2007

FCAT

Florida Comprehensive Assessment Test®

REPORT ON THE 2007 FCAT SCIENCE RELEASED ITEMS

FLORIDA *Inquires!*

GRADES 5, 8 & 11

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Florida Inquires! Report on the 2007 FCAT Science Released Items

Grades 5, 8 & 11

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Preface

Florida Inquires! Report on the 2007 FCAT Science Released Items is provided to help educators understand the scoring of the short-response performance tasks included on the 2007 "Performance Task Student Report" for FCAT Science (Grades 5, 8, and 11). *Florida Reads! Report on the 2007 FCAT Reading Released Items* (Grades 4, 8, and 10) and *Florida Solves! Report on the 2007 FCAT Mathematics Released Items* (Grades 5, 8, and 10) provide information about the reading and mathematics performance tasks featured on the 2007 student reports. *Florida Writes! Report on the 2007 FCAT Writing+ Assessment* (three separate publications for Grades 4, 8, and 10) provides information about the writing assessment administered in 2007. Additional information about FCAT reports can be found in *Understanding FCAT Reports 2007* on the FCAT home page of the Florida Department of Education (DOE) website at http://www.fldoe.org.

The Performance Task Student Report For FCAT 2007, administered during March 2007, performance task results are provided for students in Grades 5, 8, and 11 on the Science 2007 "Performance Task Student Reports." These reports summarize the total number of points possible on the performance tasks and the number of points each student earned. In addition, each report displays one of the tasks from the test and the number of points the student earned on that task. A copy (image) of the student's actual response to this featured task is printed on the bottom half of the report.

This Booklet General information about the scoring of the FCAT Science performance tasks is provided. Also included are guidelines for scoring the short-response performance tasks that are printed on the 2007 student reports. Each science task in this booklet includes the following:

- the general rubric for each score point;
- the actual task as it appeared in 2007 on the FCAT;
- the scoring guide for that task, which includes an example of a top-score response;
- four sample (anchor) papers for score point two (2);
- four sample (anchor) papers for score point one (1);
- two sample (anchor) papers for score point zero (0); and
- annotations for each sample paper.

Sunshine State Standards

Development of the Sunshine State Standards began in 1993, and the Standards were adopted by the State Board of Education in May 1996 to provide expectations for student achievement in Florida. The Standards were written in seven subject areas, each divided into four separate grade clusters (PreK–2, 3–5, 6–8, and 9–12). This format was chosen to provide flexibility to school districts in designing curricula based on local needs. As Florida moved toward greater accountability for student achievement at each grade level, the Sunshine State Standards were further refined. In the subject areas of language arts, mathematics, science, and social studies, the Sunshine State Standards were expanded to include Grade Level Expectations (GLEs) for PreK–8.

Background Information About FCAT Science

Florida Comprehensive Assessment Test® (FCAT) Design

The FCAT was originally designed to measure the reading and mathematics content defined by the Sunshine State Standards. The state writing assessment, first administered in 1992, became part of the FCAT in 1998 and was expanded to include multiple-choice questions in 2006. A test measuring the science Sunshine State Standards was added to the FCAT in 2003. The test questions and prompts are written to measure benchmarks from the Sunshine State Standards that identify what students are expected to know and demonstrate in reading, mathematics, writing, and science.

The FCAT is different from other tests students take in three important ways. First, the FCAT is the only test administered in all Florida public schools that is directly linked to the Sunshine State Standards.

Second, the FCAT is designed to represent the kinds of tasks and activities that parents and teachers expect as part of good instruction. In the FCAT Mathematics, Reading, and Science tests, this is accomplished by presenting on the test the types of information and questions that students encounter in the classroom. In FCAT Writing+, students respond to topics similar to those used in the classroom.

Third, the FCAT demands a more in-depth understanding and application of information than is typical of many standardized tests. The FCAT Mathematics, Reading, and Science tests require students to analyze, synthesize, and evaluate information and to apply strategies or procedures they have learned. Similarly, FCAT Writing+ requires students to demonstrate and apply their writing skills by drafting an original piece of writing in response to a real-world prompt, and respond to multiple-choice questions that assess students' skills with sentence structure, spelling, usage, and grammar.

Science Standards, Benchmarks, and Clusters

The Sunshine State Standards define the content standards for which test items are developed. The Sunshine State Standards identify the knowledge and skills that students are expected to acquire and include an expectation that students become creative and critical thinkers. The importance of thinking skills and problem solving is identified in *Florida's System of School Improvement and Accountability*, in Standard 4 of Goal 3: "Florida students use creative thinking skills to generate new ideas, make the best decisions, recognize and solve problems through reasoning, interpret symbolic data, and develop efficient techniques for lifelong learning." FCAT test items and performance tasks are developed with the intent of reinforcing the thinking and problem-solving abilities envisioned by this standard.

The term *benchmark* refers to a knowledge and skill statement presented in the Sunshine State Standards. The benchmarks are statements of expected student achievement and are specific to different grade levels. For assessment purposes two or more related benchmarks sometimes are grouped together because the assessment of one benchmark necessarily addresses the other benchmark. More information on the assessment of these benchmarks can be found in *FCAT Science Test Item Specifications*. (See Resources.)

The Sunshine State Standards contain benchmarks in the area of science. For the purpose of reporting FCAT results, science benchmarks are organized into four reporting categories called clusters.

Cluster 1 Physical and Chemical Sciences
Cluster 2 Earth and Space Sciences
Cluster 3 Life and Environmental Sciences
Cluster 4 Scientific Thinking

The specific content strand, standard, and benchmark for each performance task contained in this booklet is followed by an image of the actual science performance task as it appeared in 2007 on the FCAT.

Test Item Formats

Science test items at Grades 5, 8, and 11 are framed in the context of the Sunshine State Standards. Students are asked to answer questions that connect and apply science concepts, such as the diversity and interdependence of living things.

On FCAT Science tests, students respond to three kinds of questions.

- Multiple-choice questions require students to choose the correct answer from four possible choices.

- Gridded-response questions, at Grades 8 and 11, require students to solve a problem and to bubble their numeric answers in answer grids. Students must solve these problems on their own without being able to guess, as they can with multiple-choice questions. In some cases, the correct answer can be represented in more than one way, such as when one student uses significant figures and another student does not use significant figures to respond to a problem. Similarly, more than one answer can be correct, as can happen when there is a range of acceptable answers.

- Performance tasks require students to think about a scientific concept or problem, develop a strategy, and explain their strategy and solution. There are two kinds of performance tasks: short-response tasks, which require approximately five minutes to answer, and extended-response tasks, which require about ten to fifteen minutes to answer.

To emphasize the thinking required, the performance tasks in science are labeled "Read, Inquire, Explain." For these questions, students are required to respond to a question, and the response is later scored by teams of trained scorers. About 20 percent of the total score points of a test are generated by these performance tasks; the remaining score points come from multiple-choice, and in Grades 8 and 11, gridded-response questions.

Examples of FCAT test items for all grade levels are contained in *Sample Test Books* for FCAT Reading, Writing+, Mathematics, and Science tests. Sample Test Materials and released FCAT Reading and FCAT Mathematics test items and answer keys are distributed to school districts prior to the FCAT administration each year and can be downloaded from the FCAT home page on the DOE website at http://www.fldoe.org. (See Resources.)

How FCAT Science Is Scored

The FCAT is scored both manually and electronically. All the answer documents that students complete are scanned using a process called *imaging,* which involves capturing electronic images of the pages that include students' answers in their own handwriting. Students' multiple-choice and gridded responses are machine-scored using computer programs that read the students' bubbled answers and evaluate them based on an answer key. Students' answers to the performance tasks, however, must be scored by trained scorers using a process commonly called *handscoring*.

The handscoring of students' written responses is conducted by professional scorers. These scorers are required to have college degrees and are specially trained to score student papers. Scorers may only use the FCAT scoring rubrics and item-specific scoring criteria that have been established and validated by teams of Florida educators at FCAT Rangefinding meetings. (The General Scoring Rubrics can be found in Appendix A.)

After each science performance task is administered in a field test to a sample of Florida students, a team of Florida science teachers and administrators works with Florida Department of Education staff to score asample of these papers. A top-score response for each task is defined, and papers representing the possible scores for that task are identified (4, 3, 2, 1, and 0 for extended-response tasks and 2, 1, and 0 for short-response tasks). In this way, clear definitions of each score point are developed, and model papers, called *anchor papers*, are selected to represent the range of responses for each possible score point.

These field-test papers, scored by the team of Florida educators, then become the training materials for the professional scorers. This process and the quality control measures (reliability and validity checks) implemented during scoring ensure that all performance tasks are scored according to Florida's standards. Each student response is read independently by at least two professional scorers. For short-response performance tasks, if the scorers' two scores are not identical, a third scorer reviews the scoring to resolve the difference. For extended-response performance tasks, a third scorer is used if the first two scores are nonadjacent, that is, if they differ by more than one point. This third scoring, called *resolution scoring*, is performed by a scoring supervisor. All scoring is monitored by Florida Department of Education staff.

Scores from the handscoring process are combined with scores from the machine-scoring process to create a record for each student. The student's total scale score is created by a computer-based analysis procedure that combines the scores from the various types of test items. Scale scores are used to report student results because of their precision and because they can be equated from year to year. Equating scores ensures the same standard of achievement is used each year. In this way, scores can be compared from year to year, and the progress of students and schools can be evaluated fairly.

For more detailed information about scoring performance tasks, see *FCAT Performance Task Scoring—Practice for Educators* publications and software sent to Florida school districts in 2001. Also, more information can be found in the *FCAT Handbook—A Resource for Educators,* which can be downloaded from the DOE website.

Holistic Scoring

What is holistic scoring? Student responses to the FCAT Science performance tasks are scored holistically. The term *holistic* is used to emphasize the importance of the whole work, including the interdependence of its parts. A rubric is used to evaluate student responses to each task. Different rubrics are used for the two different types of tasks, short- and extended-response. Holistic scoring is a method of evaluation that is used in many state assessments and involves judging a student response for its *total* effect. No single factor is weighted to the exclusion of any other.

Analytic scoring, on the other hand, is a method of scoring in which separate judgments or ratings are made for each of several traits. In science, for example, the scorer might evaluate such traits as parts of process, method, and scientific accuracy, giving a separate score for each. It is important to note that separate analytic judgments are **not** made when scoring the FCAT performance tasks. By scoring holistically, scorers take all traits into consideration and give a single, overall score. Potential bias issues are also discussed with scorers. (See Appendix C.)

What is a rubric? A rubric is a general guide for scoring. It identifies the performance features to be evaluated and describes how performance varies across the scoring scale. For the FCAT Science extended-response tasks, a 4-point rubric is used (4, 3, 2, 1, 0). A 2-point rubric (2, 1, 0) is used for short-response tasks. (Appendix A includes the 2-point and 4-point rubrics used for scoring the FCAT Science performance tasks.) The 2-point rubric precedes each short-response performance task within this booklet as well.

What are anchor papers? Anchor papers are actual, unedited student responses demonstrating typical performance for each point in the rubric. They are used to train professional scorers to recognize, for example, what a score point 4 response looks like or what a score point 2 response looks like. Anchor papers also help scorers make decisions about assigning score points during live scoring.

What are annotations? Annotations explain the reasoning associated with a particular score. They describe the strengths and weaknesses of a paper. Annotations are used to train scorers by giving them insights into the knowledge and reasoning skills that students use in responding to performance tasks.

Scoring Tools for FCAT Science

Two scoring tools are available for scorers of the FCAT Science performance tasks.

- **General Rubrics** General scoring rubrics are available for both the short-response tasks and the extended-response tasks. (See Appendix A.) These rubrics describe the characteristics associated with each score point. Because they are general, these rubrics apply to all science performance tasks.

- **Example of a Top-Score Response** The top-score response displays one example of a correct and complete response *for that particular task*.

When used in combination with the anchor responses and annotations, these scoring tools give scorers and educators a clear and comprehensive understanding of how to interpret and evaluate students' responses to the FCAT Science performance tasks.

Grade 5

Short-Response Performance Task

- Calculators are not used on Grade 5 FCAT Science.
- Any formulas that students need for answering Grade 5 FCAT Science items are provided with the test item.

General Short-Response Scoring Rubric

READ
INQUIRE
EXPLAIN

Score	Description
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.

Science Short-Response Performance Task from FCAT 2007

The strand, standard, and benchmark for the task are presented below along with the task as it appears in the FCAT 2007 test.

Description of Task

Strand G: How Living Things Interact with Their Environment

Standard 1: The student understands the competitive, interdependent, cyclic nature of living things in the environment.

Benchmark: SC.G.1.2.2 The student knows that living things compete in a climatic region with other living things and that structural adaptations make them fit for an environment.

Performance Task: Fifth grade students were directed to respond in their test books. The performance task below may have been reduced to fit on this page. The actual size is shown on the following page.

READ
INQUIRE
EXPLAIN

Many animals live on the African plain and compete for the limited food supply. Each type of animal, including the lion, the zebra, the antelope, and the giraffe, has become adapted to a different niche within this environment. Select **one** of these animals and describe a specialized trait. Explain how this trait helps it to survive.

Example of a Top-Score Response for This Task

READ
INQUIRE
EXPLAIN

Many animals live on the African plain and compete for the limited food supply. Each type of animal, including the lion, the zebra, the antelope, and the giraffe, has become adapted to a different niche within this environment. Select **one** of these animals and describe a specialized trait. Explain how this trait helps it to survive.

An explanation similar to the following:

The zebra's stripes are a trait that helps it to survive. Its stripes help the zebra blend in with other zebras in the herd making it confusing for predators to pick one zebra to attack.

STUDENT RESPONSE

READ
INQUIRE
EXPLAIN

Many animals live on the African plain and compete for the limited food supply. Each type of animal, including the lion, the zebra, the antelope, and the giraffe, has become adapted to a different niche within this environment. Select **one** of these animals and describe a specialized trait. Explain how this trait helps it to survive.

One of the giraffe's trait is their long neck. This trait helps the giraffe to survive, to eat and get the nutrients he needs The giraffe needs lots of ndur5 nutrients from the trees. Since their the only animal with such long necks they get most of the leaves on the upper part of the tree

SCORE POINT
2

The response demonstrates a thorough understanding of a specialized trait that helps a giraffe survive on the African plain. The response correctly describes a specialized trait for a giraffe by stating "One of the giraffe's trait is their long neck." The statement "This trait helps the giraffe to survive, to eat and get the nutrients he needs . . . Since their the only animal with such long necks they get most of the leaves on the upper part of the tree" correctly explains how a giraffe's long neck helps it survive on the African plain. A giraffe uses its long neck to eat leaves from the upper part of trees or tall trees where other animals cannot reach, reducing competition for food. The response is clear and complete.

READ
INQUIRE
EXPLAIN

Many animals live on the African plain and compete for the limited food supply. Each type of animal, including the lion, the zebra, the antelope, and the giraffe, has become adapted to a different niche within this environment. Select **one** of these animals and describe a specialized trait. Explain how this trait helps it to survive.

The lion has golden fur. It can blend in with the dead grass so the animal or animals it is hunting cannot see it. It can also climb and blend with the leaves of the trees so it can pounce on prey. This trait will help it get food.

STUDENT RESPONSE

SCORE POINT
2

The response demonstrates a thorough understanding of a specialized trait that helps a lion survive on the African plain. The response correctly describes a specialized trait for a lion by stating "The lion has golden fur." The statement "It can blend in with the dead grass so the animal or animals it is hunting cannot see it. It can also climb and blend with the leaves of the trees" explains how a lion's golden fur helps it survive on the African plain. The lion's golden fur helps it to camouflage or blend in with the amber-colored grasses of the African savannah, increasing the lion's chance of catching prey. The statement "so it can pounce on prey" does not detract from a thorough understanding. The response is clear and complete.

STUDENT RESPONSE

READ
INQUIRE
EXPLAIN

Many animals live on the African plain and compete for the limited food supply. Each type of animal, including the lion, the zebra, the antelope, and the giraffe, has become adapted to a different niche within this environment. Select **one** of these animals and describe a specialized trait. Explain how this trait helps it to survive.

The giraffe has many traits for survival. One of a giraffe's best traits are fur coated lips. furry lips help the giraffe eat from spikey trees. It also help so the spikes don't catch on the animals lips..

SCORE POINT
2

The response demonstrates a thorough understanding of a specialized trait that helps a giraffe survive on the African plain. The response correctly describes a specialized trait for a giraffe by stating "One of a giraffe's best traits are fur coated lips." The statement "Furry lips help the giraffe eat from spikey trees. It also help so the spikes don't catch on the animals lips" explains how a giraffe's fur-coated lips help it survive on the African plain. A giraffe's lips are protected by a thick layer of hair and covered by hard growths called papillae, an adaptation that helps it eat leaves from trees with thorns. The response is clear and complete.

STUDENT RESPONSE

READ
INQUIRE
EXPLAIN

Many animals live on the African plain and compete for the limited food supply. Each type of animal, including the lion, the zebra, the antelope, and the giraffe, has become adapted to a different niche within this environment. Select **one** of these animals and describe a specialized trait. Explain how this trait helps it to survive.

The zebra and its' stripes it can camoflage with other zebras to hide and confuse a predetor. When the Zebra is in a group they look like one big Zebra.

SCORE POINT
2

The response demonstrates a thorough understanding of a specialized trait that helps a zebra survive on the African plain. The response correctly describes a specialized trait for a zebra by stating "The zebra and its' stripes it can camoflage." The statement "it can camoflage with other zebras to hide and confuse a predetor. When the Zebra is in a group they look like one big zebra" explains how a zebra's stripes help it survive on the African plain. A zebra's stripes, within a group of zebras, break up the outline of the zebra and confuse predators, increasing the zebra's chance of survival. The response is clear and complete.

STUDENT RESPONSE

READ
INQUIRE
EXPLAIN

Many animals live on the African plain and compete for the limited food supply. Each type of animal, including the lion, the zebra, the antelope, and the giraffe, has become adapted to a different niche within this environment. Select **one** of these animals and describe a specialized trait. Explain how this trait helps it to survive.

The giraffe has a good place to be, it is in African plain. The reason why I picked the giraffe is in Africa there is lots of trees, and the giraff has a long neck so it works perfect for the giraff.

SCORE POINT
1

The response demonstrates partial understanding of a specialized trait that helps a giraffe survive on the African plain. The response correctly describes a specialized trait for a giraffe by stating "the giraff has a long neck." The statement "The reason why I picked the giraffe is in Africa there is lots of trees, and the giraff has a long neck so it works perfect for the giraff" does not explain how a giraffe uses its long neck or identify a benefit of the long neck to the giraffe that helps it to survive on the African plain. A giraffe uses its long neck to eat leaves from the upper part of trees or tall trees where other animals cannot reach, reducing competition for food. An appropriate description of a specialized trait contributes to the demonstration of a partial understanding of the scientific concepts embodied in the task.

READ
INQUIRE
EXPLAIN

Many animals live on the African plain and compete for the limited food supply. Each type of animal, including the lion, the zebra, the antelope, and the giraffe, has become adapted to a different niche within this environment. Select **one** of these animals and describe a specialized trait. Explain how this trait helps it to survive.

The zebra has many ways to protect itself in the African Plains. One survival trait is, the zebra blends itself in with tall grass. This way it's preditors would be confused. Another way is to, blend it'self with other zebra. That way, the preditor won't reconize it.

STUDENT RESPONSE

SCORE POINT
1

The response demonstrates partial understanding of a specialized trait that helps a zebra survive on the African plain. The response does not describe a specialized trait for a zebra, but instead, explains how the unnamed trait would help the zebra survive by stating "One survival trait is, the zebra blends itself in with tall grass. This way it's preditors would be confused. Another way is to, blend it'self with other zebra. That way, the preditor won't reconize it." A zebra's stripes, within a group of zebras, break up the outline of the zebra and confuse predators, increasing the zebra's chance of survival. An appropriate explanation of how a specialized trait helps the zebra survive in its environment contributes to the demonstration of partial understanding of the scientific concepts embodied in the task.

STUDENT RESPONSE

READ
INQUIRE
EXPLAIN

Many animals live on the African plain and compete for the limited food supply. Each type of animal, including the lion, the zebra, the antelope, and the giraffe, has become adapted to a different niche within this environment. Select **one** of these animals and describe a specialized trait. Explain how this trait helps it to survive.

lion - they have sharp teeth so they can eat. They also know how to fight for there food. They also have alot of fur to keep them warm in the winter.

SCORE POINT
1

The response demonstrates partial understanding of a specialized trait that helps a lion survive on the African plain. The response correctly describes a specialized trait for a lion by stating "lion - they have sharp teeth." The statement "so they can eat" does not explain how the lion uses its sharp teeth or identify a unique benefit of the sharp teeth to the lion that helps it survive on the African plain. The statement "They also know how to fight for there food" is a behavior, and is neither a specialized trait nor an explanation of a unique benefit of a survival trait. An appropriate description of a specialized trait contributes to the demonstration of partial understanding of the scientific concepts embodied in the task.

STUDENT RESPONSE

READ
INQUIRE
EXPLAIN

Many animals live on the African plain and compete for the limited food supply. Each type of animal, including the lion, the zebra, the antelope, and the giraffe, has become adapted to a different niche within this environment. Select **one** of these animals and describe a specialized trait. Explain how this trait helps it to survive.

the antelope is a very fast runer. It helps to out run most of it's prediders and tires them down a lot till they have to stop running.

SCORE POINT
1

This response demonstrates partial understanding of a specialized trait that helps an antelope survive on the African plain. The response does not describe a specialized trait for an antelope, but instead explains how the unnamed trait would help the antelope survive by stating "The antelope is a very fast runer. It helps to out run most of it's prediders and tires them down a lot till they have to stop running." The skeleton, muscles, and long legs of the antelope help the animal to run at fast speeds for long distances. An appropriate explanation of how a specialized trait helps the antelope survive in its environment contributes to the demonstration of partial understanding of the scientific concepts embodied in the task.

STUDENT RESPONSE

READ
INQUIRE
EXPLAIN

Many animals live on the African plain and compete for the limited food supply. Each type of animal, including the lion, the zebra, the antelope, and the giraffe, has become adapted to a different niche within this environment. Select **one** of these animals and describe a specialized trait. Explain how this trait helps it to survive.

The lions traits help him or her survive by looking after each other when they are drinking water. Another way is the mothers kill the pray and bring it back while the father and baby or babies rest. Another way is because they help each other while they are in packs.

SCORE POINT
0

The response demonstrates a lack of understanding of a specialized trait that helps a lion survive on the African plain. The response does not describe a specialized trait for a lion; the statements "The lions traits help him or her survive by looking after each other when they are drinking water . . . Another way is the mothers kill the pray and bring it back while the father and baby or babies rest. Another way is because they help each other while they are in packs" do not explain how a specialized trait helps the lion survive on the African plain, but instead addresses behaviors of lions. The response does not demonstrate an understanding of the scientific concepts embodied in the task.

READ
INQUIRE
EXPLAIN

Many animals live on the African plain and compete for the limited food supply. Each type of animal, including the lion, the zebra, the antelope, and the giraffe, has become adapted to a different niche within this environment. Select **one** of these animals and describe a specialized trait. Explain how this trait helps it to survive.

Each animal has it's owne habbitat that it can live in it take the lion for example it can live in africa because it has it's food to eat of and is use to it's climate. If an animal is placed in a different place might not no how to survive.

STUDENT RESPONSE

SCORE POINT
0

The response demonstrates a lack of understanding of a specialized trait that helps a lion survive on the African plain. The statement "Each animal has it's owne habbitat that it can live in it take the lion for example it can live in africa because it has it's food to eat of and is use to it's climate. If an animal is placed in a different place might not no how to survive" does not describe a specialized trait or explain how a specialized trait helps the lion survive on the African plain. The response does not demonstrate an understanding of the scientific concepts embodied in the task.

Grade 8

Short-Response Performance Task

- Calculators are provided for Grade 8 students to use for FCAT Science.
- FCAT Science Reference Sheets with formulas and conversions and the Periodic Table of the Elements are provided for Grade 8 students. (See Appendix B.)

READ
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EXPLAIN

General Short-Response Scoring Rubric

Score	Description
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.

Science Short-Response Performance Task from FCAT 2007

The strand, standard, and benchmark for the task are presented below along with the task as it appears in the FCAT 2007 test.

Description of Task

Strand E: Earth and Space

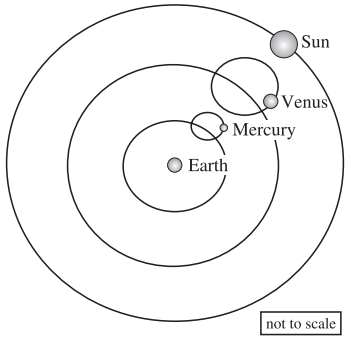
Standard 1: The student understands the interaction and organization in the Solar System and the universe and how this affects life on Earth.

Benchmark: SC.E.1.3.1 The student understands the vast size of our Solar System and the relationship of the planets and their satellites. (Also assesses SC.E.1.3.2 Knows that available data from various satellite probes show the similarities and differences among planets and their moons in the Solar System.)

Performance Task: Eighth grade students were directed to their answer books to respond to this question. The performance task below was reduced to fit on this page. The actual size is shown on the following page.

READ
INQUIRE
EXPLAIN

Hipparchus, an astronomer in ancient Greece, proposed an Earth-centered model of the solar system. In this model, the Sun, Earth's moon, Mercury, Venus, Mars, Jupiter, and Saturn not only traveled around Earth, but also traveled in small circles called "epicycles." A simplified illustration of Hipparchus's solar system is shown below.

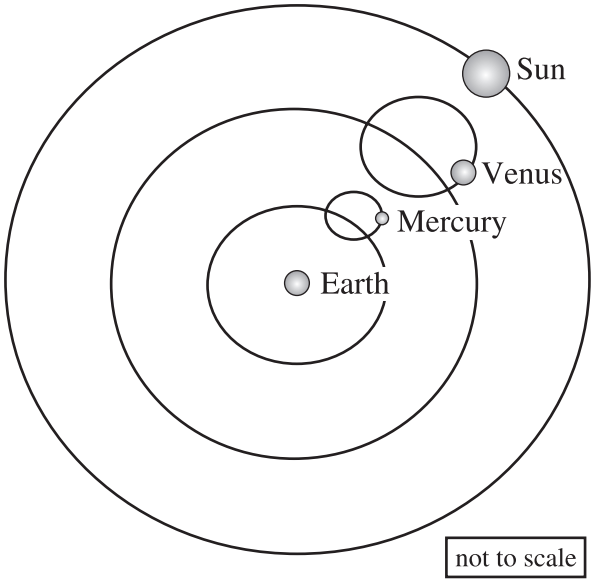


Explain how our current understanding of the solar system differs from Hipparchus's Earth-centered solar system.

Example of a Top-Score Response for This Task

READ
INQUIRE
EXPLAIN

Hipparchus, an astronomer in ancient Greece, proposed an Earth-centered model of the solar system. In this model, the Sun, Earth's moon, Mercury, Venus, Mars, Jupiter, and Saturn not only traveled around Earth, but also traveled in small circles called "epicycles." A simplified illustration of Hipparchus's solar system is shown below.



Explain how our current understanding of the solar system differs from Hipparchus's Earth-centered solar system.

An explanation similar to the following:

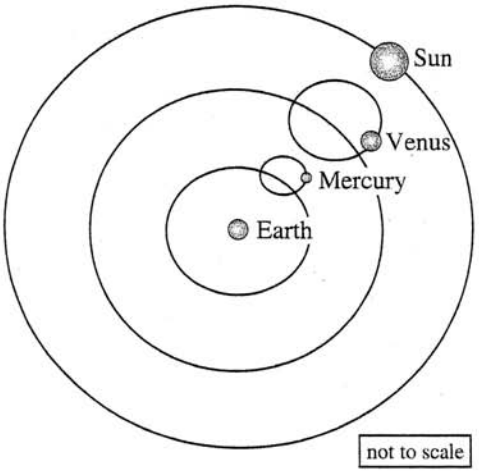
We now know that the Sun is at the center of the solar system instead of Earth.

We also know that the planets do not travel in epicycles; instead, they rotate on their axes as they revolve around the Sun.

STUDENT RESPONSE

READ
INQUIRE
EXPLAIN

Hipparchus, an astronomer in ancient Greece, proposed an Earth-centered model of the solar system. In this model, the Sun, Earth's moon, Mercury, Venus, Mars, Jupiter, and Saturn not only traveled around Earth, but also traveled in small circles called "epicycles." A simplified illustration of Hipparchus's solar system is shown below.



Explain how our current understanding of the solar system differs from Hipparchus's Earth-centered solar system.

Our current understanding of the solar system differs from Hipparchesis because the Sun is the center of our solar system and the planets revolve around it, not the Earth. Also, as the planets revolve around the Sun, they do not travel in circles called epicycles, but they do rotate. Last, Mercury is the closest planet to the sun, not Venus.

SCORE POINT
2

The response demonstrates a thorough understanding of the differences between Hipparchus's model of the solar system and our current understanding of the solar system. The response correctly describes a heliocentric solar system by stating "the Sun is the center of our solar system, and the planets revolve around it, not the Earth." The response also correctly rejects the existence of epicycles and recognizes planetary rotation by stating "Also, as the planets revolve around the Sun, they do not travel in circles called epicycles, but they do rotate." The statement "Mercury is the closest planet to the sun, not Venus" correctly describes the order of the planets in the current model of our solar system. The response is clear and complete.

READ
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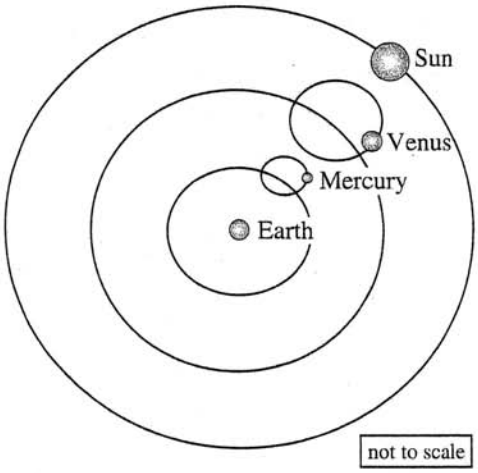
EXPLAIN

Hipparchus, an astronomer in ancient Greece, proposed an Earth-centered model of the solar system. In this model, the Sun, Earth's moon, Mercury, Venus, Mars, Jupiter, and Saturn not only traveled around Earth, but also traveled in small circles called "epicycles." A simplified illustration of Hipparchus's solar system is shown below.



Explain how our current understanding of the solar system differs from Hipparchus's Earth-centered solar system.

our current understanding of the solar system differs from Hipparchus's Earth-Centered Solar System. While studying the universe, we now know that the planets and sun do not orbit Earth, but the Planets orbit the Sun. We also know that the planet order from the Sun is Mercury, Venus, then Earth and that there are five more planets in our solar system.

STUDENT RESPONSE

SCORE POINT
2

The response demonstrates a thorough understanding of the differences between Hipparchus's model of the solar system and our current understanding of the solar system. The response correctly describes a heliocentric solar system by stating "the planets and sun do not orbit Earth, but the planets orbit the Sun." The response also correctly describes the order of planets as "Mercury, Venus, then Earth . . ." and recognizes the existence of additional planets in our solar system in that "there are five more planets in our solar system." Our most current understanding is that, in addition to Mercury, Venus, and Earth, there are five more planets in our solar system. The response is clear and complete.

STUDENT RESPONSE

READ
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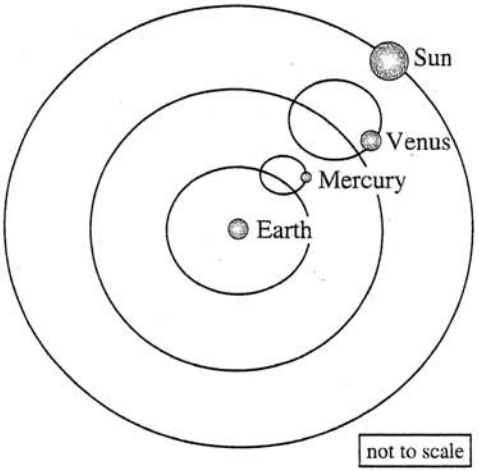
EXPLAIN

Hipparchus, an astronomer in ancient Greece, proposed an Earth-centered model of the solar system. In this model, the Sun, Earth's moon, Mercury, Venus, Mars, Jupiter, and Saturn not only traveled around Earth, but also traveled in small circles called "epicycles." A simplified illustration of Hipparchus's solar system is shown below.



Explain how our current understanding of the solar system differs from Hipparchus's Earth-centered solar system.

Our current understanding of the solar system is different from Hipparchus's Earth-centered solar system because now we know all planets in our solar system revolve around the sun, not the earth. We also know that the planets in our solar system travel our sun in an elliptical path, not a circular path like Hipparchus predicted.

SCORE POINT
2

The response demonstrates a thorough understanding of the differences between Hipparchus's model of the solar system and our current understanding of the solar system. The response correctly describes a heliocentric solar system by stating "all planets in our solar system revolve around the sun, not the earth." The response also states that "the planets . . . travel our sun in an elliptical path, not a circular path," which is an acceptable description of planetary motion. The response is clear and complete.

READ
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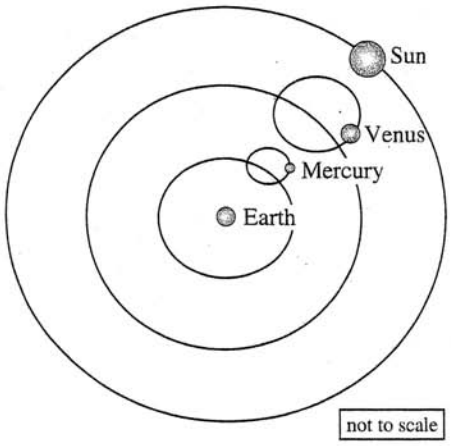
EXPLAIN

Hipparchus, an astronomer in ancient Greece, proposed an Earth-centered model of the solar system. In this model, the Sun, Earth's moon, Mercury, Venus, Mars, Jupiter, and Saturn not only traveled around Earth, but also traveled in small circles called "epicycles." A simplified illustration of Hipparchus's solar system is shown below.



Explain how our current understanding of the solar system differs from Hipparchus's Earth-centered solar system.

The sun is the center of the solar system. The plants have moons that go ground them. The planets don't have epicycles. There are also nine planets now.

STUDENT RESPONSE

SCORE POINT
2

The response demonstrates a thorough understanding of the differences between Hipparchus's model of the solar system and our current understanding of the solar system. The response correctly describes a heliocentric solar system by stating "The sun is the center of the solar system." The statement "There are also nine planets now" is acceptable and recognizes the existence of additional planets in our solar system. Although our most current understanding of the solar system is that there are eight planets, inclusion of Pluto as a planet is a minor flaw that does not detract from the demonstration of a thorough understanding. The statement "The plants have moons that go around them" addresses the existence of additional moons in our solar system. Recognizing that not all planets possess orbiting moons, and use of the word plant rather than planet, are considered minor flaws. While the statement "The planets don't have epicycles" rejects the existence of epicycles, it does not clarify that planets are now known to rotate on their individual axes while revolving around the Sun. Identification of a heliocentric solar system and the recognition of additional planets and their moons contribute to a thorough understanding. The response is clear and complete.

STUDENT RESPONSE

READ
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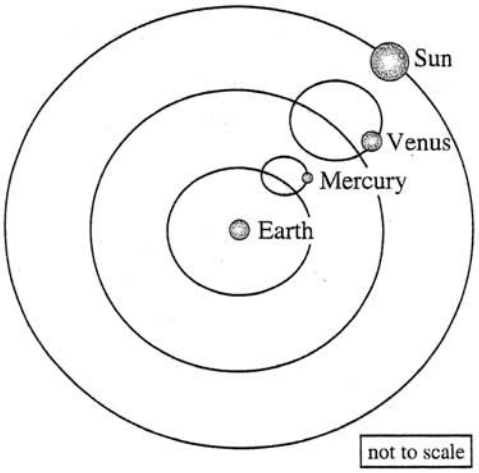
EXPLAIN

Hipparchus, an astronomer in ancient Greece, proposed an Earth-centered model of the solar system. In this model, the Sun, Earth's moon, Mercury, Venus, Mars, Jupiter, and Saturn not only traveled around Earth, but also traveled in small circles called "epicycles." A simplified illustration of Hipparchus's solar system is shown below.



Explain how our current understanding of the solar system differs from Hipparchus's Earth-centered solar system.

our current understanding of the Solar system and Hipparchus's earth-centered Solar system differ because today our under standing of the Solar System is better then it was in Hippchus's time. also we have been to space to see the planets. we have satilites and he didn't. So we Know that the earth is not at the center of the Solar system the Sun is and that earth is the third planet from the Sun.

SCORE POINT
1

The response demonstrates a partial understanding of the differences between Hipparchus's model of the solar system and our current understanding of the solar system. The response correctly describes a heliocentric solar system by stating "earth is not at the center of the Solar System the Sun is." Although "earth is the third Planet from the Sun" is a correct statement, it does not describe a difference between Hipparchus's model and our current understanding of the solar system and does not contribute to the demonstration of an understanding of the task. The statement "we have been to space to see the planets" offers an explanation for why our understanding of the solar system has changed, but does not address what those changes in understanding are. The statement "we have satilittes and he didn't" lacks sufficient information to determine understanding. This response demonstrates partial understanding.

READ
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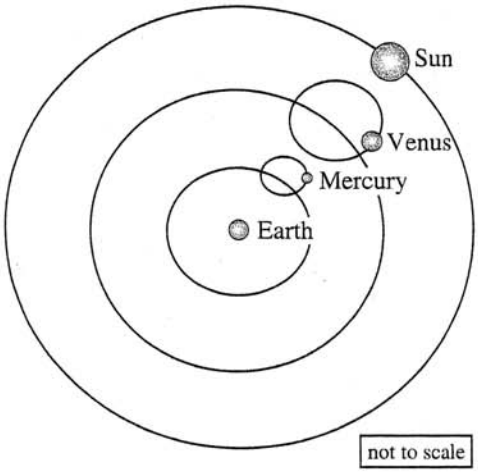
EXPLAIN

Hipparchus, an astronomer in ancient Greece, proposed an Earth-centered model of the solar system. In this model, the Sun, Earth's moon, Mercury, Venus, Mars, Jupiter, and Saturn not only traveled around Earth, but also traveled in small circles called "epicycles." A simplified illustration of Hipparchus's solar system is shown below.



not to scale

Explain how our current understanding of the solar system differs from Hipparchus's Earth-centered solar system.

Our current understanding of the soler system differs from Hipparchus's Earth-centered solar system by all of the planets revolve around the sun. We know now that the planets do not travel in epicycles. The only planet that travels around the Earth is the moon. This is what differs between our current understanding and Hipparchus' Earth-centered solar system.

STUDENT RESPONSE

SCORE POINT
1

The response demonstrates a partial understanding of the differences between Hipparchus's model of the solar system and our current understanding of the solar system. The response correctly describes a heliocentric solar system by stating "all of the planets revolve around the sun." While the statement "the planets do not travel in epicycles" rejects the existence of epicycles, it does not clarify that planets are now known to rotate on their individual axes while revolving around the Sun. In the statement "The only planet that travels around the Earth is the moon," the use of the term "planet" to describe Earth's Moon is incorrect and demonstrates some misunderstanding of the underlying scientific concepts.

STUDENT RESPONSE

READ
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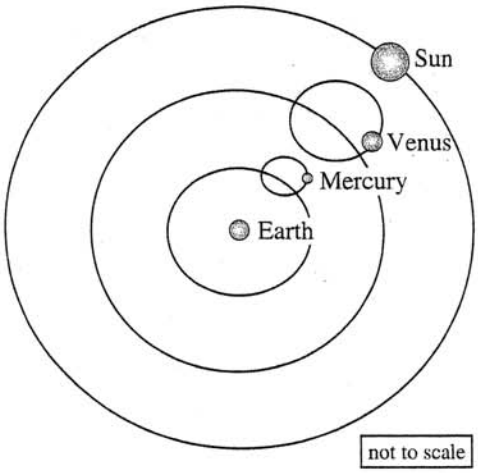
EXPLAIN

Hipparchus, an astronomer in ancient Greece, proposed an Earth-centered model of the solar system. In this model, the Sun, Earth's moon, Mercury, Venus, Mars, Jupiter, and Saturn not only traveled around Earth, but also traveled in small circles called "epicycles." A simplified illustration of Hipparchus's solar system is shown below.



Explain how our current understanding of the solar system differs from Hipparchus's Earth-centered solar system.

our current understanding from Hipparchus's differs because our understanding is that the Sun is the center of the solar system and that the planets, including earth, orbit the Sun not the earth.

SCORE POINT
1

The response demonstrates a partial understanding of the differences between Hipparchus's model of the solar system and our current understanding of the solar system. The statement "the Sun is the center of the Solar System and that the planets, including earth, orbit the Sun not the earth" correctly describes a heliocentric solar system; however, because this is the only difference between Hipparchus's model and our current understanding that is addressed, the response is not thorough.

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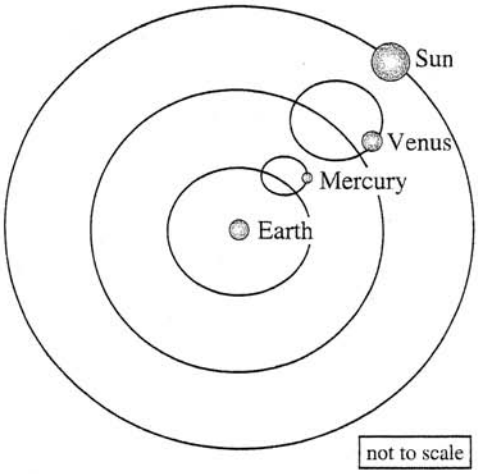
EXPLAIN

Hipparchus, an astronomer in ancient Greece, proposed an Earth-centered model of the solar system. In this model, the Sun, Earth's moon, Mercury, Venus, Mars, Jupiter, and Saturn not only traveled around Earth, but also traveled in small circles called "epicycles." A simplified illustration of Hipparchus's solar system is shown below.



Explain how our current understanding of the solar system differs from Hipparchus's Earth-centered solar system.

Our understanding of the solar system differs because we believe that the sun is in the middle of the solar system. Also, we have 7 planets, while they only had five.

STUDENT RESPONSE

SCORE POINT
1

The response demonstrates a partial understanding of the differences between Hipparchus's model of the solar system and our current understanding of the solar system. The response addresses a heliocentric solar system by stating "we believe that the sun is in the middle of the solor system." Use of the term "middle" rather than "center" is acceptable to describe the position of the Sun in the solar system. Although the statement "we have 7 planets, while they only had five" suggests that additional planets are recognized in our current model of the solar system, it demonstrates some misunderstanding of the underlying scientific concepts embodied in the task. Currently, the number of officially recognized planets is eight, not seven.

STUDENT RESPONSE

READ
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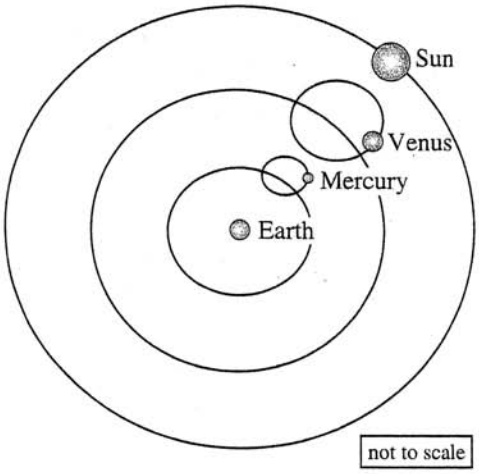
EXPLAIN

Hipparchus, an astronomer in ancient Greece, proposed an Earth-centered model of the solar system. In this model, the Sun, Earth's moon, Mercury, Venus, Mars, Jupiter, and Saturn not only traveled around Earth, but also traveled in small circles called "epicycles." A simplified illustration of Hipparchus's solar system is shown below.



Explain how our current understanding of the solar system differs from Hipparchus's Earth-centered solar system.

Because we know that Venus and Mercury don't orbit any thing. And the Hipparchus's think that they orbit something.

SCORE POINT
0

The response demonstrates a lack of understanding of the differences between Hipparchus's model of the solar system and our current understanding of the solar system. The statement "we know that Venus and Mercury don't orbit any thing . . . Hipparchus's think that they orbit something" is incorrect and demonstrates a clear misunderstanding of the underlying scientific concepts embodied in the task. Our current understanding is that all planets, including Mercury and Venus, revolve around the Sun in elliptical orbits while rotating on their axes. A correct explanation of differences between Hipparchus's model of the solar system and our current understanding of the solar system is not provided.

READ
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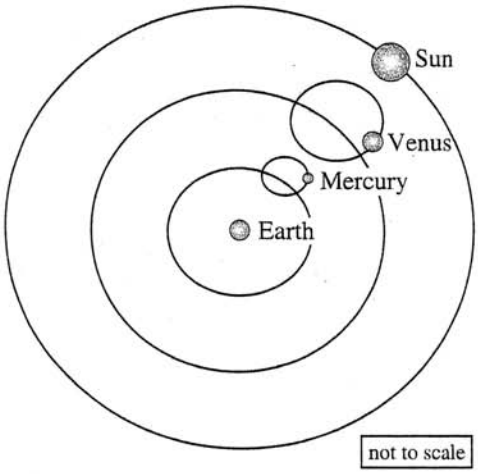
EXPLAIN

Hipparchus, an astronomer in ancient Greece, proposed an Earth-centered model of the solar system. In this model, the Sun, Earth's moon, Mercury, Venus, Mars, Jupiter, and Saturn not only traveled around Earth, but also traveled in small circles called "epicycles." A simplified illustration of Hipparchus's solar system is shown below.



Explain how our current understanding of the solar system differs from Hipparchus's Earth-centered solar system.

Our current understanding explains the way the planets rotates around the Earth at different speeds and, different time periods.

STUDENT RESPONSE

SCORE POINT
0

The response demonstrates a lack of understanding of the differences between Hipparchus's model of the solar system and our current understanding of the solar system. The statement "our current understanding explains the way the planets rotates around the Earth at different speeds and, different time periods" is incorrect and demonstrates a clear misunderstanding of the underlying scientific concepts embodied in the task. Planets do not rotate around Earth. Instead, all planets, including Earth, revolve around the Sun in elliptical orbits while rotating on their axes. A correct explanation of differences between Hipparchus's model of the solar system and our current understanding of the solar system is not provided.

Grade 11

Short-Response Performance Task

- Calculators are provided for Grade 11 students to use for FCAT Science.
- FCAT Science Reference Sheets with formulas and conversions and the Periodic Table of the Elements are provided for Grade 11 students. (See Appendix B.)

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General Short-Response Scoring Rubric

Score	Description
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.

Science Short-Response Performance Task from FCAT 2007

The strand, standard, and benchmark for the task are presented below along with the task as it appears in the FCAT 2007 test.

Description of Task

Strand F: Processes of Life

Standard 1: The student describes patterns of structure and function in living things.

Benchmark: SC.F.1.4.1 The student knows that the body processes involve specific biochemical reactions governed by biochemical principles (Also assesses SC.F.1.4.3 Knows that membranes are sites for chemical synthesis and essential energy conversions and SC.F.1.4.5 Knows that complex interactions among the different kinds of molecules in the cell cause distinct cycles of activity governed by proteins.)

Performance Task: Eleventh grade students were directed to their answer books to respond to this question. The performance task below may have been reduced to fit on this page. The actual size is shown on the following page.

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During normal human metabolism, waste products are produced. One of the waste products produced is carbon dioxide (CO_2). Explain how carbon dioxide is removed from the human body.

Example of a Top-Score Response for This Task

READ
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During normal human metabolism, waste products are produced. One of the waste products produced is carbon dioxide (CO_2). Explain how carbon dioxide is removed from the human body.

An explanation similar to the following:

Carbon dioxide is a product of cellular respiration and passes from cells into the bloodstream. The bloodstream carries the CO_2 to the lungs. CO_2 then moves from the bloodstream to the alveoli and is removed from the body when a person exhales.

During normal human metabolism, waste products are produced. One of the waste products produced is carbon dioxide (CO_2). Explain how carbon dioxide is removed from the human body.

READ
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CO_2 is traded off for O_2 in the Blood Stream. The blood then takes the CO_2 to the heart. The heart pumps the deoxygenized blood into the lungs where the CO_2 is exhaled, and replaced with fresh O_2

STUDENT RESPONSE

SCORE POINT
2

The response demonstrates a thorough understanding of how carbon dioxide, produced as a waste product of human metabolism, is removed from the body. The statement "CO_2 is traded off for O_2 in the Blood Stream" correctly explains how CO_2 that is produced in cells as a result of metabolism enters the bloodstream. The statement "The blood then takes the CO_2 to the heart. The heart pumps the deoxygenized blood into the lungs" is a scientifically sound description of how carbon dioxide in the bloodstream reaches the lungs and demonstrates understanding of the role of the respiratory system in the process of carbon dioxide removal in that carbon dioxide passes through the lungs in order to be removed. The response continues with "where the CO_2 is exhaled," which correctly identifies the process by which carbon dioxide is removed from the body. The response is clear and complete.

READ
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EXPLAIN

During normal human metabolism, waste products are produced. One of the waste products produced is carbon dioxide (CO_2). Explain how carbon dioxide is removed from the human body.

Carbon dioxide enters the bloodstream in capillaries located throughout the body. The blood flows through the body until it reaches the heart. The blood carrying carbon dioxides enters the right atria, passing through the tricuspid valve, the right ventricle, the pulmonary valve, and the pulmonary trunk. Then the blood flows to the lungs, where the carbon dioxide is filtered out, and the blood goes back to the heart as the carbon dioxide is exhaled.

STUDENT RESPONSE

SCORE POINT
2

The response demonstrates a thorough understanding of how carbon dioxide, that is produced as a waste product of human metabolism, is removed from the body. The statement "Carbon dioxide enters the bloodstream in capillaries" correctly describes how carbon dioxide that is produced as a result of human metabolism enters the bloodstream. The description of blood flow through the heart as "enters the right atria, passing through the tricuspid valve, the right ventricle, the pulmonary valve, and the pulmonary trunk" is scientifically sound, but since this is not required of the task, the description neither adds to nor detracts from the demonstration of a thorough understanding. The statement "Then the blood flows to the Lungs, where the carbon dioxide is filtered out" describes the role of the respiratory system in the process of carbon dioxide removal. The response continues with "as the carbon dioxide is exhaled," which correctly identifies the process by which carbon dioxide is removed from the body. The response is clear and complete.

During normal human metabolism, waste products are produced. One of the waste products produced is carbon dioxide (CO_2). Explain how carbon dioxide is removed from the human body.

READ
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EXPLAIN

Carbon Dioxide is released from the body when humans exhale. We breathe in oxygen and our blood cells use the oxygen and deliver everywhere in our bodies the when oxygen is dropped off and oxygen used, carbon dioxide is produced and it carried by blood cells to respitory system and let out. It's a never ending cycle of a living human, because everyone of our muscles need oxygen to preform their tasks and/or grow.

STUDENT RESPONSE

SCORE POINT
2

The response demonstrates a thorough understanding of how carbon dioxide, produced as a waste product of human metabolism, is removed from the body. The statement "Carbon Dioxide is released from the body when humans exhale" correctly identifies the process by which carbon dioxide is removed from the body. The statement "carbon dioxide is produced and it carried by blood cells" addresses the concept that carbon dioxide that is produced as a result of metabolism travels through the bloodstream. The response continues with "to respitory system and let out," which recognizes the role of the respiratory system in the process of carbon dioxide removal. The response is clear and complete.

READ
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EXPLAIN

During normal human metabolism, waste products are produced. One of the waste products produced is carbon dioxide (CO_2). Explain how carbon dioxide is removed from the human body.

CO_2 is picked up by the bloodstream and taken to the lungs. The CO_2 is then released as you exhail.

STUDENT RESPONSE

SCORE POINT
2

The response demonstrates understanding of how carbon dioxide that is produced as a waste product of human metabolism is removed from the body. The statement "CO_2 is picked up by the bloodstream and taken to the lungs" correctly states that carbon dioxide produced in cells as a result of metabolism reaches the lungs via the bloodstream and recognizes the role of the respiratory system in the process of carbon dioxide removal. The statement "CO_2 is then released as you exhail" correctly identifies the process by which carbon dioxide is removed from the body. The response is clear and complete.

During normal human metabolism, waste products are produced. One of the waste products produced is carbon dioxide (CO_2). Explain how carbon dioxide is removed from the human body.

READ
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EXPLAIN

Carbon dioxide is removed from the human body by our lungs. When we breath in air, it is carried to our lungs and the carbon dioxide is seperated from the oxygen. the oxygen gets absorbed by the blood and the carbon dioxide is push back out of the body by the lungs.

STUDENT RESPONSE

SCORE POINT
1

The response demonstrates a partial understanding of how carbon dioxide that is produced as a waste product of human metabolism is removed from the body. The response explains the role of the respiratory system in the process of carbon dioxide removal by stating "Carbon dioxide is removed from the human body by our lungs." The process by which carbon dioxide is removed from the body, exhalation, is not identified but is described by the statement "carbon dioxide is push back out of the body by the lungs." The response does not explain that carbon dioxide that is produced as a result of metabolism travels through the bloodstream, but instead states "carbon dioxide is seperated from the oxygen. the oxygen gets absorbed by the blood and the carbon dioxide is push back out," which demonstrates some misunderstanding of the underlying scientific concepts.

During normal human metabolism, waste products are produced. One of the waste products produced is carbon dioxide (CO_2). Explain how carbon dioxide is removed from the human body.

READ
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EXPLAIN

Carbon dioxide is removed by transferring from the bloodstream to the trachea and out of the noes or mouth.

STUDENT RESPONSE

SCORE POINT
1

The response demonstrates a partial understanding of how carbon dioxide that is produced as a waste product of human metabolism is removed from the body. The statement "Carbon dioxide is removed by transferring from the bloodstream" recognizes that carbon dioxide that is produced as a result of human metabolism travels through the bloodstream during the process of carbon dioxide removal; however, it continues with "to the trachea and out of the noes or mouth," which demonstrates some misunderstanding of the underlying scientific concepts. Carbon dioxide must pass from the bloodstream through the lungs first, rather than directly to the trachea. The response also does not identify exhalation as the process by which carbon dioxide is removed from the body.

During normal human metabolism, waste products are produced. One of the waste products produced is carbon dioxide (CO_2). Explain how carbon dioxide is removed from the human body.

READ
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CO_2 is removed from the human body on the respratory system. The lungs filter out CO_2 and we breath it back out into the enviroment.

STUDENT RESPONSE

SCORE POINT
1

The response demonstrates a partial understanding of how carbon dioxide that is produced as a waste product of human metabolism is removed from the body. The role of the respiratory system in the process of carbon dioxide removal is addressed by the statement "CO_2 is removed from the human body in the respratory system. The lungs filter out CO_2 . . . " The response continues with "and we breath it back out," which is an acceptable description of the exhalation process, which removes carbon dioxide from the body. The response does not address that carbon dioxide produced as a result of metabolism reaches the lungs through the bloodstream, which detracts from the demonstration of a thorough understanding.

During normal human metabolism, waste products are produced. One of the waste products produced is carbon dioxide (CO_2). Explain how carbon dioxide is removed from the human body.

READ
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EXPLAIN

Carbon dioxide is removed from the human body through the process of respiration. Humans breathe in Oxygen (O_2), and our bodies give off carbon dioxide (CO_2), as waste in the form of a gas. Trees and other plants "breathe" in and give off CO_2, and in turn, give off O_2 as waste that we humans use. It is a never-ending cycle.

STUDENT RESPONSE

SCORE POINT
1

The response demonstrates a partial understanding of how carbon dioxide that is produced as a waste product of human metabolism is removed from the body. The response correctly identifies the process by which carbon dioxide is removed from the body by stating "Carbon dioxide is removed from the human body through the process of respiration." Use of the word "respiration" alone, however, does not sufficiently address the role of the respiratory system in the process of carbon dioxide removal. The response does not explain that carbon dioxide produced as a result of metabolism travels through the bloodstream to the lungs before it is removed from the body. The response contains information describing gas exchange between humans and plants "Humans breathe in Oxygen (O_2), and . . . give off carbon dioxide (CO_2) . . . plants 'breathe' in . . . CO_2, and . . . give off O_2;" however, this information does not address the scientific concepts embodied in the task.

During normal human metabolism, waste products are produced. One of the waste products produced is carbon dioxide (CO_2). Explain how carbon dioxide is removed from the human body.

READ
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Carbon dioxide is removed from the body by other cells in the human body. The other cells fight off what is supposed to be there or if there is to much of something.

STUDENT RESPONSE

SCORE POINT
0

The response demonstrates a lack of understanding of how carbon dioxide that is produced as a waste product of human metabolism is removed from the body. The response does not address the role of the respiratory system in the process of carbon dioxide removal or identify the process by which carbon dioxide is removed, which is exhalation. The removal of carbon dioxide is described as taking place "by other cells in the human body," which lacks sufficient information to demonstrate understanding that carbon dioxide is carried to the lungs by the bloodstream. The response continues with "The other cells fight off what is supposed to be there or if there is to much of something," which is uninterpretable.

During normal human metabolism, waste products are produced. One of the waste products produced is carbon dioxide (CO_2). Explain how carbon dioxide is removed from the human body.

READ
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Carbon Dioxide is removed from the human body when you drink alot of (H_2O) water which cleanses the system from any waste. It gets in and it kinds of wastes it out. Also if we watch what we eat and work out, burn body fat, it will remove itself from the body- we have our attendancy to not know when it's there so we have to be cautious and take good cur of ourselves.

STUDENT RESPONSE

SCORE POINT
0

The response demonstrates a lack of understanding of how carbon dioxide that is produced as a waste product of human metabolism is removed from the body. The response does not address the role of the respiratory system in the process of carbon dioxide removal or identify the exhalation process by which carbon dioxide is removed, but instead states "Carbon Dioxide is removed . . . when you drink alot of (H_2O) water which cleanses the system from any waste," which demonstrates a clear misunderstanding of the underlying scientific concepts. The response does not address the concept that carbon dioxide that is produced as a result of human metabolism travels through the bloodstream, but states "if we watch what we eat and work out, burn body fat, it will remove itself from the body," suggesting that removal of carbon dioxide is a voluntary action.

Appendix A
FCAT Science Short-Response Rubric

READ
INQUIRE
EXPLAIN

General Short-Response Scoring Rubric

Score	Description
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.

FCAT Science Extended-Response Rubric

READ
INQUIRE
EXPLAIN

General Extended-Response Scoring Rubric

Score	Description
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.

Appendix B

Grade 8 FCAT Science Reference Sheet

Equations

Acceleration (a)	=	$\frac{\text{change in velocity (m/s)}}{\text{time taken for this change (s)}}$	a	=	$\frac{v_f - v_i}{t_f - t_i}$
Average speed (v)	=	$\frac{\text{distance}}{\text{time}}$	v	=	$\frac{d}{t}$
Density (D)	=	$\frac{\text{mass (g)}}{\text{Volume (cm}^3\text{)}}$	D	=	$\frac{m}{V}$
Percent Efficiency (e)	=	$\frac{\text{Work out (J)}}{\text{Work in (J)}} \times 100$	%e	=	$\frac{W_{out}}{W_{in}} \times 100$
Force (F)	=	mass (kg) × acceleration (m/s^2)	F	=	ma
Frequency (f)	=	$\frac{\text{number of events (waves)}}{\text{time (s)}}$	f	=	$\frac{n \text{ of events}}{t}$
Momentum (p)	=	mass (kg) × velocity (m/s)	p	=	mv
Wavelength (λ)	=	$\frac{\text{velocity (m/s)}}{\text{frequency (Hz)}}$	λ	=	$\frac{v}{f}$
Work (W)	=	Force (N) × distance (m)	W	=	Fd

Units of Measure

m = meter	g = gram	s = second
cm = centimeter	kg = kilogram	Hz = hertz (waves per second)
J = joule (newton-meter)		
N = newton (kilogram-meter per second squared)		

Appendix B

Grade 11 FCAT Science Reference Sheet

Equations

Acceleration (a)	=	$\frac{\text{change in velocity (m/s)}}{\text{time taken for this change (s)}}$	a	=	$\frac{v_f - v_i}{t_f - t_i}$
Average speed (v)	=	$\frac{\text{distance}}{\text{time}}$	v	=	$\frac{d}{t}$
Density (D)	=	$\frac{\text{mass (g)}}{\text{Volume (cm}^3\text{)}}$	D	=	$\frac{m}{V}$
Percent Efficiency (e)	=	$\frac{\text{Work out (J)}}{\text{Work in (J)}} \times 100$	%e	=	$\frac{W_{out}}{W_{in}} \times 100$
Force (F)	=	mass (kg) × acceleration (m/s^2)	F	=	ma
Frequency (f)	=	$\frac{\text{number of events (waves)}}{\text{time (s)}}$	f	=	$\frac{n \text{ of events}}{t}$
Momentum (p)	=	mass (kg) × velocity (m/s)	p	=	mv
Pressure (P)	=	$\frac{\text{Force (N)}}{\text{area (m}^2\text{)}}$	P	=	$\frac{F}{A}$
Wavelength (λ)	=	$\frac{\text{velocity (m/s)}}{\text{frequency (Hz)}}$	λ	=	$\frac{v}{f}$
Work (W)	=	Force (N) × distance (m)	W	=	Fd

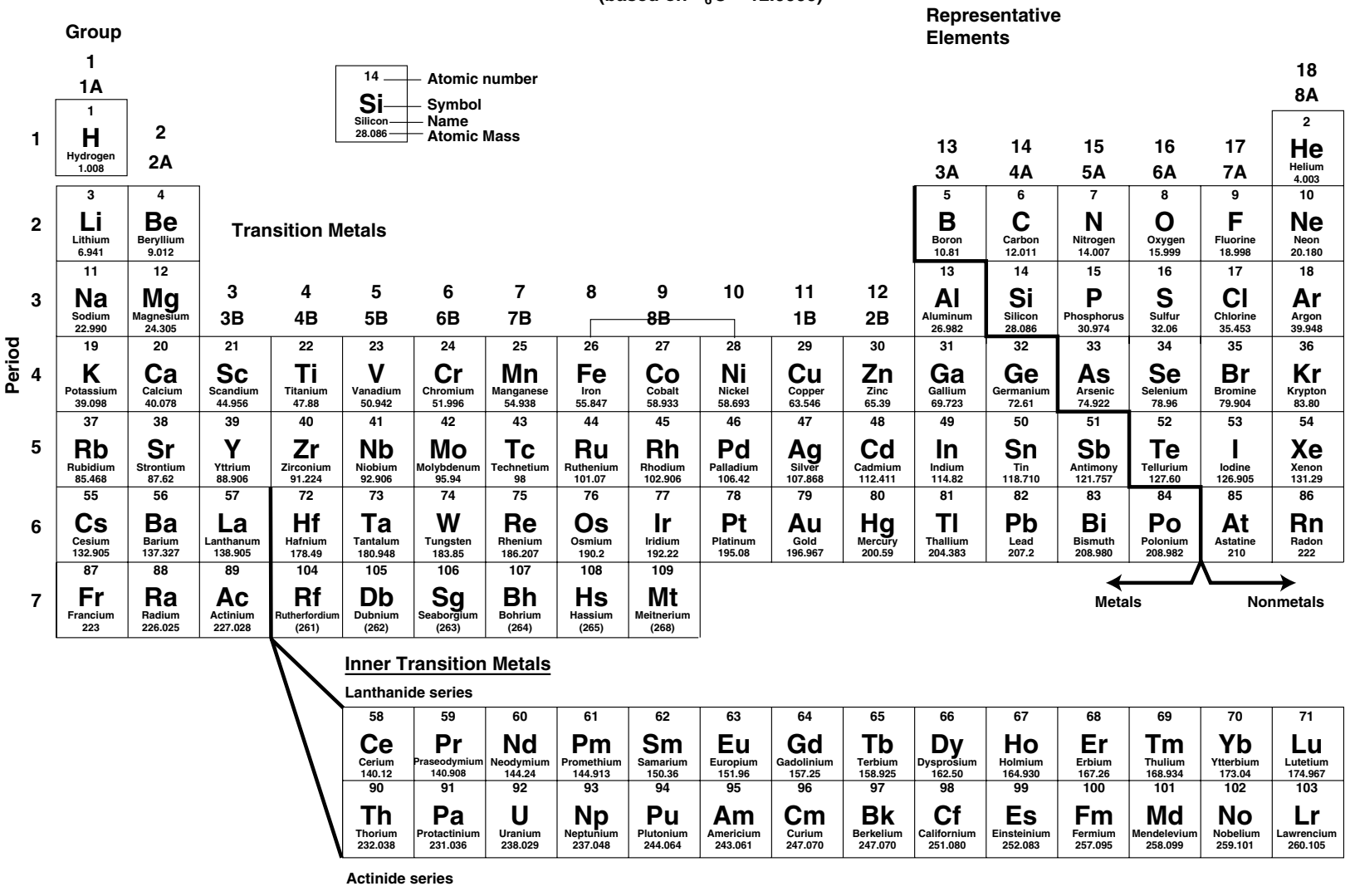
Units of Measure

m = meter
cm = centimeter
g = gram
kg = kilogram
s = second
Hz = hertz (waves per second)
J = joule (newton-meter)
N = newton (kilogram-meter per second squared)

1 Astronomical Unit (AU) = distance between Earth and the Sun (approximately 150 million kilometers)

Periodic Table of the Elements

(based on $^{12}_{6}C = 12.0000$)



Appendix B
Grades 8 & 11 FCAT Science
Periodic Table of the Elements

Appendix C
Scorer Bias

Scorer bias refers to factors that have no basis in the scoring criteria or rubric, but have an effect on a scorer's perception of a student's response. Scorers are trained to avoid these biases because research indicates that biases can interfere with a consistent application of the scoring rubric.

1. **Reactions to Scoring Criteria from Other Assessments, Previous Experience with Instruction, or the Use of the Test or Test Scores.** Do you prefer the scoring criteria of another project, state, or grade level? Do you have an issue with instruction, the appropriateness of the rubric, the soundness of the administration, or the use of the assessment? Your role is to score the responses according to the scoring criteria rather than to react to the scoring criteria, administration procedures, or the use of the assessment.
2. **Appearance of Response.** How does the paper look at first glance? How long is the response? You should not be influenced by handwriting, neatness, and margins. Handwriting ability is not the same as writing ability. The scoring criteria are based on the quality of the response rather than on the appearance of the response.
3. **Knowledge of Topic.** Are you knowledgeable about the topic? When evaluating student responses, you should consistently adhere to the scoring criteria, regardless of your expertise (or lack of expertise) about the topic.
4. **Reactions to Style.** Does the student begin sentences with "And" or "But"; use an informal tone; use first person; use clichés; place the thesis statement in the conclusion rather than in the introduction; use one-sentence paragraphs; or choose a formulaic, a traditional, or a nontraditional organizational structure? Does the use of a particular stylistic or organizational method prejudice your scoring? Are you unduly influenced by the use of one well-turned phrase in what otherwise is a nonillustrative response? Florida's scoring criteria do not mandate a particular style or organizational structure.
5. **Reactions to Content.** Has the student used vulgar or violent content? Is the response mundane? Does the student include information that either subtly or directly identifies the student's culture, ethnicity, religion, gender, sexual preference, or exceptionality? Does the student come across as brash, shy, cute, honest, willing to take a chance, or being like (or unlike) you were at that age? Your views about any of the preceding should never influence your scoring of a response. You should judge the student's ability to communicate, not the student's personality or voice. All scores must reflect the scoring criteria.
6. **Transference in Scoring.** Have many responses looked very similar? Is your scoring prejudiced by previously scored responses? In spite of the sameness or uniqueness of responses, an individual student wrote each response. You are responsible for applying the scoring criteria to each response as if it is the only response. Your judgment of a paper should never be influenced by the characteristics and quality of a previously scored paper.
7. **Well-being of Scorer.** Is your physical or mental state impeding your scoring accuracy? Each student's score must reflect the scoring criteria and not your state of mind, state of health, or state of rest.

Resources
FCAT Publications and Products

The Department of Education (DOE) produces many materials to help educators, students, and parents better understand the FCAT program. A list of FCAT-related publications and products is provided below. Additional information about the FCAT program is available on the FCAT home page of the DOE website at http://www.fldoe.org.

About the FCAT Web Brochure

This web-based brochure is found on the DOE website at http://www.firn.edu/doe/sas/fcat/aboutfcat/english/. English, Spanish, and Haitian Creole brochures provide information about FCAT Reading, Writing+, Mathematics, and Science for Grades 3–11 and link the reader to other helpful DOE web resources.

Assessment & Accountability Briefing Book

This book provides an overview of Florida's assessment, school accountability, and teacher certification programs. FCAT topics include frequently asked questions, content assessed by the FCAT, reliability, and validity. This booklet can be downloaded from the DOE website at http://www.firn.edu/doe/sas/fcat/fcatpub1.htm.

FCAT Handbook—A Resource for Educators

This publication provides the first comprehensive look at the FCAT, including history, test content, test format, test development and construction, test administration, and test scoring and reporting. Educator involvement is emphasized, demonstrating how Florida teachers and administrators participate in reviewing test items, determining how standards should be assessed, finding ranges of scores, and providing input on aspects of the test administration process. The PDF version is available on the DOE website at http://www.firn.edu/doe/sas/fcat/handbk/fcathandbook.html.

FCAT Myths vs. Facts

By providing factual information about the FCAT program, this brochure addresses common concerns about the FCAT that are based on myths. It is also available in Spanish and can be downloaded from the DOE website at http://www.firn.edu/doe/sas/fcat/fcatpub3.htm.

FCAT Performance Task Scoring—Practice for Educators (publications and software)

These materials are designed to help teachers learn to score FCAT Reading, Writing, and Mathematics performance tasks at Grades 4, 5, 8, and 10. A *Trainer's Guide* includes instructions for using the scoring publications and software in teacher education seminars and workshops. The publications mirror the scorer training experiences by presenting samples of student work for teachers to score.

FCAT Posters

Elementary, middle, and high school FCAT Reading, Writing+, Science, and Mathematics posters have an instructional focus. Two additional posters provide information about achievement levels and which FCAT tests are given at each grade. A high school poster reminds students about the graduation requirement to pass the FCAT Reading and Mathematics tests and the multiple opportunities available to retake the tests. Posters were delivered to Florida school districts in 2005; limited numbers of these posters are still available from the DOE Assessment office.

FCAT Released Tests

Reading, Grades 3, 4, 7, 8, 9, and 10
Mathematics, Grades 3, 4, 7, 8, 9, and 10

The DOE released FCAT Reading and FCAT Mathematics previously used full tests for Grades 4, 8, and 10 in 2005 and for Grades 3, 7, 9, and 10 in 2006. This web-based release included not only the tests, but also several other important documents including: interactive test books, answer keys, "How to Use the FCAT Released Tests," "How to Score the FCAT Released Tests," and "Frequently Asked Questions about the FCAT Released Tests." These supplemental materials provide many details about the FCAT, especially the range of correct answers and points needed for each achievement level. All materials are available on the DOE website at http://www.firn.edu/doe/sas/fcatrelease.html. In 2007 the DOE plans to release FCAT Reading and FCAT Mathematics tests for Grades 5 and 6.

FCAT Results Folder: A Guide for Parents and Guardians

This folder is designed for parents and guardians of students in Grades 3–11. It provides information about FCAT student results and allows parents to store student reports for future reference. Spanish and Haitian Creole versions are available. Delivery coincides with the spring delivery of student reports.

FCAT Test Item Specifications

Reading, Grades 3–5, 6–8, and 9–10
Mathematics, Grades 3–5, 6–8, and 9–10
Science, Grades 5, 8, and 10/11
Writing+ draft versions, Grades 4, 8, and 10

Defining both the content and the format of the FCAT test questions, the *Specifications* primarily serve as guidelines for item writers and reviewers, but also contain information for educators and the general public. The *Specifications* are designed to be broad enough to ensure test items are developed in several formats to measure the concepts presented in each benchmark. These materials can be downloaded from the DOE website at http://www.firn.edu/doe/sas/fcat/fcatis01.htm.

Florida Reads! Report on the 2007 FCAT Reading Released Items (Grades 4, 8 & 10)
Florida Solves! Report on the 2007 FCAT Mathematics Released Items (Grades 5, 8 & 10)
Florida Inquires! Report on the 2007 FCAT Science Released Items (Grades 5, 8 & 11)

These reports provide information about the scoring of the FCAT Reading, Mathematics, and Science performance tasks displayed on the 2007 student reports. *Florida Reads!* combines Grades 4, 8, and 10 in one document; *Florida Solves!* covers Grades 5, 8, and 10; and *Florida Inquires!* includes Grades 5, 8, and 11. The reports are distributed each May and are also posted to the DOE website at http://www.firn.edu/doe/sas/fcat/fcatflwrites.html.

Florida Writes! Report on the 2007 FCAT Writing+ Assessment, Grade 4
Florida Writes! Report on the 2007 FCAT Writing+ Assessment, Grade 8
Florida Writes! Report on the 2007 FCAT Writing+ Assessment, Grade 10

Each grade-level publication describes the content and application of the FCAT Writing+ tests and offers suggestions for activities that may be helpful in preparing students for the assessments. The reports are distributed each May and are also posted to the DOE website at http://www.firn.edu/doe/sas/fcat/fcatflwrites.html.

Frequently Asked Questions About FCAT

This brochure provides answers to frequently asked questions about the FCAT program and is available on the DOE website at http://www.firn.edu/doe/sas/fcat/fcatpub3.htm.

Keys to FCAT, Grades 3–5, 6–8, and 9–11

These booklets are distributed each January and contain information for parents and students preparing for FCAT Reading, Writing+, Mathematics, and Science. *Keys to FCAT* are translated into Spanish and Haitian Creole and are available, along with the English version, on the DOE website at http://www.firn.edu/doe/sas/fcat/fcatkeys.htm.

Lessons Learned—FCAT, Sunshine State Standards and Instructional Implications

This document provides an analysis of previous years' FCAT results and contains analyses of FCAT Reading, Writing, and Mathematics state-level data through 2000. The PDF version is available on the DOE website at http://www.firn.edu/doe/sas/fcat/fclesn02.htm. The DOE is currently working on the next version of *Lessons Learned* for FCAT Reading and Mathematics that will analyze data from 2001–2005. The planned release in print and on the DOE website is during Fall 2007.

Sample Test Materials for the FCAT
Reading and Mathematics, Grades 3–10
Science, Grades 5, 8, and 11
Writing+, Grades 4, 8, and 10

These materials are produced and distributed each fall for teachers to use with students. The student's test booklet contains practice questions and hints for answering them. The teacher's answer key provides the correct answer, an explanation for the correct answer, and also indicates the assessed SSS benchmark. These booklets are available in PDF format on the DOE website at http://www.firn.edu/doe/sas/fcat/fcatsmpl.htm.

The New FCAT NRT: Stanford Achievement Test, Tenth Edition (SAT10)

This brochure outlines differences between the previous FCAT NRT (SAT9) and the current FCAT NRT (SAT10). It is available in PDF format on the DOE website at http://www.firn.edu/doe/sas/fcat/fcatpub2.htm.

Understanding FCAT Reports

This booklet provides information about the FCAT student, school, and district reports for the recent test administration. Samples of reports, explanations about the reports, and a glossary of technical terms are included. Distribution to districts is scheduled to coincide with the delivery of student reports each May. The booklet can be downloaded from the DOE website at http://www.firn.edu/doe/sas/fcat/fcatpub2.htm.

What every teacher should know about FCAT

This document provides suggestions for all subject-area teachers to use in helping their students be successful on the FCAT. It can be downloaded from the DOE website at http://www.firn.edu/doe/sas/fcat/fcatpub2.htm.

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