix B.)
Benchmark Clarifications	Students will describe the size and composition of planets and other astronomical bodies. Students will describe the distances among planets and astronomical bodies in terms of hierarchical relationships relative to the solar system, galaxies, and the universe.
Content Limits	Items for this benchmark may assess astronomical bodies, including planets, stars, moons, asteroids, nebulae, galaxies, dwarf planets, and comets. Items for this benchmark will provide distances in units of astronomical units (AU) or light-years. Items for this benchmark will not require memorization of quantitative astronomical data. Items for this benchmark will not require calculations but may require comparison or use of quantitative data, including tables.

Benchmark SC.8.E.5.4	
Body of Knowledge/ Strand	**Earth and Space Science**
Standard	**Big Idea 5: Earth in Space and Time**
Benchmark	**SC.8.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.**
Common Core State Standard Connections	Indicate appropriate alignments to the Grade 8 CCSS Mathematics and/or Literacy Standards for Science whenever applicable. (See Appendix B.)
Benchmark Clarifications	N/A
Content Limits	Items for this benchmark will not require memorization of quantitative astronomical data. Items for this benchmark will focus on planets, stars, and/or solar systems.

Benchmark SC.8.E.5.5	
Body of Knowledge/ Strand	**Earth and Space Science**
Standard	**Big Idea 5: Earth in Space and Time**
Benchmark	**SC.8.E.5.5: Describe and classify specific physical properties of stars: apparent magnitude (brightness), temperature (color), size, and luminosity (absolute brightness).**
Common Core State Standard Connections	Indicate appropriate alignments to the Grade 8 CCSS Mathematics and/or Literacy Standards for Science whenever applicable. (See Appendix B.)
Benchmark Clarifications	N/A
Content Limits	Items for this benchmark will focus on main sequence stars and their properties. Items for this benchmark will not assess stages of stellar evolution. Items for this benchmark will not assess the specific chemical composition of stars. Items for this benchmark will provide distances in units of astronomical units (AU) or light- years.

Benchmark SC.8.E.5.6	
Body of Knowledge/ Strand	**Earth and Space Science**
Standard	**Big Idea 5: Earth in Space and Time**
Benchmark	**SC.8.E.5.6: Create models of solar properties including: rotation, structure of the Sun, convection, sunspots, solar flares, and prominences.**
Common Core State Standard Connections	Indicate appropriate alignments to the Grade 8 CCSS Mathematics and/or Literacy Standards for Science whenever applicable. (See Appendix B.)
Benchmark Clarifications	Students will compare and/or contrast various historical models of the solar system.
Content Limit	Items for this benchmark will not require the use of the formula for the law of universal gravitation or the gravitational constant. Items for this benchmark will provide distances in units of astronomical units (AU) or light-years.

Benchmark SC.8.E.5.7	
Body of Knowledge/ Strand	**Earth and Space Science**
Standard	**Big Idea 5: Earth in Space and Time**
Benchmark	**SC.8.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.**
Common Core State Standard Connections	Indicate appropriate alignments to the Grade 8 CCSS Mathematics and/or Literacy Standards for Science whenever applicable. (See Appendix B.)
Benchmark Clarifications	N/A
Content Limits	Items for this benchmark may assess the presence, absence, and/or relative thickness of planetary atmospheres. Items for this benchmark may assess the relationship between distance from the Sun and the length of year and/or the relationship between distance from the Sun and average surface temperature. Items for this benchmark may assess the concept of eccentricity of orbital paths of astronomical bodies in terms of the differing shapes of orbits. Items for this benchmark will provide distances in units of astronomical units (AU) or light-years.

Benchmark SC.8.E.5.8	
Body of Knowledge/ Strand	**Earth and Space Science**
Standard	**Big Idea 5: Earth in Space and Time**
Benchmark	**SC.8.E.5.8: Compare various historical models of the Solar System, including geocentric and heliocentric.**
Common Core State Standard Connections	Indicate appropriate alignments to the Grade 8 CCSS Mathematics and/or Literacy Standards for Science whenever applicable. (See Appendix B.)
Benchmark Clarifications	N/A
Content Limits	Items for this benchmark will not assess characteristics of the Sun in isolation. Items for this benchmark may assess the concept of eccentricity of orbital paths of astronomical bodies in terms of the differing shapes of orbits but not specific values of eccentricity or the term *eccentricity*.

Benchmark SC.8.E.5.9	
Body of Knowledge/ Strand	**Earth and Space Science**
Standard	**Big Idea 5: Earth in Space and Time**
Benchmar	**SC.8.E.5.9: Explain the impact of objects in space on each other including: 1. the Sun on Earth including seasons and gravitational attraction 2. the Moon on Earth, including phases, tides, and eclipses, and the relative position of each body.**
Common Core State Standard Connections	Indicate appropriate alignments to the Grade 8 CCSS Mathematics and/or Literacy Standards for Science whenever applicable. (See Appendix B.)
Benchmark Clarifications	Students will explain the effect of astronomical bodies on each other, including the Sun's and/or the Moon's effects on Earth.
Content Limits	Items for this benchmark that address eclipses should be assessed at the conceptual level and will not assess specific vocabulary associated with eclipses, such as *umbra* and *penumbra*. Answer options written for items for this benchmark may be in the form of labeled illustrations.

Benchmark SC.8.E.5.10	
Body of Knowledge/ Strand	**Earth and Space Science**
Standard	**Big Idea 5: Earth in Space and Time**
Benchmark	**SC.8.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.**
Common Core State Standard Connections	Indicate appropriate alignments to the Grade 8 CCSS Mathematics and/or Literacy Standards for Science whenever applicable. (See Appendix B.)
Benchmark Clarifications	Students will explain how advances in technology have helped to gather data on, and gain access to, outer space and other remote locations (such as the deep ocean).
Content Limits	Items for this benchmark may assess general knowledge and application of technological advances (e.g., telescopes, space shuttle). Item for this benchmark may not include calculations or complex equations.

Benchmark SC.8.E.5.11	
Body of Knowledge/ Strand	**Earth and Space Science**
Standard	**Big Idea 5: Earth in Space and Time**
Benchmark	**SC.8.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.**
Common Core State Standard Connections	Indicate appropriate alignments to the Grade 8 CCSS Mathematics and/or Literacy Standards for Science whenever applicable. (See Appendix B.)
Benchmark Clarifications	Students will identify and compare the different properties of electromagnetic radiation along the electromagnetic spectrum in terms of types of radiation (radio, micro, infrared, visible, ultraviolet, X-ray, gamma ray), scale of wavelength, wave frequency, and wave amplitude. Students will describe the basic use of electromagnetic properties as they apply to the world of science and technology (e.g. radios, cell phones, medical imaging). Students will describe the relative range of properties along the electromagnetic spectrum (e.g., radio waves occur at a lower frequency than X-rays).
Content Limits	N/A

Benchmark SC.8.E.5.12	
Body of Knowledge/ Strand	**Earth and Space Science**
Standard	**Big Idea 5: Earth in Space and Time**
Benchmark	**SC.8.E.5.12: Summarize the effects of space exploration on the economy and culture of Florida.**
Common Core State Standard Connections	Indicate appropriate alignments to the Grade 8 CCSS Mathematics and/or Literacy Standards for Science whenever applicable. (See Appendix B.)
Benchmark Clarifications	Students will describe that space exploration has had an overall positive effect on the economy and culture of Florida (e.g., attracting tourists and top space scientists to Florida). Students will describe the benefits of continuing the NASA space exploration programs at Cape Canaveral.
Content Limits	Items for this benchmark will not ask students to calculate, determine, or interpret specific revenue figures.

Benchmark SC.8.L.18.1	
Body of Knowledge/ Strand	**Life Science**
Standard	**Big Idea 18: Matter and Energy Transformations**
Benchmark	**SC.8.L.18.1: Describe and investigate the process of photosynthesis, such as the roles of light, carbon dioxide, water and chlorophyll; production of food; release of oxygen.**
Common Core State Standard Connections	Indicate appropriate alignments to the Grade 8 CCSS Mathematics and/or Literacy Standards for Science whenever applicable. (See Appendix B.)
Benchmark Clarifications	N/A
Content Limits	Item for this benchmark may use the word equation or chemical equation for photosynthesis. Items for this benchmark may not assess the following: • the interrelatedness of photosynthesis and cellular respiration • anaerobic respiration

Benchmark SC.8.L.18.2	
Body of Knowledge/ Strand	**Life Science**
Standard	**Big Idea 18: Matter and Energy Transformations**
Benchmark	**SC.8.L.18.2: Describe and investigate how cellular respiration breaks down food to provide energy and releases carbon dioxide.**
Common Core State Standard Connections	Indicate appropriate alignments to the Grade 8 CCSS Mathematics and/or Literacy Standards for Science whenever applicable. (See Appendix B.)
Benchmark Clarifications	Students will describe and/or explain the general processes of cellular respiration.
Content Limits	Scenarios for this benchmark may use word equations or chemical equations for cellular respiration.

Benchmark SC. 8.L.18.3	
Body of Knowledge/ Strand	**Life Science**
Standard	**Big Idea 18: Matter and Energy Transformations**
Benchmark	**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.**
Common Core State Standard Connections	Indicate appropriate alignments to the Grade 8 CCSS Mathematics and/or Literacy Standards for Science whenever applicable. (See Appendix B.)
Benchmark Clarifications	Students will describe carbon dioxide gas in the atmosphere as the main reservoir of carbon but also know that considerable quantities are tied up in organic and inorganic forms. Students will recognize that plants take in carbon dioxide to convert to glucose/sugar.
Content Limits	Items for this benchmark will not assess the greenhouse effect or global warming. Items for this benchmark that refer to the carbon cycle may include carbon reservoirs, such as the atmosphere, plants and animals, decaying organic matter, fossil fuels, sediments, aquatic organisms, and oceans/water.

Benchmark SC.8.L.18.4	
Body of Knowledge/ Strand	**Life Science**
Standard	**Big Idea 18: Matter and Energy Transformations**
Benchmark	**SC.8.L.18.4: Cite evidence that living systems follow the Laws of Conservation of Mass and Energy.**
Common Core State Standard Connections	Indicate appropriate alignments to the Grade 8 CCSS Mathematics and/or Literacy Standards for Science whenever applicable. (See Appendix B.)
Benchmark Clarifications	Students will describe and/or explain the general processes of photosynthesis or cellular respiration following the law of conservation of mass. Students will describe and/or explain how matter and energy flowing through the carbon cycle follows the law of conservation of mass.
Content Limit	Items for this benchmark will refer to living systems in terms of the law of conservation of mass. Items for this benchmark will not assess knowledge of specific steps or stages of living systems.

Benchmark SC.8.N.1.1	
Body of Knowledge/ Strand	**Nature of Science**
Standard	**Big Idea 1: The Practice of Science**
Benchmark	**SC.8.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.**
Common Core State Standard Connections	Indicate appropriate alignments to the Grade 8 CCSS Mathematics and/or Literacy Standards for Science whenever applicable. (See Appendix B.)
Benchmark Clarifications	N/A
Content Limits	N/A

Benchmark SC.8.N.1.2	
Body of Knowledge/ Strand	**Nature of Science**
Standard	**Big Idea 1: The Practice of Science**
Benchmark	**SC.8.N.1.2: Design and conduct a study using repeated trials and replication.**
Common Core State Standard Connections	Indicate appropriate alignments to the Grade 8 CCSS Mathematics and/or Literacy Standards for Science whenever applicable. (See Appendix B.)
Benchmark Clarifications	N/A
Content Limits	N/A

Benchmark SC.8.N.1.3	
Body of Knowledge/ Strand	**Nature of Science**
Standard	**Big Idea 1: The Practice of Science**
Benchmark	**SC.8.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.**
Common Core State Standard Connections	Indicate appropriate alignments to the Grade 8 CCSS Mathematics and/or Literacy Standards for Science whenever applicable. (See Appendix B.)
Benchmark Clarifications	N/A
Content Limits	N/A

Benchmark SC.8.N.1.4	
Body of Knowledge/ Strand	**Nature of Science**
Standard	**Big Idea 1: The Practice of Science**
Benchmark	**SC.8.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.**
Common Core State Standard Connections	Indicate appropriate alignments to the Grade 8 CCSS Mathematics and/or Literacy Standards for Science whenever applicable. (See Appendix B.)
Benchmark Clarifications	N/A
Content Limits	Items for this benchmark will not assess whether the hypothesis is supported by data.

Benchmark SC.8.N.1.5	
Body of Knowledge/ Strand	**Nature of Science**
Standard	**Big Idea 1: The Practice of Science**
Benchmark	**SC.8.N.1.5: Analyze the methods used to develop a scientific explanation as seen in different fields of science.**
Common Core State Standard Connections	Indicate appropriate alignments to the Grade 8 CCSS Mathematics and/or Literacy Standards for Science whenever applicable. (See Appendix B.)
Benchmark Clarifications	Students will distinguish between an experiment and other types of scientific investigations where variables cannot be controlled.
Content Limits	N/A

Benchmark SC.8.N.1.6	
Body of Knowledge/ Strand	**Nature of Science**
Standard	**Big Idea 1: The Practice of Science**
Benchmark	**SC.8.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.**
Common Core State Standard Connections	Indicate appropriate alignments to the Grade 8 CCSS Mathematics and/or Literacy Standards for Science whenever applicable. (See Appendix B.)
Benchmark Clarifications	N/A
Content Limits	N/A

Benchmark SC.8.N.2.1	
Body of Knowledge/ Strand	**Nature of Science**
Standard	**Big Idea 2: The Characteristics of Scientific Knowledge**
Benchmark	**SC.8.N.2.1: Distinguish between scientific and pseudoscientific ideas.**
Common Core State Standard Connections	Indicate appropriate alignments to the Grade 8 CCSS Mathematics and/or Literacy Standards for Science whenever applicable. (See Appendix B.)
Benchmark Clarifications	Students will distinguish between a scientific idea and other types of ideas (e.g. supernatural, aesthetic, artistic, philosophical, religious). Students will explain that science is testable, while pseudoscience is not. Students will explain that science seeks falsification, while pseudoscience seeks confirmation.
Content Limits	N/A

Benchmark SC.8.N.2.2	
Body of Knowledge/ Strand	**Nature of Science**
Standard	**Big Idea 2: The Characteristics of Scientific Knowledge**
Benchmark	**SC.8.N.2.2: Discuss what characterizes science and its methods.**
Common Core State Standard Connections	Indicate appropriate alignments to the Grade 8 CCSS Mathematics and/or Literacy Standards for Science whenever applicable. (See Appendix B.)
Benchmark Clarifications	Students will recognize that scientific thinking strives for objectivity but also recognize that subjectivity, creativity, and discovery play important roles. Students will • recognize that scientific knowledge is durable and robust but open to change; • recognize that scientific ideas are logical and well reasoned; • explain that scientific ideas are based on empirical evidence; • explain the characteristics of science, including the systematic, organized inquiry that is derived from observations and experimentation that can be verified through testing to explain natural phenomena.
Content Limits	N/A

Benchmark SC.8.N.3.1	
Body of Knowledge/ Strand	**Nature of Science**
Standard	**Big Idea 3: The Role of Theories, Laws, Hypotheses, and Models**
Benchmark	**SC.8.N.3.1: Select models useful in relating the results of their own investigations.**
Common Core State Standard Connections	Indicate appropriate alignments to the Grade 8 CCSS Mathematics and/or Literacy Standards for Science whenever applicable. (See Appendix B.)
Benchmark Clarifications	Students will be familiar with the following scientific terms: *theories*, *laws*, *hypotheses*, and *models*. Students will be able to explain why the model they chose is the best one to use in the scenario. Students will be able to select the best model for a given investigation.
Content Limits	N/A

Benchmark SC.8.N.3.2	
Body of Knowledge/ Strand	**Nature of Science**
Standard	**Big Idea 3: The Role of Theories, Laws, Hypotheses, and Models**
Benchmark	**SC.8.N.3.2: Explain why theories may be modified but are rarely discarded.**
Common Core State Standard Connections	Indicate appropriate alignments to the Grade 8 CCSS Mathematics and/or Literacy Standards for Science whenever applicable. (See Appendix B.)
Benchmark Clarifications	N/A
Content Limits	Items for this benchmark will ask students to provide explanations only about theories, not about laws, hypotheses, or models.

Benchmark SC.8.N.4.1	
Body of Knowledge/ Strand	**Nature of Science**
Standard	**Big Idea 4: Science and Society**
Benchmark	**SC.8.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.**
Common Core State Standard Connections	Indicate appropriate alignments to the Grade 8 CCSS Mathematics and/or Literacy Standards for Science whenever applicable. (See Appendix B.)
Benchmark Clarifications	N/A
Content Limits	Items for this benchmark will not assess decision-making issues that cannot be addressed by science. Given a particular decision that needs to be made, students will describe scientific research that could be done to help the decision-making process at the community, state, national, or international levels.

Benchmark SC.8.N.4.2	
Body of Knowledge/ Strand	**Nature of Science**
Standard	**Big Idea 4: Science and Society**
Benchmark	**SC.8.N.4.2: Explain how political, social, and economic concerns can affect science, and vice versa.**
Common Core State Standard Connections	Indicate appropriate alignments to the Grade 8 CCSS Mathematics and/or Literacy Standards for Science whenever applicable. (See Appendix B.)
Benchmark Clarifications	Students will predict the most likely application of a given area of scientific research for a simple political/social/economic situation. Students will predict the most likely political/social/economic outcome given a specific scientific discovery.
Content Limits	Items for this benchmark will not address controversial or complex issues.

Benchmark SC.8.P.8.1	
Body of Knowledge/ Strand	**Physical Science**
Standard	**Big Idea 8: Properties of Matter**
Benchmark	**SC.8.P.8.1: 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.**
Common Core State Standard Connections	Indicate appropriate alignments to the Grade 8 CCSS Mathematics and/or Literacy Standards for Science whenever applicable. (See Appendix B.)
Benchmark Clarifications	Students will describe the motion of particles in solids, liquids, and/or gases. Students will describe solids as the state in which intermolecular attractions keep the molecules in fixed spatial relationships. Students will describe liquids as the state in which intermolecular attractions keep molecules in proximity but not in fixed relationships. Students will describe gases as the state in which molecules are comparatively separated and intermolecular attractions have relatively little effect on their respective motions.
Content Limits	N/A

Benchmark SC.8.P.8.2	
Body of Knowledge/ Strand	**Physical Science**
Standard	**Big Idea 8: Properties of Matter**
Benchmark	**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.**
Common Core State Standard Connections	Indicate appropriate alignments to the Grade 8 CCSS Mathematics and/or Literacy Standards for Science whenever applicable. (See Appendix B.)
Benchmark Clarifications	Students will explain why an object or a person has the same mass on Earth and on the Moon but different weights on Earth and on the Moon. Students will predict the mass and weight of an object or person on a natural satellite or planet as compared with the mass and weight of the object or person on Earth.
Content Limits	Items for this benchmark will not require use of the density formula to calculate density, mass, or volume when comparing substances. Items for this benchmark may ask students to calculate the weight of an object or person on a natural satellite or another planet when given the difference in weight between Earth and a natural satellite or another planet if the difference is given in whole numbers or simple fractions.

Benchmark SC.8.P.8.3	
Body of Knowledge/ Strand	**Physical Science**
Standard	**Big Idea 8: Properties of Matter**
Benchmark	**SC.8.P.8.3: Explore and describe the densities of various materials through measurement of their masses and volumes.**
Common Core State Standard Connections	Indicate appropriate alignments to the Grade 8 CCSS Mathematics and/or Literacy Standards for Science whenever applicable. (See Appendix B.)
Benchmark Clarifications	Students will describe density and/or calculate and compare the densities of various materials using the materials' masses and volumes.
Content Limits	Items for this benchmark may require use of the density formula to calculate density, mass, or volume when comparing substances.

Benchmark SC.8.P.8.4	
Body of Knowledge/ Strand	**Physical Science**
Standard	**Big Idea 8: Properties of Matter**
Benchmark	**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.**
Common Core State Standard Connections	Indicate appropriate alignments to the Grade 8 CCSS Mathematics and/or Literacy Standards for Science whenever applicable. (See Appendix B.)
Benchmark Clarifications	Students will describe physical properties and/or compare the physical properties of various materials.
Content Limits	Items for this benchmark that assess conductivity, solubility, or magnetic properties will be at a conceptual level only—items will not require calculations for these topics. Items for this benchmark that address solubility may include the terms *solvent*, *solute*, and *saturation*. Items for this benchmark may assess the concept of saturation. Items for this benchmark will not require memorization of the specific melting points and/or boiling points of substances. Items for this benchmark will not require use of the density formula to calculate density, mass, or volume when comparing substances.

Benchmark SC.8.P.8.5	
Body of Knowledge/ Strand	**Physical Science**
Standard	**Big Idea 8: Properties of Matter**
Benchmark	**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.**
Common Core State Standard Connections	Indicate appropriate alignments to the Grade 8 CCSS Mathematics and/or Literacy Standards for Science whenever applicable. (See Appendix B.)
Benchmark Clarifications	Students will explain that atoms are the smallest unit of an element and are composed of subatomic particles. Students will explain why there are many, but limited, combinations of atoms. Students will demonstrate with atomic models how atoms can combine in many ways. Students will use models to demonstrate the conservation of mass in chemical reactions.
Content Limits	Items for this benchmark will not assess chemical bonding. Items for this benchmark will not assess valence electrons or electron configurations.

Benchmark SC.8.P.8.6	
Body of Knowledge/ Strand	**Physical Science**
Standard	**Big Idea 8: Properties of Matter**
Benchmark	**SC.8.P.8.6: Recognize that elements are grouped in the periodic table according to similarities of their properties.**
Common Core State Standard Connections	Indicate appropriate alignments to the Grade 8 CCSS Mathematics and/or Literacy Standards for Science whenever applicable. (See Appendix B.)
Benchmark Clarifications	N/A
Content Limits	Items for this benchmark will not assess valence electrons or electron configurations.

Benchmark SC.8.P.8.7	
Body of Knowledge/ Strand	**Physical Science**
Standard	**Big Idea 8: Properties of Matter**
Benchmark	**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).**
Common Core State Standard Connections	Indicate appropriate alignments to the Grade 8 CCSS Mathematics and/or Literacy Standards for Science whenever applicable. (See Appendix B.)
Benchmark Clarifications	Students will explain that • matter is composed of discrete units called atoms; and • atoms are composed of sub-atomic particles called protons, neutrons, and electrons.
Content Limits	Items for this benchmark will not assess chemical bonding. Items for this benchmark will not assess valence electrons or electron configurations.

Benchmark SC.8.P.8.8	
Body of Knowledge/ Strand	**Physical Science**
Standard	**Big Idea 8: Properties of Matter**
Benchmark	**SC.8.P.8.8: Identify basic examples of and compare and classify the properties of compounds, including acids, bases, and salts.**
Common Core State Standard Connections	Indicate appropriate alignments to the Grade 8 CCSS Mathematics and/or Literacy Standards for Science whenever applicable. (See Appendix B.)
Benchmark Clarifications	N/A
Content Limits	Items for this benchmark may assess a conceptual understanding of the pH scale. Items for this benchmark will not assess chemical bonding. Items for this benchmark will not require knowledge of the pH of specific substances.

Benchmark SC.8.P.8.9	
Body of Knowledge/ Strand	**Physical Science**
Standard	**Big Idea 8: Properties of Matter**
Benchmark	**SC.8.P.8.9: Distinguish among mixtures (including solutions) and pure substances.**
Common Core State Standard Connections	Indicate appropriate alignments to the Grade 8 CCSS Mathematics and/or Literacy Standards for Science whenever applicable. (See Appendix B.)
Benchmark Clarifications	N/A
Content Limits	Items for this benchmark that assess mixtures and solutions may include components in different states of matter (e.g., gas dissolved in liquid). Items for this benchmark will not assess chemical bonding.

Benchmark SC.8.P.9.1	
Body of Knowledge/ Strand	**Physical Science**
Standard	**Big Idea 9: Changes in Matter**
Benchmark	**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.**
Common Core State Standard Connections	Indicate appropriate alignments to the Grade 8 CCSS Mathematics and/or Literacy Standards for Science whenever applicable. (See Appendix B.)
Benchmark Clarifications	Students will describe what happened to missing atoms/missing mass after a chemical change occurs in an open container. Students will predict how the mass of a substance will change after a physical change occurs.
Content Limits	Items for this benchmark will not require balancing equations or analysis of chemical formulas. Items for this benchmark will focus on a conceptual understanding of the law of conservation of mass—items will not require mathematical computations.

Benchmark SC.8.P.9.2	
Body of Knowledge/ Strand	**Physical Science**
Standard	**Big Idea 9: Changes in Matter**
Benchmark	**SC.8.P.9.2: Differentiate between physical changes and chemical changes.**
Common Core State Standard Connections	Indicate appropriate alignments to the Grade 8 CCSS Mathematics and/or Literacy Standards for Science whenever applicable. (See Appendix B.)
Benchmark Clarifications	N/A
Content Limits	Items for this benchmark will not require balancing equations or analysis of chemical formulas. Items for this benchmark will not require mathematical computations. Items for this benchmark will not assess reaction rates.

Benchmark SC.8.P.9.3	
Body of Knowledge/ Strand	**Physical Science**
Standard	**Big Idea 9: Changes in Matter**
Benchmark	**SC.8.P.9.3: Investigate and describe how temperature influences chemical changes.**
Common Core State Standard Connections	Indicate appropriate alignments to the Grade 8 CCSS Mathematics and/or Literacy Standards for Science whenever applicable. (See Appendix B.)
Benchmark Clarifications	Students will predict how adding heat to or removing heat from a specific chemical reaction will affect the reaction rate.
Content Limits	Items for this benchmark will not require balancing equations or analysis of chemical formulas.

Appendix A: Sample Items

Sample Item 1

Grade/Course	Item Type	DOK	NGSSS Benchmark	CCSS Benchmark	Point Value
8/Science	SR	1	SC.8.E.5.5: Describe and classify specific physical properties of stars: apparent magnitude (brightness), temperature (color), size, and luminosity (absolute brightness).	N/A	1

One physical property of a star is apparent magnitude. Which of the following is used in determining the apparent magnitude of a star?

A. the constellation the star is in

B. the distance of the star from Earth*

C. the number of times the star rotates

D. the number of prominences the star makes

Correct Answer: B

Rationales:

A	Incorrect. Students may think that stars within the same constellation have the same apparent magnitude. Constellations are perceived patterns of stars as seen in the sky from Earth. Stars within a single constellation may be made up of stars of vast differences in distance from Earth and brightness as seen from Earth (apparent magnitude).
B	Correct.
C	Incorrect. Students may think that the more a star rotates, the brighter it becomes. Stellar rotation is an important factor in determining the age of a star, but it is not a factor used to determine the apparent magnitude of a star.
D	Incorrect. Students may think that the more prominences that a star generates, the greater the apparent magnitude. Prominences are flares of hot gas that shoot out from the surfaces of stars, such as the Sun; they are not used to determine the apparent magnitude of a star.

Sample Item 2

Grade/Course	Item Type	DOK	NGSSS Benchmark	CCSS Benchmark	Point Value
6/Science	SHR	1	SC.6.N.3.3: Give several examples of scientific laws.	N/A	1

Scientific laws affect the modern day world. Identify two scientific laws.

Correct answer: Law of gravity (universal gravitation), gas laws, laws of motion, laws of thermodynamics; correct descriptions of scientific laws are also acceptable.

Rationale:

Correct Answer	Names of any two of many universally accepted laws of science are acceptable. A description of a scientific law is also acceptable; for example, instead of Charles' Law, a student may say, "When the temperature of a gas is increased, its volume increases." The name of the scientist or a mathematical equation is not required.

Sample Item 3

Grade/Course	Item Type	DOK	NGSSS Benchmark	CCSS Benchmark	Point Value
8/Science	CR	2	SC.8.P.9.2: Differentiate between physical changes and chemical changes.	LACC.68.WHST.1.2: Write informative/ explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes.	2

Changes in substances are either physical or chemical. Explain the difference between a physical and a chemical change, and give one example of each kind of change.

Scoring Rubric and Exemplar

Rubric	
2	A score of two indicates that the student has demonstrated a thorough understanding of the scientific concepts and/or procedures embodied in the task. The student has completed the task correctly, in a scientifically sound manner. When required, student explanations and/or interpretations are clear and complete. The response may contain minor flaws that do not detract from the demonstration of a thorough understanding.

1	A score of one indicates that the student has provided a response that is only partially correct. For example, the student may arrive at an acceptable conclusion or provide an adequate interpretation, but may demonstrate some misunderstanding of the underlying scientific concepts and/or procedures. Conversely, a student may arrive at an unacceptable conclusion or provide a faulty interpretation, but could have applied appropriate and scientifically sound concepts and/or procedures.
0	A score of zero indicates that the student has not provided a response or has provided a response that does not demonstrate an understanding of the scientific concepts and/or procedures embodied in the task. The student's explanation may be uninterpretable, lack sufficient information to determine the student's understanding, or contain clear misunderstandings of the underlying scientific concepts and/or procedures, or it may be incorrect.

Exemplar	
2	A correct student response should describe the difference between a chemical and physical change and give an example of each type of change. An example of a physical change is ice melting to make water. Ice and water are still chemically the same substance. A chemical change produces a new substance and is not a reversible process. An example of a process involving a chemical change is cooking an egg.

Sample Item 4

Grade/Course	Item Type	DOK	NGSSS Benchmark	CCSS Benchmark	Point Value
7/Science	ER	3	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.	LACC.68.WHST.1.2: Write informative/ explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes.	4

Traits are passed from parents to offspring. Explain how a set of instructions from genes determines the traits that are passed from parents to their offspring.

Scoring Rubric and Exemplar

Rubric	
4	A score of four indicates that the student has demonstrated a thorough understanding of the scientific concepts and/or procedures embodied in the task. The student has completed the task correctly, used scientifically sound procedures, and provided clear and complete explanations and interpretations. The response may contain minor flaws that do not detract from a demonstration of a thorough understanding.
3	A score of three indicates that the student has demonstrated an understanding of the scientific concepts and/or procedures embodied in the task. The student's response to the task is essentially correct, but the scientific procedures, explanations, and/or interpretations provided are not thorough. The response may contain minor flaws that reflect inattentiveness or indicate some misunderstanding of the underlying scientific concepts and/or procedures.
2	A score of two indicates that the student has demonstrated only a partial understanding of the scientific concepts and/or procedures embodied in the task. Although the student may have arrived at an acceptable conclusion or provided an adequate interpretation of the task, the student's work lacks an essential understanding of the underlying scientific concepts and/or procedures. The response may contain errors related to misunderstanding important aspects of the task, misuse of scientific procedures/processes, or faulty interpretations of results.
1	A score of one indicates that the student has demonstrated a very limited understanding of the scientific concepts and/or procedures embodied in the task. The student's response is incomplete and exhibits many flaws. Although the student's response has addressed some of the conditions of the task, the student has reached an inadequate conclusion and/or provided reasoning that is faulty or incomplete. The response exhibits many flaws or may be incomplete.
0	A score of zero indicates that the student has not provided a response or has provided a response that does not demonstrate an understanding of the scientific concepts and/or procedures embodied in the task. The student's explanation may be uninterpretable, lack sufficient information to determine the student's understanding, or contain clear misunderstandings of the underlying scientific concepts and/or procedures, or it may be incorrect.

Exemplar	
4	Any student response that includes the following information in the explanation: • Chromosomes are made up of strands of DNA that carry all genetic information/traits. • Genes are parts of DNA strands. • Genes carry the instructions/information needed to make amino acids/enzymes/proteins that control all reactions in a cell; this information is known as the genetic code. • DNA/genes are passed from parents to their offspring/children during meiosis.

Sample Item 5

Grade/Course	Item Type	DOK	NGSSS Benchmark	CCSS Benchmark	Point Value
7/Science	ESR	3	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.	LACC.68.WHST.1.2: Write informative/ explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes.	6

The Burmese python may be described as a problematic animal that was introduced to the Florida Everglades. This large snake, native to Southeast Asia, was originally brought to the United States to be bred and sold as a pet. Over several years, Burmese pythons have been released deliberately by their owners or escaped captivity and now successfully reproduce in the wild.

Write a short essay describing the steps you might use to investigate these large snakes and their possible effect on the food web that currently exists in the Everglades. Be sure to include all of the steps in the scientific method that you have learned, and predict what might happen to the food web if these Burmese pythons increase in numbers.

Scoring Rubric and Exemplar

Rubric	
6	Complete and correct response is made to all parts of the prompt. Appropriate scientific terminology is used correctly. There are no major conceptual errors, though there may be nondetracting minor errors. In-depth understanding of the scientific concepts applicable to the prompt is demonstrated. Thorough understanding of the connection between the scientific concepts and the real-life application is demonstrated.

5	Complete and correct response is made to all parts of the prompt. Appropriate scientific terminology is used correctly. There are no major conceptual errors, though there may be minor conceptual errors. Understanding of the scientific concepts applicable to the prompt is demonstrated. Connections are made between the scientific concepts and real-life application.
4	Complete and correct response is made to all parts of the prompt. There are minor errors in the use of scientific terminology. There are minor conceptual errors or omissions. The response may attempt connections between the scientific concepts and the real-life application.
3	Response to two or more parts of the prompt is attempted. There is limited use of scientific terminology. Response contains some major conceptual errors or omissions. Response shows limited understanding.
2	Response to one or more parts of the prompt is attempted. The use of scientific terminology may be missing. Response contains many major conceptual errors and omissions. Response shows minimal understanding.
1	Little attempt to answer the prompt is evident. Scientific terminology is missing. Response contains many major conceptual errors and omissions. Explanation shows no understanding.
0	Response addresses an entirely different topic or is completely unintelligible.

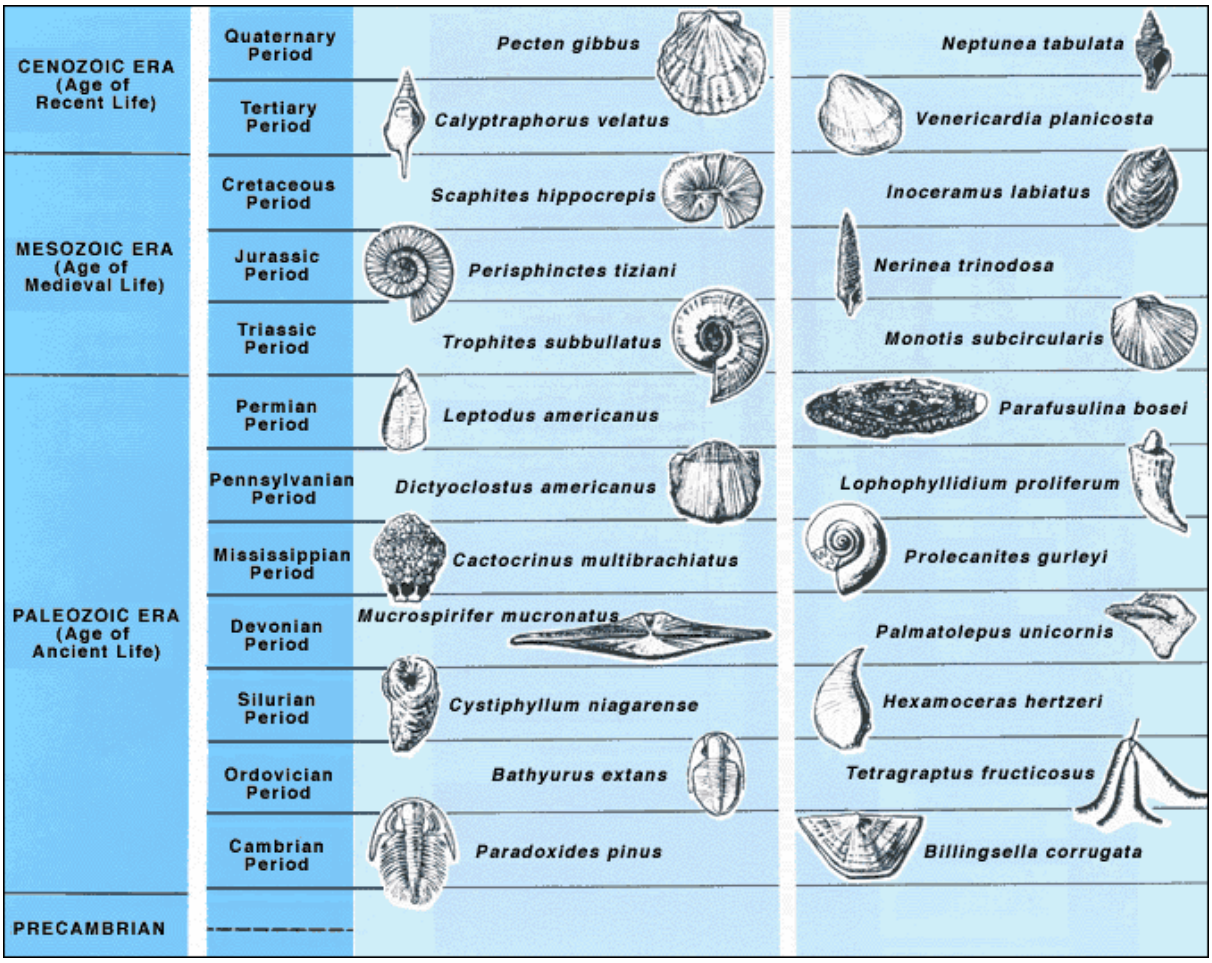
Exemplar	
6	**A full-credit student response should contain similar points of information that are presented in a logical flow of ideas that is similar to the following:** Information about the Burmese python would be researched to find out what it eats, where it lives, and how it reproduces. Information from scientists would be collected about how many pythons have been seen and caught in the Everglades in the past ten years. From this information one could tell if the population is increasing and what kind of animals the pythons eat. Data about the populations of other predators, prey, and producers in the Everglades would also be collected. The information would be organized into charts and tables to analyze the impact the invasive snake is having on the food web. The prediction is that if the Burmese python numbers are increasing, this predator will change the food web of the Everglades and some other predators may become extinct and other organism populations may be impacted. The conclusion would be that scientists should find ways to remove these snakes from the region and also keep people from releasing more pythons into this ecosystem.

Sample Item 6

Grade/Course	Item Type	DOK	NGSSS Benchmark	CCSS Benchmark	Point Value
7/Science	PT	4	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.	LACC.68.WHST.1.2: Write informative/ explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes.	4

Look at the chart showing extinct mollusk species from the fossil record. Many of these species look similar to species we still see today.

Stimulus:



Stimulus Reference: *http://pubs.usgs.gov/gip/geotime/fossils.gif*

Student Instructions:

Perform an Internet search of a modern day mollusk and compare it with one of the fossils on the chart. Describe similarities and differences between the two, and explain what additional information you would need to make better comparisons. Finally, explain why the two species might have similar features even though they are separated by millions of years. Why did those traits not evolve away over time?

Teacher Instructions:

This Performance Task requires students to explore the scientific theory of evolution by comparing the similarities and differences of an extinct species with a species living today. Students will use the Internet to gather information from reliable scientific sources (e.g., USGS.gov, ucmp.berkeley.edu, livescience.com).

Scoring Rubric and Exemplar	
4	A full-credit student response would similarly provide all four key points of information comparing an extinct mollusk from the chart with a modern-day mollusk shown below: • describe a major similarity or difference between the extinct mollusk species from the chart and modern-day mollusk (e.g., shell shape, shell thickness, shell opening/closing) • explain a piece of additional information needed to make better comparisons (e.g., It would be helpful to have more information about any number of features, such as size, anatomy, and physiology.) • explain why the two species might have similar features even though they are separated by millions of years (e.g., protection from predators) • explain why those traits did not evolve away over time (e.g., A certain feature may have contributed to a species survival and was thus favored by natural selection.)

Appendix B: Common Core State Standard Connections

A. Grade 6 Reading Standards for Literacy in Science and Technical Subjects

LACC.68.RST.1.3	Follow precisely a multistep procedure when carrying out experiments, taking measurements, or performing technical tasks.
LACC.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.
LACC.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).
LACC.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.

B. Grade 6 Writing Standards for Literacy in Science and Technical Subjects

LACC.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.
LACC.68.WHST.3.9	Draw evidence from informational texts to support analysis, reflection, and research.

C. Grade 6 Mathematics Standards in Science and Technical Subjects

MACC.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.
MACC.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.

MACC.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.*

D. Grade 7 Reading Standards for Literacy in Science and Technical Subjects

LACC.68.RST.1.3	Follow precisely a multistep procedure when carrying out experiments, taking measurements, or performing technical tasks.
LACC.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.
LACC.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).
LACC.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.

E. Grade 7 Writing Standards for Literacy in Science and Technical Subjects

LACC.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.
LACC.68.WHST.3.9	Draw evidence from informational texts to support analysis, reflection, and research.

F. Grade 7 Mathematics Standards in Science and Technical Subjects

MACC.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.

G. Grade 8 Reading Standards for Literacy in Science and Technical Subjects

LACC.68.RST.1.3	Follow precisely a multistep procedure when carrying out experiments, taking measurements, or performing technical tasks.
LACC.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.
LACC.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).

LACC.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.

H. Grade 8 Writing Standards for Literacy in Science and Technical Subjects

LACC.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.
LACC.68.WHST.3.9	Draw evidence from informational texts to support analysis, reflection, and research.

I. Grade 8 Mathematics Standards in Science and Technical Subjects

MACC.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.