2011

FCAT 2.0

Florida Comprehensive Assessment Test®

DRAFT

FCAT 2.0 SCIENCE

Test Item Specifications

Grade 5

FLORIDA DEPARTMENT OF EDUCATION
www.fldoe.org

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Introduction

In recent years, two realities focused attention on the need to reevaluate Florida's Sunshine State Standards. First, in 2005, outside consultants reviewed the 1996 Sunshine State Standards and suggested that the benchmark language offer greater specificity to indicate clearly what teachers should teach and what students should be able to do. Second, federal legislation through the *No Child Left Behind Act of 2001* (NCLB) holds schools and school districts accountable for how well each child is learning, which further emphasizes the need to hone expectations for all students.

In January 2006, the Florida Department of Education (DOE) committed to a six-year cycle of review and revision of the K–12 content standards. The science standards were rewritten, and the Next Generation Sunshine State Standards (NGSSS) for science were adopted by the Florida State Board of Education in February 2008 (available online at: http://www.floridastandards.org/Standards/FLStandardSearch.aspx).

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. This document, *FCAT 2.0 Science Test Item Specifications, Grade 5* (*Specifications*), provides information about the benchmarks, the stimulus types, and the test items designed to assess the standards for Grades 3–5.

The Florida Comprehensive Assessment Test 2.0® (FCAT 2.0) measures achievement of Florida students in writing, reading, mathematics, and science. End-of-course (EOC) assessments measure achievement of Florida students who have completed coursework in Algebra 1, Geometry, and U.S. History. The Biology 1 EOC Assessment measures achievement of Florida students enrolled in Biology 1, or an equivalent course, by assessing student progress on benchmarks from the NGSSS that are assigned to Biology 1 course descriptions.

Origin and Purpose of the *Specifications*

The Florida Department of Education and committees of experienced Florida educators developed and approved the *Specifications*. The *Specifications* is a resource that defines the content and format of the test and test items for item writers and reviewers. The grade-level *Specifications* indicates the alignment of test items with the NGSSS. It also serves to provide all stakeholders with information about the scope and function of the FCAT 2.0.

Scope of this Document

The *Specifications* for Grade 5 provides general and grade-specific guidelines for the development of all test items used in the FCAT 2.0 Science test for Grade 5. Two additional *Specifications* documents provide the same information for the FCAT 2.0 Science Grade 8 and the Biology 1 EOC assessments.

The Overall Considerations section in this Introduction provides an explanation of the science concepts and elements assessed by the test. The Criteria for FCAT 2.0 Science Test Items section addresses cognitive complexity levels as well as the review processes used to ensure the quality of the stimuli and test items. The same section explains the general guidelines for selection and development of multiple-choice items. The Individual Benchmark Specifications section contains specific information about each benchmark. This section provides benchmark clarification statements, content limits, stimulus attributes, response attributes, and a sample item for each benchmark grouping.

Overall Considerations

This section of the *Specifications* describes the guidelines that apply to all test items developed for the FCAT 2.0 Science Grades 5 and 8.

Overall considerations are broad item-development issues that should be addressed during the development of test items. Sections of Criteria for FCAT 2.0 Science Test Items relate more specifically to one aspect of the development (e.g., content limits, stimulus attributes).

1. Each test item should be written to measure primarily one benchmark; however, other benchmarks may also be reflected in the item context (scenario).
2. Some benchmarks are combined for assessment, and the individual specification indicates which benchmarks are combined. Test items may be written to "also assesses" benchmarks; however, the overall theme of the benchmark grouping should be evident in the items.
3. Test 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, except for specifically assessed science terms or concepts. Some words used in the Grade 5 benchmarks are above grade level. The Individual Benchmark Specifications and the Grade 5 Item Writer Glossary provide information to the writer on which science terms are appropriate for use in test items at Grade 5. For Grade 8, words found in the benchmarks and the glossary are appropriate for use in test items unless otherwise noted in the *Specifications*.
4. Test items should be written to the cognitive level of the benchmark unless otherwise noted in the individual specification sections. For example, if the benchmark states the student will compare concepts, the test item should assess a comparison.
5. Test items should assess the application of the concept rather than the memorization of science fact, law, or theory unless otherwise noted in the individual benchmark specifications.
6. Test items will not require the student to define terms.
7. Test items that include a collection of data should require the student to analyze or interpret that data (e.g., use data from a scenario to identify a trend) rather than retrieve information directly from a passage, chart, graph, or table.
8. Test items or illustrations for Grades 5 and 8 may use the following common elementary laboratory tools: balance, battery, beaker, compass, eyedropper, flashlight, globe, graduated cylinder, light bulb, magnet, magnifying glass or hand lens, metric measuring tape, metric ruler, microscope, microscope slide, mirror, model, safety goggles, spring scales, stopwatch, telescope, test tube, thermometer, topographic map, and tuning fork.
9. Test items or illustrations for Grade 8 may use the following common middle-school laboratory tools in addition to the elementary laboratory tools: dissection equipment, electronic balance, flask, hot plate, meter stick, petri dish, pH sensors, pipette, probe, prism, pulley, test strips, and triple-beam balance.

10. Test items referring to technologies familiar to elementary and middle-school students may include computers and computer models (simulations).
11. Test items will not require the creation of a chart, graph, or table.
12. At Grade 5, all test items should be written in a conceptual nature. Grade 5 test items should not require use of a calculator. At Grade 8, students are allowed to use a four-function calculator, although test items should not require its use.
13. Test items may require the student to apply knowledge of the science concepts described in the prior knowledge benchmarks from lower grades; however, that knowledge should NOT be assessed in isolation.
14. Each test item should be written clearly and unambiguously to elicit the desired response.
15. Test items will not require the memorization of equations or formulas unless otherwise noted in the Individual Benchmark Specifications. A reference sheet is not provided to students. If equations or formulas are needed, they must be included in the test item.
16. Test items will not require memorization of the Periodic Table. For Grade 8, a periodic table is provided to the students and is also found in Appendix D.
17. Test 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.

Item Contexts (Scenarios)

The context in which a test item is presented is called the item context or scenario. Test items should be placed in a context.

1. The test item context should be designed to interest students at the tested levels. 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 test items as concise as possible without losing cognitive flow or missing the overall idea or concept.
3. Grade 5 scenarios in test items are limited to those familiar to an elementary student rather than global situations. Grade 8 scenarios in test items are limited to those familiar to a middle-school student rather than global situations. All test items will use age-, grade-, and experience-appropriate scenarios, graphics, diagrams, and illustrations.
4. Item contexts should not refer to students using textbooks or the Internet as resources. Item contexts should focus on the students engaging in science learning rather than reading about science. Item contexts should avoid using a simple classroom scenario.
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. The test item content should be timely but not likely to become dated.

Criteria for FCAT 2.0 Science Test Items

All FCAT 2.0 Science test items are in multiple-choice (MC) for mat. The general specifications on pages 5 through 16 cover the following criteria for the FCAT 2.0:

- Use of Graphics
- Item Style and Format
- Scope of Test Items
- Guidelines for Item Writers
- Cognitive Complexity of FCAT 2.0 Science Test Items
- Universal Design

Use of Graphics

Graphics are used to provide both necessary and supplemental information—that is, some graphics contain information that is necessary for answering the question, while other graphics illustrate or support the context of the question. Scenarios may include diagrams, illustrations, charts, or tables, unless otherwise noted in the individual benchmark specifications.

1. Test items should not begin with art. Art in test items is always preceded by text.
2. All tables, charts, and graphs should be titled. Titles should be in all caps, boldfaced, and centered.
3. Illustrations and pictures are either titled or introduced. If a title is used , the title may be placed above or below the illustration or picture.

Item Style and Format

This section presents stylistic guidelines and for matting directions that should be followed while developing test items.

General Guidelines

1. Test items should be clear and concise and should use v ocabulary and sentence structure appropriate for the assessed grade level. Writers should refer to the resources provided during item writer training and to the Glossar y in the back of the *Specifications* to determine if the language used in the test item is grade-level appropriate.
2. Scientific concepts should be grade appropriate. Writers should refer to the Prior Knowledge information in the Individual Benchmark Specifications section, the instructional foundation for each benchmark grouping. The Grades K–2 benchmarks are found on pages 21–27.
3. Test items should have only one correct answer. The words *most likely* or *best* should only be used when appropriate to the question.
4. The final sentence of all test item stems must be e xpressed as a question.
5. At Grade 5, test items addressing temperature should use de grees Celsius with the approximate whole number equivalent in degrees Fahrenheit, e.g., 37°C (99°F). At Grade 8, temperatures should be given in degrees Celsius unless otherwise noted in the individual benchmark specifications.

6. 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.
7. Test 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 test items should be clearly labeled and contain all necessary information.
9. Test items referring to new developments or discoveries should include phrases similar to *according to current knowledge* or *based on current knowledge*.
10. Test item questions using the word *not* should emphasize the word *not* using all uppercase letters (e.g., Which of the following is NOT an example of . . .).
11. As appropriate, boldface type should be used to emphasize key words in the test item question (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. An equal balance of male and female names should be used, including names representing current student names and different ethnic groups appropriate for Florida.
14. Grade 8 test items may express values using scientific notation; however, test items should not require calculations involving scientific notation. Use of scientific notation is not appropriate at Grade 5.
15. Decimal numbers between -1 and 1 should have a leading zero.
16. SI units should be expressed in a single type of unit when possible (e.g., 1.4 kilograms instead of 1 kilogram 400 grams).
17. Decimal notation should be used for numbers with SI units (e.g., 1.5 grams instead of $1\frac{1}{2}$ grams).
18. 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).
19. The first occurrence of units of measure should be written out in the test 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).
20. 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).

21. 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).
22. Test items assessing concepts that require equations should include the equation with the test item unless otherwise noted in the individual benchmark specifications. Test items will not require the memorization of formulas.
23. In the item stem, values needed to compute answers should be presented as numerals.

Multiple-Choice (MC) Items

1. MC items should take approximately one minute per item to answer.
2. MC items are worth one point each.
3. MC items should have four answer options (A, B, C, and D).
4. The correct response should be indicated.
5. The rationale for distractors (incorrect answer choices) should be indicated. The rationale should include information explaining why a student would select that distractor.
6. Distractor rationales should represent computational or conceptual errors commonly made by students who have not mastered the assessed concepts.
7. Each distractor should be a believable answer for someone who does not really know the correct answer.
8. Whenever possible, distractors should include common science misconceptions.
9. All distractors should be written in a style appropriate to the question asked. For example, a "how" question should have distractors that explain how.
10. Paired comparison structure of options should be avoided.
11. 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).
12. Test items should not be clued or answered by information in the stem or other options.
13. Options such as *none of the above*, *all of the above*, *not here*, *not enough information*, or *cannot be determined* should not be used. These responses should not be used as distractor rationales.
14. 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.
15. In most cases, answer options should be arranged vertically beneath the item stem.
16. If four graphics are labeled horizontally or vertically and horizontally, the option labeling should be as follows:

    A. B. C. D. or A. C.
    B. D.

17. If the answer options for a test item are strictly numerical, they should be arranged in ascending or descending order, with the place values of digits aligned. When the test 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.
18. If the answer options for a test item are neither strictly numerical nor denominate numbers, the options should be arranged by the logic presented in the test item, by alphabetical order, or by length. Options may also be ordered in reverse alphabetical order or from longest to shortest. Answers that are one word in length should be in alphabetical or reverse alphabetical order.

Context-Dependent (CD) Item Sets

1. The stimulus for the CD set may be a **short** passage describing a scientific event, or investigation. The stimulus may include illustrations, graphics, tables, and/or graphs.
2. As a general rule the stimulus content should focus on primarily two science areas from the NGSSS (Nature of Science, Earth and Space Science, Life Science, or Physical Science).
3. The reading level of the stimulus, excluding science terms, should be on grade level.
4. Test items will be written so that students with benchmark mastery use scientific knowledge and the information in the passage to answer the test items in the set.
5. Test items will not be clued or answered by information in the passage or other test items in the set.
6. Test items may require the student to analyze, interpret, evaluate, and/or draw inferences from the information in the stimulus.
7. As many test items as possible should be written to the stimulus. Those test items should represent an appropriate variety of benchmarks. On a test, a minimum of two different benchmarks should be assessed in the CD set.
8. CD sets may be titled; however, titles are not required.

Scope of Test Items

The scope of FCAT 2.0 Science test items for Grades 3–5 is presented in Appendix B. The benchmarks serve as the objectives to which the test items are written. Additional guidelines or restrictions are located in the individual benchmark specifications.

Guidelines for Item Writers

FCAT 2.0 Science item writers must have a comprehensive knowledge of the assessed science curriculum and a strong understanding of the scientific concepts and cognitive abilities of the students taking the test. Item writers should know and consistently apply the guidelines established in this *Specifications* document, as well as contribute to the goal of developing test content that allows students to perform at their best. Item writers are also expected to use their best judgment in writing test items that measure the science benchmarks of the NGSSS without introducing extraneous elements that reflect bias for or against a group of students.

Item writers for FCAT 2.0 Science must submit test items in a particular format and must include the following information about each test item. Because test items are rated by committees of Florida educators following submission to DOE, familiarity with the directions for rating test items (found in Appendix A) would prove useful to all item writers.

Format

Item writers must submit test items in the agreed-upon template. All appropriate sections of the template should be completed before the test items are submitted.

Sources

Item writers are expected to provide sources for all verifiable information included in the test item. Acceptable sources include science magazines, science journals, or Internet sites maintained by reputable organizations such as government agencies, universities, or research centers.

Correct Response

Item writers must supply the correct response. Each distractor should be a believable answer for someone who does not know the correct answer. Rationales must include explanations for these errors.

Submission of Items

When submitting test items, item writers must balance several factors. Test item submissions should:

- include test items of varying difficulty;
- include test items of varying cognitive complexity;
- include test items from varying content foci;
- include the content source for the test items;
- have a balance in location of the correct answer within benchmarks;
- have a balance of different female and different male names;
- use names representative of elementary and middle-school students in Florida; and
- be scientifically accurate.

Cognitive Complexity of FCAT 2.0 Science Test Items

Educational standards and assessments can be aligned based on the category of content covered and also on the complexity of knowledge required. The FCAT 2.0 test items, while assessing Florida's NGSSS, must also reflect this goal and standard. It is important to develop test items that elicit student responses that demonstrate the complexity of knowledge and skills required to meet these objectives. The degree of challenge of FCAT 2.0 items is currently categorized in two ways: **item difficulty** and **cognitive complexity**.

Item Difficulty

The difficulty of FCAT 2.0 test items is initially estimated by committees of educators participating in Item Content Review meetings each year. As each test item is reviewed, committee members make a prediction of difficulty based upon their knowledge of student performance at the given grade level. The classification scheme used for this prediction of item difficulty is based on the following:

Easy	More than 70 percent of the students are likely to respond correctly.
Average	Between 40 percent and 70 percent of the students are likely to respond correctly.
Challenging	Less than 40 percent of the students are likely to respond correctly.

After a test item appears on a test, item difficulty refers to the actual percentage of students who chose the correct answer.

Cognitive Complexity of FCAT 2.0 Science Test Items

Cognitive complexity refers to the cognitive demand associated with a test item. In the early years of the FCAT program, DOE used Bloom's Taxonomy[1] to classify test items; however, Bloom's Taxonomy is difficult to use because it requires an inference about the skill, knowledge, and background of the students responding to the test item. Beginning in 2004, the DOE implemented a new cognitive classification system based upon Dr. Norman L. Webb's Depth of Knowledge (DOK) levels.[2] The rationale for classifying a test item by its DOK level of complexity focuses on the *expectations made of the test item*, not on the *ability of the student*. When classifying a test item's demands on thinking (i.e., what the test item requires the student to recall, understand, analyze, and do), it is assumed that the student is familiar with the basic concepts of the task. Test items are chosen for the FCAT 2.0 based on the NGSSS and their grade-level appropriateness, but the complexity of the test items remains independent of the particular curriculum a student has experienced. On any given assessment, the cognitive complexity of a multiple-choice item may be affected by the distractors (answer options). The cognitive complexity of a test item depends on the grade level of the assessment; a test item that has a high level of cognitive complexity at one grade may not be as complex at a higher grade.

The categories—low complexity, moderate complexity, and high complexity—form an ordered description of the demands a test item may make on a student. For example, low-complexity test items may require a student to solve a one-step problem. Moderate-complexity test items may require multiple steps. High-complexity test items may require a student to analyze and synthesize information. The distinctions made in item complexity ensure that test items will assess the depth of student knowledge at each benchmark. The intent of the item writer weighs heavily in determining the complexity of a test item. At the end of this section, three FCAT 2.0 Science test items illustrate how a single concept may be assessed by test items with increasing cognitive complexity.

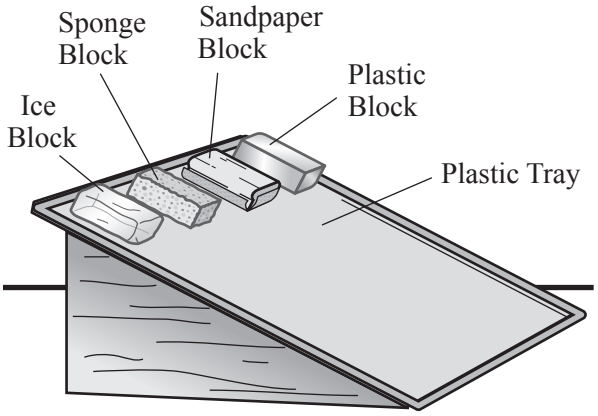
The pages that follow illustrate some of the varying demands that test items might make at each complexity level for FCAT 2.0 Science. Note that test items may fit one or more descriptions. In most instances, these test items are classified in the highest level of complexity demanded by the test item. Caution must be used in referring to the table of descriptors that is provided for each cognitive complexity level. This table is provided for ease of reference, but the ultimate determination of item complexity should be made considering the overall cognitive demand placed on a student. Another table provides the breakdown of the percentage of points by cognitive complexity level.

[1] Bloom, B.S. et al. *Taxonomy of Educational Objectives, Handbook I: Cognitive Domain*. New York: McKay, 1956.
[2] Webb, Norman L. and others. "Web Alignment Tool" 24 July 2005. Wisconsin Center of Educational Research. University of Wisconsin-Madison. 2 Feb. 2006. http://www.wcer.wisc.edu/WAT/index.aspx.

Low Complexity

Science low-complexity test items rely heavily on the recall and recognition of previously learned concepts and principles. Test items typically specify what the student is to do, which often is to carry out some procedure that can be performed mechanically. It is not left to the student to come up with an original method or solution.

Felipe and Marsha were studying forces and decided to do an experiment. They placed four equally sized blocks made of different materials on an elevated plastic tray. They watched the blocks move down the tray. Their setup is shown below.



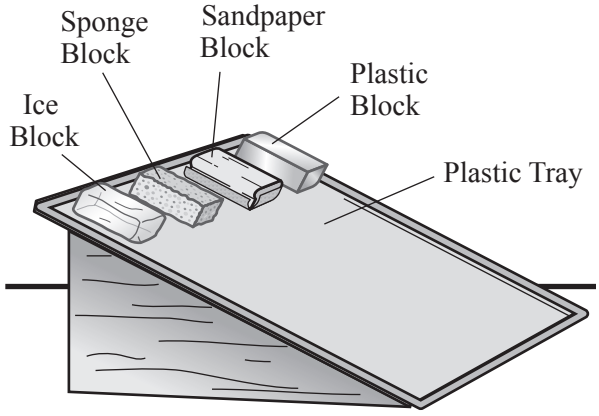
Which of the following forces causes the blocks to move down the tray?

A. electric
B. friction
★ **C.** gravity
D. magnetic

Moderate Complexity

Science moderate-complexity test items involve more flexible thinking than low-complexity test items do. They require a response that goes beyond the habitual, is not specified, and ordinarily involves more than a single step or thought process. The student is expected to decide what to do—using informal methods of reasoning and problem-solving strategies—and to bring together skill and knowledge from various domains.

Felipe and Marsha were studying forces and decided to do an experiment. They placed four equally sized blocks made of different materials on an elevated plastic tray. They watched the blocks move down the tray. Their setup is shown below.



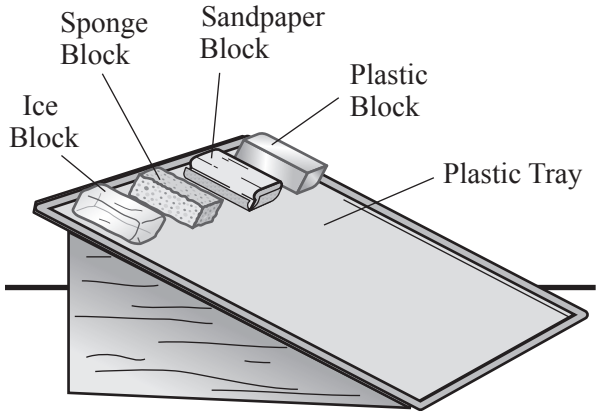
Which block would experience the **least** amount of friction as it moved down the tray?

★ **A.** Ice Block
B. Sponge Block
C. Sandpaper Block
D. Plastic Block

High Complexity

Science high-complexity test items make heavy demands on student thinking. Students must engage in abstract reasoning, planning, analysis, judgment, and creative thought. The test items require that the student think in an abstract and sophisticated way, often involving multiple steps.

Felipe and Marsha were studying forces and decided to do an experiment. They placed four equally sized blocks made of different materials on an elevated plastic tray. They watched the blocks move down the tray. Their setup is shown below.



Which of the following conclusions can Felipe and Marsha make about the forces that cause the blocks to move down the tray?

A. The force of friction is the same on each block.
B. The force of friction causes the speed of each block to increase.
C. The force of gravity causes all the blocks to move at the same speed.
★ **D.** The force of gravity is greater than the force of friction on all the blocks.

The following table is provided for ease of reference; however, caution must be used in referring to this table of descriptors for each cognitive complexity level. The ultimate determination of an item's cognitive complexity should be made considering the intent of the overall cognitive demand placed on a student.

Examples of FCAT 2.0 Science Activities across Cognitive Complexity Levels		
Low-Complexity Science	**Moderate-Complexity Science**	**High-Complexity Science**
• Identify a common example or recognize a concept. • Retrieve information from a chart, table, diagram, or graph. • Recognize a standard scientific representation of a simple phenomenon. • Calculate or complete a familiar single-step procedure or equation using a reference sheet.	• Apply or infer relationships among facts, terms, properties, or variables. • Describe examples and non-examples of scientific processes or concepts. • Predict or determine the logical next step or outcome. • Compare or contrast structures or functions of different organisms or systems. • Choose the appropriate formula or equation to solve a problem and then solve it. • Apply and use concepts from a standard scientific model or theory.	• Construct models for research. • Generalize or draw conclusions. • Design an experiment, given data and conditions. • Explain or solve a problem in more than one way. • Provide a justification for steps in a solution or process. • Analyze an experiment to identify a flaw and propose a method for correcting it. • Interpret, explain, or solve a problem involving complex spatial relationships. • Predict a long-term effect, outcome, or result of a change within a system.

The table below presents the range for the percent of raw score points by cognitive complexity on FCAT 2.0 Science, Grade 5 and Grade 8, and the Biology 1 EOC Assessment.

Percentage of Points by Cognitive Complexity Level for FCAT 2.0 Science and Biology 1 EOC Assessment

Grade	Low	Moderate	High
5	10%–20%	60%–80%	10%–20%
8	10%–20%	60%–80%	10%–20%
Biology 1	10%–20%	60%–80%	10%–20%

Universal Design

The application of universal design principles helps develop assessments that are usable to the greatest number of test takers, including students with disabilities and nonnative speakers of English. To support the goal of providing access to all students, the test maximizes readability, legibility, and compatibility with accommodations, and test development includes a review for potential bias and sensitivity issues.

DOE trains both internal and external reviewers to revise test items, allowing 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 test layout and design including, but not limited to, type size, line length, spacing, and graphics.

Review Procedures for FCAT 2.0 Science Test Items

Prior to appearing on any FCAT 2.0, all science test items must pass several levels of review as part of the FCAT 2.0 development process. Florida educators and citizens, in conjunction with DOE and FCAT 2.0 contractors, scrutinize all material related to test items prior to accepting it for placement on the tests.

Review for Potential Bias and Community Sensitivity

Science test items are reviewed by groups of Florida educators generally representative of Florida's geographic regions and culturally diverse population. Test 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.

Florida citizens associated with a variety of organizations and institutions review all test items for issues of potential concern to members of the community at large. The purpose for this review is to ensure that the primary purpose of assessing science achievement is not undermined by inadvertently including in the test any material that parents and 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. Test items are written to meet FCAT 2.0 criteria and to measure the content in the NGSSS for science.

Review of Test Items

The DOE and FCAT 2.0 contractors review all test items during the item development process.

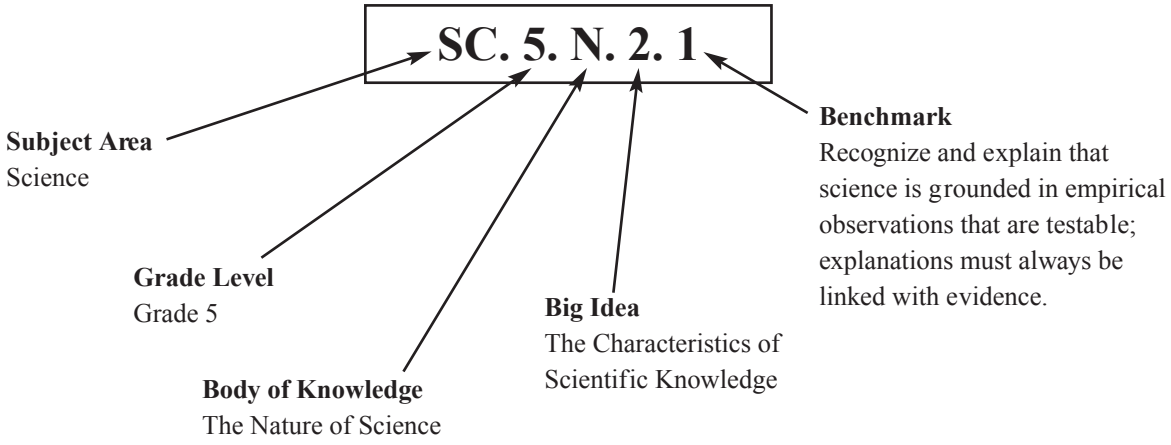
Groups of Florida science educators are subsequently convened to review the test items for content characteristics and item specifications. The content review focuses on validity, determining whether each test item is a valid measure of the designated NGSSS benchmark, as defined by grade-level specifications for test items. Separate reviews for bias and sensitivity issues are also conducted as noted above.

Due to the theory-based nature of the content area, all potential science test items undergo an extra level of scrutiny. A committee of university-level science researchers, university-level faculty, and practicing scientists from the private sector reviews the test items to ensure the accuracy and currency of the science content.

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** to which the benchmark belongs.
- The letter in the *third position* represents the **Body of Knowledge** to which the benchmark belongs.
- The number in the *fourth position* represents the **Big Idea**.
- The number in the *last position* identifies the specific **Benchmark** under the Big Idea.



Grade 5
Body of Knowledge: The Nature of Science
Big Idea 2: The Characteristics of Scientific Knowledge
SC.5.N.2.1 Recognize and explain that science is grounded in empirical observations that are testable; explanations must always be linked with evidence.

Definitions of Benchmark Specifications

The *Specifications* identifies how the benchmarks in Florida's NGSSS are assessed on the FCAT 2.0 at Grades 5 and 8. For each benchmark assessed in science, the following information is provided in the Individual Benchmarks Specifications section.

Reporting Categories are groupings of related benchmarks from the NGSSS that are used to summarize and report achievement for FCAT 2.0 Science. There are four reporting categories for Grades 5 and 8 FCAT 2.0 Science: Nature of Science, Earth and Space Science, Physical Science, and Life Science.

Standard refers to the standards statement presented in the NGSSS. In the *Specifications* for Grades 5 and 8, the standard also includes the Big Idea.

Benchmark refers to the benchmark statement presented in the NGSSS. The benchmarks are specific statements of expected student achievement. The benchmarks are different for each Grade K–8. In some cases, two or more benchmarks are grouped together because of the relatedness of the concepts in those benchmarks. The related benchmarks are noted in the Also Assesses section.

Also Assesses refers to the benchmarks that are closely related to the benchmark (see description above).

Benchmark Clarifications explain how achievement of the benchmark will be demonstrated by students. Clarification statements are written for the benchmark and the also assesses benchmark(s). 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 test items for the benchmark.

Benchmark content limits are to be used in conjunction with the Overall Considerations, Item Contexts, and the General Guidelines of the Item Style and Format sections in the *Specifications*. The content limits defined in the Individual Benchmark Specifications section may be an expansion or further restriction of the Overall Considerations, Item Contexts, and the General Guidelines.

Stimulus Attributes define the types of stimulus materials that should be used in the test items, including the appropriate use of item context, content, or graphic materials.

Response Attributes define the characteristics of the options from which a student must choose to answer the question.

Prior Knowledge refers to benchmarks from lower grades that are the foundation for the concept(s) assessed. Test items may require the student to apply scientific knowledge described in the NGSSS from lower grades; however, test items should be written to assess the appropriate grade-level benchmark.

Sample Items are provided for each assessed benchmark grouping. The sample test items are presented in a format similar to the one used in the test. The correct answer for each sample test item is identified with a star. The benchmark that the sample item is written to assess is provided. The sample items provided represent a range of cognitive complexities.

Grades K–2 FCAT 2.0 Science Benchmarks

The NGSSS for science are organized by grade level for K–8. Although eighteen Big Ideas thread throughout all grade levels and build in rigor and depth as students advance, not all grades have benchmarks for each Big Idea. The benchmarks for Grades K–2 serve as a foundation for Grades 3–5 benchmarks. For that reason, the K–2 science benchmarks are included in this document. In the Individual Benchmark Specifications section for Grade 5, K–2 benchmarks are cited in the Prior Knowledge section of the individual benchmark specifications.

Big Idea 1 The Practice of Science		
Kindergarten	**Grade 1**	**Grade 2**
SC.K.N.1.1 Collaborate with a partner to collect information.	**SC.1.N.1.1** Raise questions about the natural world, investigate them in teams through free exploration, and generate appropriate explanations based on those explorations.	**SC.2.N.1.1** Raise questions about the natural world, investigate them in teams through free exploration and systematic observations, and generate appropriate explanations based on those explorations.
SC.K.N.1.2 Make observations of the natural world and know that they are descriptors collected using the five senses.	**SC.1.N.1.2** Using the five senses as tools, make careful observations, describe objects in terms of number, shape, texture, size, weight, color, and motion, and compare their observations with others.	**SC.2.N.1.2** Compare the observations made by different groups using the same tools.
SC.K.N.1.3 Keep records as appropriate—such as pictorial records—of investigations conducted.	**SC.1.N.1.3** Keep records as appropriate—such as pictorial and written records—of investigations conducted.	**SC.2.N.1.3** Ask "how do you know?" in appropriate situations and attempt reasonable answers when asked the same question by others.
SC.K.N.1.4 Observe and create a visual representation of an object which includes its major features.	**SC.1.N.1.4** Ask "how do you know?" in appropriate situations.	**SC.2.N.1.4** Explain how particular scientific investigations should yield similar conclusions when repeated.
SC.K.N.1.5 Recognize that learning can come from careful observation.		**SC.2.N.1.5** Distinguish between empirical observation (what you see, hear, feel, smell, or taste) and ideas or inferences (what you think).
		SC.2.N.1.6 Explain how scientists alone or in groups are always investigating new ways to solve problems.

Grades K–2 FCAT 2.0 Science Benchmarks

Big Idea 2 The Characteristics of Science Knowledge		
Kindergarten	**Grade 1**	**Grade 2**
Big Idea 3 The Role of Theories, Law, Hypotheses, and Models		
Kindergarten	**Grade 1**	**Grade 2**
Big Idea 4 Science and Society		
Kindergarten	**Grade 1**	**Grade 2**
Big Idea 5 Earth in Space and Time		
Kindergarten	**Grade 1**	**Grade 2**
SC.K.E.5.1 Explore the Law of Gravity by investigating how objects are pulled toward the ground unless something holds them up.	**SC.1.E.5.1** Observe and discuss that there are more stars in the sky than anyone can easily count and that they are not scattered evenly in the sky.	
SC.K.E.5.2 Recognize the repeating pattern of day and night.	**SC.1.E.5.2** Explore the Law of Gravity by demonstrating that Earth's gravity pulls any object on or near Earth toward it even though nothing is touching the object.	
SC.K.E.5.3 Recognize that the Sun can only be seen in the daytime.	**SC.1.E.5.3** Investigate how magnifiers make things appear bigger and help people see things they could not see without them.	
SC.K.E.5.4 Observe that sometimes the Moon can be seen at night and sometimes during the day.	**SC.1.E.5.4** Identify the beneficial and harmful properties of the Sun.	
SC.K.E.5.5 Observe that things can be big and things can be small as seen from Earth.		
SC.K.E.5.6 Observe that some objects are far away and some are nearby as seen from Earth.		

Grades K–2 FCAT 2.0 Science Benchmarks

Big Idea 6 Earth Structures		
Kindergarten	**Grade 1**	**Grade 2**
	SC.1.E.6.1 Recognize that water, rocks, soil, and living organisms are found on Earth's surface.	**SC.2.E.6.1** Recognize that Earth is made up of rocks. Rocks come in many sizes and shapes.
	SC.1.E.6.2 Describe the need for water and how to be safe around water.	**SC.2.E.6.2** Describe how small pieces of rock and dead plant and animal parts can be the basis of soil and explain the process by which soil is formed.
	SC.1.E.6.3 Recognize that some things in the world around us happen fast and some happen slowly.	**SC.2.E.6.3** Classify soil types based on color, texture (size of particles), the ability to retain water, and the ability to support the growth of plants.
Big Idea 7 Earth Systems and Patterns		
Kindergarten	**Grade 1**	**Grade 2**
		SC.2.E.7.1 Compare and describe changing patterns in nature that repeat themselves, such as weather conditions including temperature and precipitation, day to day and season to season.
		SC.2.E.7.2 Investigate by observing and measuring, that the Sun's energy directly and indirectly warms the water, land, and air.
		SC.2.E.7.3 Investigate, observe and describe how water left in an open container disappears (evaporates), but water in a closed container does not disappear (evaporate).

Grades K–2 FCAT 2.0 Science Benchmarks

Big Idea 7 Earth Systems and Patterns		
Kindergarten	**Grade 1**	**Grade 2**
		SC.2.E.7.4 Investigate that air is all around us and that moving air is wind.
		SC.2.E.7.5 State the importance of preparing for severe weather, lightning, and other weather related events.
Big Idea 8 Properties of Matter		
Kindergarten	**Grade 1**	**Grade 2**
SC.K.P.8.1 Sort objects by observable properties, such as size, shape, color, temperature (hot or cold), weight (heavy or light) and texture.	**SC.1.P.8.1** Sort objects by observable properties, such as size, shape, color, temperature (hot or cold), weight (heavy or light), texture, and whether objects sink or float.	**SC.2.P.8.1** Observe and measure objects in terms of their properties, including size, shape, color, temperature, weight, texture, sinking or floating in water, and attraction and repulsion of magnets.
		SC.2.P.8.2 Identify objects and materials as solid, liquid, or gas.
		SC.2.P.8.3 Recognize that solids have a definite shape and that liquids and gases take the shape of their container.
		SC.2.P.8.4 Observe and describe water in its solid, liquid, and gaseous states.
		SC.2.P.8.5 Measure and compare temperatures taken every day at the same time.
		SC.2.P.8.6 Measure and compare the volume of liquids using containers of various shapes and sizes.

Grades K–2 FCAT 2.0 Science Benchmarks

Big Idea 9 Changes in Matter		
Kindergarten	**Grade 1**	**Grade 2**
SC.K.P.9.1 Recognize that the shape of materials such as paper and clay can be changed by cutting, tearing, crumpling, smashing, or rolling.		**SC.2.P.9.1** Investigate that materials can be altered to change some of their properties, but not all materials respond the same way to any one alteration.
Big Idea 10 Forms of Energy		
Kindergarten	**Grade 1**	**Grade 2**
SC.K.P.10.1 Observe that things that make sound vibrate.		**SC.2.P.10.1** Discuss that people use electricity or other forms of energy to cook their food, cool or warm their homes, and power their cars.
Big Idea 11 Energy Transfer and Transformations		
Kindergarten	**Grade 1**	**Grade 2**
Big Idea 12 Motion of Objects		
Kindergarten	**Grade 1**	**Grade 2**
SC.K.P.12.1 Investigate that things move in different ways, such as fast, slow, etc.	**SC.1.P.12.1** Demonstrate and describe the various ways that objects can move, such as in a straight line, zigzag, back-and-forth, round-and-round, fast, and slow.	
Big Idea 13 Forces and Changes in Motion		
Kindergarten	**Grade 1**	**Grade 2**
SC.K.P.13.1 Observe that a push or a pull can change the way an object is moving.	**SC.1.P.13.1** Demonstrate that the way to change the motion of an object is by applying a push or a pull.	**SC.2.P.13.1** Investigate the effect of applying various pushes and pulls on different objects.
		SC.2.P.13.2 Demonstrate that magnets can be used to make some things move without touching them.

Grades K–2 FCAT 2.0 Science Benchmarks

Big Idea 13 Forces and Changes in Motion		
Kindergarten	**Grade 1**	**Grade 2**
		SC.2.P.13.3 Recognize that objects are pulled toward the ground unless something holds them up.
		SC.2.P.13.4 Demonstrate that the greater the force (push or pull) applied to an object, the greater the change in motion of the object.
Big Idea 14 Organization and Development of Living Organisms		
Kindergarten	**Grade 1**	**Grade 2**
SC.K.L.14.1 Recognize the five senses and related body parts.	**SC.1.L.14.1** Make observations of living things and their environment using the five senses.	**SC.2.L.14.1** Distinguish human body parts (brain, heart, lungs, stomach, muscles, and skeleton) and their basic functions.
SC.K.L.14.2 Recognize that some books and other media portray animals and plants with characteristics and behaviors they do not have in real life.	**SC.1.L.14.2** Identify the major parts of plants, including stem, roots, leaves, and flowers.	
SC.K.L.14.3 Observe plants and animals, describe how they are alike and how they are different in the way they look and in the things they do.	**SC.1.L.14.3** Differentiate between living and nonliving things.	
Big Idea 15 Diversity and Evolution of Living Organisms		
Kindergarten	**Grade 1**	**Grade 2**
Big Idea 16 Heredity and Reproduction		
Kindergarten	**Grade 1**	**Grade 2**
	SC.1.L.16.1 Make observations that plants and animals closely resemble their parents, but variations exist among individuals within a population.	**SC.2.L.16.1** Observe and describe major stages in the life cycles of plants and animals, including beans and butterflies.

Grades K–2 FCAT 2.0 Science Benchmarks

Big Idea 17 Interdependence		
Kindergarten	**Grade 1**	**Grade 2**
	SC.1.L.17.1 Through observation, recognize that all plants and animals, including humans, need the basic necessities of air, water, food, and space.	**SC.2.L.17.1** Compare and contrast the basic needs that all living things, including humans, have for survival.
		SC.2.L.17.2 Recognize and explain that living things are found all over Earth, but each is only able to live in habitats that meet its basic needs.
Big Idea 18 Matter and Energy Transformations		
Kindergarten	**Grade 1**	**Grade 2**

Individual Benchmark Specifications for FCAT 2.0 Science Grade 5

This section of the *Specifications* describes how the science benchmarks are assessed on the FCAT 2.0. Each grade level includes benchmarks from the four Bodies of Knowledge (Nature of Science, Life Science, Earth Science, and Physical Science). Eighteen Big Ideas thread throughout all the grade levels and build in rigor and depth as students advance.

The sample test items included in the *Specifications* represent, whenever possible, a range of difficulty and cognitive complexity. Although most of the test items are of average difficulty and moderate complexity, some of the test items presented will be challenging for some students and are specifically included to prompt item writers to submit test items that will measure the abilities of higher-achieving students. As a general rule, test items should be written at the cognitive level of the benchmark.

Benchmark SC.5.N.1.1

Reporting Category	Nature of Science
Standard	**Big Idea 1** The Practice of Science
Benchmark	**SC.5.N.1.1 Define a problem, use appropriate reference materials to support scientific understanding, plan and carry out scientific investigations of various types such as: systematic observations, experiments requiring the identification of variables, collecting and organizing data, interpreting data in charts, tables, and graphics, analyze information, make predictions, and defend conclusions. (Also assesses SC.3.N.1.1, SC.4.N.1.1, SC.4.N.1.6, SC.5.N.1.2, and SC.5.N.1.4.)**
Also Assesses	**SC.3.N.1.1** Raise questions about the natural world, investigate them individually and in teams through free exploration and systematic investigations, and generate appropriate explanations based on those explorations. **SC.4.N.1.1** Raise questions about the natural world, use appropriate reference materials that support understanding to obtain information (identifying the source), conduct both individual and team investigations through free exploration and systematic investigations, and generate appropriate explanations based on those explorations. **SC.4.N.1.6** Keep records that describe observations made, carefully distinguishing actual observations from ideas and inferences about the observations. **SC.5.N.1.2** Explain the difference between an experiment and other types of scientific investigation. **SC.5.N.1.4** Identify a control group and explain its importance in an experiment.
Benchmark Clarifications	Students will evaluate a written procedure or experimental setup. Students will identify appropriate forms of record keeping. Students will interpret and analyze data to generate appropriate explanations based on that data. Students will identify examples of or distinguish among observations, predictions, and/or inferences. Students will explain the difference between an experiment and other types of scientific investigations. Students will identify a control group and/or explain its importance in an experiment.

Content Limits	Items will not require the identification or evaluation of a hypothesis. Items should not use the term *hypothesis*. Items will not require the design of a procedure. Items will not require mathematical computations. Items will not require the differentiation between outcome variables (dependent variables) and test variables (independent variables). Items will not assess the reason for differences in data across groups that are investigating the same problem. Items referring to conclusions will not require the formation of a conclusion.
Stimulus Attributes	Scenarios describing a scientific experiment are limited to one control group. Scenarios referring to observations will not use the term *systematic observation*.
Response Attributes	None specified
Prior Knowledge	Items may require the student to apply science knowledge described in the NGSSS from lower grades. This benchmark requires prerequisite knowledge from SC.K.N.1.1, SC.K.N.1.2, SC.K.N.1.3, SC.K.N.1.4, SC.K.N.1.5, SC.1.N.1.1, SC.1.N.1.2, SC.1.N.1.3, SC.1.N.1.4, SC.1.E.5.3, SC.2.N.1.1, SC.2.N.1.3, SC.3.N.1.3, SC.3.N.1.6, SC.4.N.1.4, and SC.4.E.6.5.

Sample Item 1 **SC.5.N.1.1**

Delilah followed these steps of an investigation:

- Collect five objects made of different types of metal.
- Place them on a large laboratory table.
- Touch each metal object with a magnet and lift slowly.
- Record observations.

Which of the following statements is Delilah **most likely** testing?

★ **A.** All types of metal are attracted to magnets.
B. Each magnet can lift the metal object to the same height.
C. Larger magnets can pick up heavier metal objects than smaller magnets can.
D. Heavier metal objects are more attracted to magnets than lighter metal objects are.

BENCHMARK SC.5.N.2.1

Reporting Category	Nature of Science
Standard	**Big Idea 2** The Characteristics of Scientific Knowledge
Benchmark	**SC.5.N.2.1 Recognize and explain that science is grounded in empirical observations that are testable; explanation must always be linked with evidence. (Also assesses SC.3.N.1.7, SC.4.N.1.3, SC.4.N.1.7, SC.5.N.1.5, and SC.5.N.1.6.)**
Also Assesses	**SC.3.N.1.7** Explain that empirical evidence is information, such as observations or measurements, that is used to help validate explanations of natural phenomena. **SC.4.N.1.3** Explain that science does not always follow a rigidly defined method ("the scientific method") but that science does involve the use of observations and empirical evidence. **SC.4.N.1.7** Recognize and explain that scientists base their explanations on evidence. **SC.5.N.1.5** Recognize and explain that authentic scientific investigation frequently does not parallel the steps of "the scientific method." **SC.5.N.1.6** Recognize and explain the difference between personal opinion/interpretation and verified observation.
Benchmark Clarifications	Students will identify and/or explain that science is grounded in verifiable observations (empirical) that are testable. Students will distinguish between personal interpretation and verified observation. Students will distinguish between examples of evidence or observations (empirical) and personal opinions.
Content Limit	Items will not assess steps or order of scientific method.
Stimulus Attribute	The term *observation* should be used rather than the phrases *empirical observations* or *verified observations*. The term *evidence* should be used rather than the phrase *empirical evidence*.
Response Attributes	None specified
Prior Knowledge	Items may require the student to apply science knowledge described in the NGSSS from lower grades. This benchmark requires prerequisite knowledge from SC.2.N.1.5, SC.2.N.1.6, SC.4.N.2.1, and SC.4.N.1.8.

Sample Item 2 SC.5.N.1.6

Emily made the following observations.

EMILY'S OBSERVATIONS

1	The petals of red roses are softer than the petals of yellow roses.
2	The song of a mockingbird is prettier than the song of a cardinal.
3	Orange blossoms give off a sweeter smell than gardenia flowers.
4	Sunflowers with larger petals attract more bees than sunflowers with smaller petals.

Which of Emily's observations is scientifically testable?

A. 1
B. 2
C. 3
★ **D.** 4

BENCHMARK SC.5.N.2.2

Reporting Category	Nature of Science
Standard	**Big Idea 2** The Characteristics of Scientific Knowledge
Benchmark	**SC.5.N.2.2 Recognize and explain that when scientific investigations are carried out, the evidence produced by those investigations should be replicable by others. (Also assesses SC.3.N.1.2, SC.3.N.1.5, SC.4.N.1.2, SC.4.N.1.5, and SC.5.N.1.3.)**
Also Assesses	**SC.3.N.1.2** Compare the observations made by different groups using the same tools and seek reasons to explain the differences across groups. **SC.3.N.1.5** Recognize that scientists question, discuss, and check each others' evidence and explanations. **SC.4.N.1.2** Compare the observations made by different groups using multiple tools and seek reasons to explain the differences across groups. **SC.4.N.1.5** Compare the methods and results of investigations done by other classmates. **SC.5.N.1.3** Recognize and explain the need for repeated experimental trials.
Benchmark Clarifications	Students will identify and/or explain the need for replication of scientific investigations. Students will explain the reason for differences in data across groups as a result of using different tools and/or procedures. Students will identify and/or explain the need for repeated trials in a scientific investigation.
Content Limit	Items may use the terms *accurate* and/or *valid* in context but should not assess these terms or the difference between these terms.
Stimulus Attributes	None specified
Response Attributes	None specified
Prior Knowledge	Items may require the student to apply science knowledge described in the NGSSS from lower grades. This benchmark requires prerequisite knowledge from SC.2.N.1.2, SC.2.N.1.4, and SC.3.N.1.4.

Sample Item 3 SC.5.N.2.2

Gabriel is designing an experiment to see whether sugar or artificial sweetener will attract the greatest number of ants. Which statement **best** describes why Gabriel should write down his experimental procedure?

★ **A.** The exact experiment can be repeated by others and the results compared.
B. The experiment can be changed by others to get different results.
C. The data will help people decide what type of sweetener to use.
D. The data will show people which ants are more common.

Benchmark SC.5.E.5.1

Reporting Category	Earth & Space Science
Standard	**Big Idea 5** Earth in Space and Time
Benchmark	**SC.5.E.5.1 Recognize that a galaxy consists of gas, dust, and many stars, including any objects orbiting the stars. Identify our home galaxy as the Milky Way. (Also assesses SC.3.E.5.1, SC.3.E.5.2, and SC.3.E.5.3.)**
Also Assesses	**SC.3.E.5.1** Explain that stars can be different; some are smaller, some are larger, and some appear brighter than others; all except the Sun are so far away that they look like points of light. **SC.3.E.5.2** Identify the Sun as a star that emits energy; some of it in the form of light. **SC.3.E.5.3** Recognize that the Sun appears large and bright because it is the closest star to Earth.
Benchmark Clarifications	Students will identify the basic components of a galaxy. Students will explain how stars can be different. Students will identify the Sun as a star that emits energy. Students will identify that the Sun's appearance is due to its proximity to Earth.
Content Limits	Items will only assess a conceptual understanding of a galaxy. Items will not assess the name of our galaxy in isolation. Items will not assess objects orbiting stars. Items that assess stars are limited to brightness, size, or appearance in relation to distance, and that stars emit energy. Items that address energy emitted by a star are limited to visible light. Items will not assess the effects of the Sun's energy on Earth. Items will not assess numeric values for distance or number of stars. Items may assess that stars are made of gases but not the specific chemical composition of stars.
Stimulus Attributes	None specified
Response Attributes	None specified

Prior Knowledge Items may require the student to apply science knowledge described in the NGSSS from lower grades. This benchmark requires prerequisite knowledge from SC.K.E.5.5, SC.K.E.5.6, SC.1.E.5.1, and SC.1.E.5.4.

Sample Item 4 **SC.3.E.5.1**

A star named Sirius appears as the brightest star in the nighttime sky, even though a star named Pollux actually gives off more light. Which of the following **best** explains why Sirius appears brighter than Pollux in our nighttime sky?

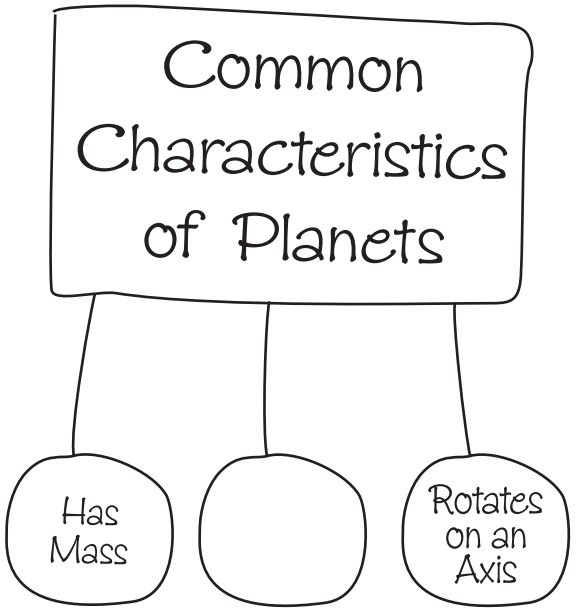
A. Sirius has a different color than Pollux does.
B. Sirius has different gases than Pollux does.
★ **C.** Sirius is closer to Earth than Pollux is.
D. Sirius is larger than Pollux is.

Benchmark SC.5.E.5.3

Reporting Category	Earth & Space Science
Standard	**Big Idea 5** Earth in Space and Time
Benchmark	**SC.5.E.5.3 Distinguish among the following objects of the Solar System — Sun, planets, moons, asteroids, comets — and identify Earth's position in it. (Also assesses SC.5.E.5.2.)**
Also Assesses	**SC.5.E.5.2** Recognize the major common characteristics of all planets and compare/contrast the properties of inner and outer planets.
Benchmark Clarifications	Students will distinguish among objects in our solar system based on their relative positions and/or their characteristics. Students will identify common characteristics of all planets. Students will compare and/or contrast the common characteristics of inner and outer planet groups.
Content Limits	Items will address a conceptual understanding of our solar system and the characteristics of objects in our solar system. Items will not assess characteristics of the Sun. Items assessing inner and outer planet groups are limited to: surface composition (whether they are mostly solid or gas), presence of an atmosphere, size, relative position to the Sun, presence of moons or rings, relative temperature, and relative length of a year. Items will not require specific knowledge of quantitative astronomical data. Items will not assess interactions of objects in our solar system. Items will not assess the force of gravity.
Stimulus Attributes	None specified
Response Attributes	None specified
Prior Knowledge	This benchmark grouping is foundational. These concepts have not been introduced in the NGSSS prior to this grade band.

Sample Item 5 SC.5.E.5.2

Jacob started creating a diagram to show some of the common characteristics of the planets in our solar system.



Which characteristic should Jacob write in the empty circle of the diag ram?

A. made mostly of gas
B. has a rocky surface
★ **C.** revolves around a star
D. is a satellite of another planet

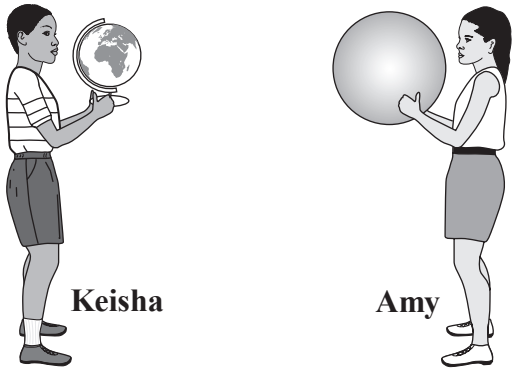
Benchmark SC.4.E.5.4

Reporting Category	Earth & Space Science
Standard	**Big Idea 5** Earth in Space and Time
Benchmark	**SC.4.E.5.4 Relate that the rotation of Earth (day and night) and apparent movements of the Sun, Moon, and stars are connected. (Also assesses SC.4.E.5.1, SC.4.E.5.2, and SC.4.E.5.3.)**
Also Assesses	**SC.4.E.5.1** Observe that the patterns of stars in the sky stay the same although they appear to shift across the sky nightly, and different stars can be seen in different seasons. **SC.4.E.5.2** Describe the changes in the observable shape of the moon over the course of about a month. **SC.4.E.5.3** Recognize that Earth revolves around the Sun in a year and rotates on its axis in a 24-hour day.
Benchmark Clarifications	Students will describe how the rotation of Earth and apparent movement of the Sun, Moon, and/or stars are related. Students will identify that the pattern of stars appears to shift across the sky nightly or that different stars can be seen in different seasons. Students will describe the visual changes in the appearance of the Moon. Students will explain that Earth revolves around the Sun in a year. Students will explain that Earth rotates on its axis in a 24-hour day.
Content Limits	Items will assess a conceptual understanding of the apparent movements of the Sun, Moon, and stars and resulting patterns. Items will not assess the causes of moon phases. Items will not assess or use vocabulary associated with moon phases, such as *waning*, *waxing*, and *gibbous*. Items will not require the identification of specific constellations. Items will not require specific knowledge of quantitative astronomical data. Items will not assess the causes of seasons, directness of sunlight, or Earth's tilt. Items will not assess solar or lunar eclipses.
Stimulus Attributes	Scenarios referring to patterns of stars in the sky will not use the term *constellation*.
Response Attributes	None specified

Prior Knowledge Items may require the student to apply science knowledge described in the NGSSS from lower grades. This benchmark requires prerequisite knowledge from SC.K.E.5.2, SC.K.E.5.3, and SC.K.E.5.4.

Sample Item 6 **SC.4.E.5.3**

Keisha wants to show Amy what happens during one Earth day. Keisha holds a small globe representing Earth, and Amy holds a large ball representing the Sun.



What should Keisha do to show Amy what happens during one Earth day?

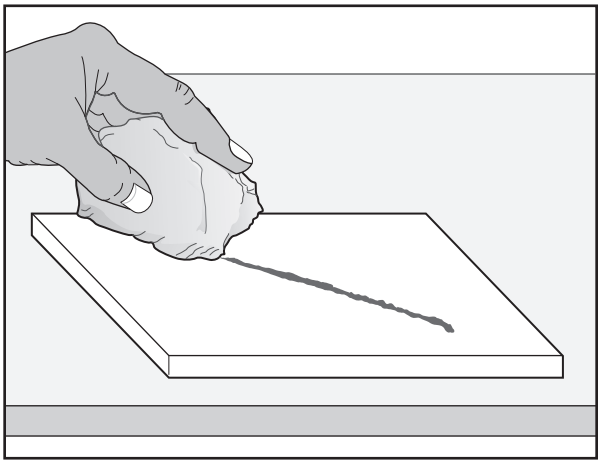
A. Keisha should move the globe in one complete circle around Amy.
B. Keisha should move the globe toward Amy and then away from her.
C. Keisha should slowly lift the globe above her head and then lower it.
★ **D.** Keisha should slowly spin the globe one complete time about its axis.

Benchmark SC.4.E.6.2

Reporting Category	Earth & Space Science
Standard	**Big Idea 6** Earth Structures
Benchmark	**SC.4.E.6.2 Identify the physical properties of common earth-forming minerals, including hardness, color, luster, cleavage, and streak color, and recognize the role of minerals in the formation of rocks. (Also assesses SC.4.E.6.1.)**
Also Assesses	**SC.4.E.6.1** Identify the three categories of rocks: igneous, (formed from molten rock); sedimentary (pieces of other rocks and fossilized organisms); and metamorphic (formed from heat and pressure).
Benchmark Clarifications	Students will identify and/or describe the physical properties of common minerals. Students will describe and/or explain the role of minerals in the formation of rocks. Students will identify the three categories of rocks and how they were formed.
Content Limits	Items will not assess the identification of a specific mineral based on its properties. Items addressing common minerals are limited to quartz, feldspar, mica, calcite, talc, pyrite, and graphite. Items will not require the identification of specific mineral composition of any type of rock. Items will not require knowledge of Moh's hardness scale. Items will not assess the rock cycle.
Stimulus Attributes	None specified
Response Attributes	None specified
Prior Knowledge	Items may require the student to apply science knowledge described in the NGSSS from lower grades. This benchmark requires prerequisite knowledge from SC.1.E.6.1, SC.2.E.6.1, SC.2.E.6.2, SC.2.E.6.3 SC.K.P.8.1, SC.1.P.8.1, and SC.2.P.8.1.

Sample Item 7 SC.4.E.6.2

Daunte performs several tests on a mineral to help identify it. The picture below shows one of the tests he performed.



Which property of the mineral will Daunte be ab le to identify using this test?

A. attraction to magnets
★ **B.** streak color
C. hardness
D. cleavage

Benchmark SC.4.E.6.3

Reporting Category	Earth & Space Science
Standard	**Big Idea 6** Earth Structures
Benchmark	**SC.4.E.6.3 Recognize that humans need resources found on Earth and that these are either renewable or nonrenewable. (Also assesses SC.4.E.6.6.)**
Also Assesses	**SC.4.E.6.6** Identify resources available in Florida (water, phosphate, oil, limestone, silicon, wind, and solar energy).
Benchmark Clarifications	Students will identify and/or distinguish between renewable and nonrenewable resources found on Earth. Students will identify resources naturally found in Florida.
Content Limits	None specified
Stimulus Attributes	None specified
Response Attributes	None specified
Prior Knowledge	Items may require the student to apply science knowledge described in the NGSSS from lower grades. This benchmark requires prerequisite knowledge from SC.1.E.6.2.

Sample Item 8 **SC.4.E.6.3**

There are many different natural resources found in Florida. Which of the following can be described as a renewable resource?

A. limestone
B. oil
C. phosphate
★ **D.** water

Benchmark SC.4.E.6.4

Reporting Category	Earth & Space Science
Standard	**Big Idea 6** Earth Structures
Benchmark	**SC.4.E.6.4 Describe the basic differences between physical weathering (breaking down of rock by wind, water, ice, temperature change, and plants) and erosion (movement of rock by gravity, wind, water, and ice).**
Benchmark Clarifications	Students will identify and/or describe the processes of physical weathering and/or erosion. Students will compare and contrast the agents and/or the processes of physical weathering and erosion.
Content Limit	Items may address but will not assess specific landforms resulting from physical weathering and erosion.
Stimulus Attributes	None specified
Response Attributes	None specified
Prior Knowledge	Items may require the student to apply science knowledge described in the NGSSS from lower grades. This benchmark requires prerequisite knowledge from SC.1.E.6.1, SC.1.E.6.3, and SC.2.E.6.1.

Sample Item 9 **SC.4.E.6.4**

Earth has a great variety of surface features that are caused by weathering and erosion. Which of the following describes a change due to weathering?

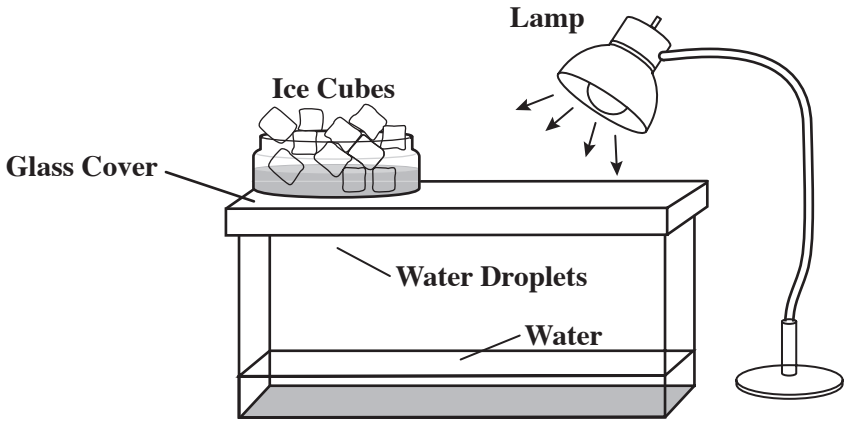
A. ocean waves washing sand off the beach
B. rivers carrying soil and rocks through valleys
C. wind blowing sand and pebbles off of a sand dune
★ **D.** tree roots breaking rocks into smaller pieces of rock

Benchmark SC.5.E.7.1

Reporting Category	Earth & Space Science
Standard	**Big Idea 7** Earth Systems and Patterns
Benchmark	**SC.5.E.7.1 Create a model to explain the parts of the water cycle. Water can be a gas, a liquid, or a solid and can go back and forth from one state to another. (Also assesses SC.5.E.7.2.)**
Also Assesses	**SC.5.E.7.2** Recognize that the ocean is an integral part of the water cycle and is connected to all of Earth's water reservoirs via evaporation and precipitation processes.
Benchmark Clarifications	Students will identify and/or explain the parts of the water cycle. Students will identify the states of water associated with each part of the water cycle and/or explain the phase changes that occur as water moves from one part of the water cycle to another. Students will identify and/or describe the role of the ocean in the water cycle.
Content Limits	Items will not address or assess transpiration, infiltration, or percolation as processes of the water cycle. Items assessing the phases of water are limited to a water cycle context.
Stimulus Attributes	Scenarios referring to the water cycle will not use the term *reservoir*.
Response Attributes	None specified
Prior Knowledge	Items may require the student to apply science knowledge described in the NGSSS from lower grades. This benchmark requires prerequisite knowledge from SC.2.E.7.1, SC.2.E.7.2, SC.2.E.7.3, and SC.2.P.8.4.

Sample Item 10 SC.5.E.7.1

A model of the water cycle was made using an aquarium with a glass cover, a container of ice cubes, water, and a lamp.



Which part of the water cycle causes the water droplets to form on the glass cover?

★ **A.** condensation
B. evaporation
C. precipitation
D. runoff

Benchmark SC.5.E.7.3

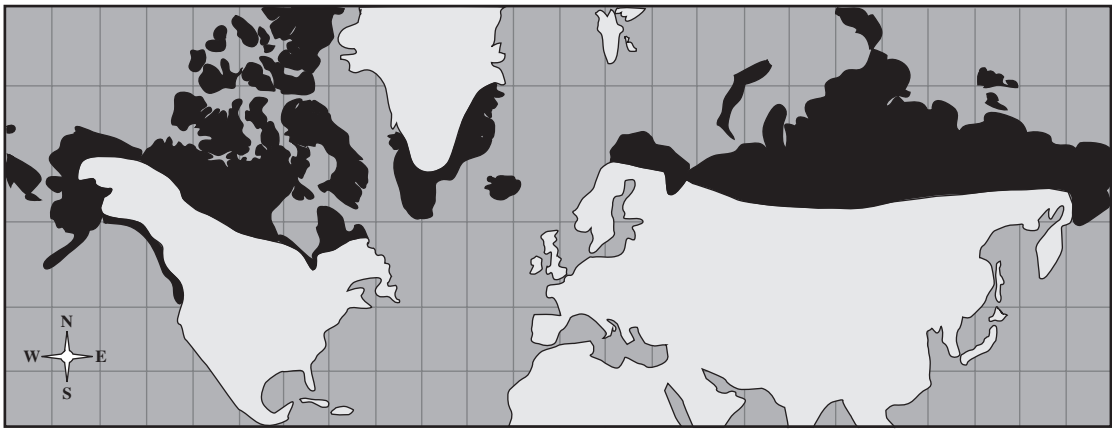
Reporting Category	Earth & Space Science
Standard	**Big Idea 7** Earth Systems and Patterns
Benchmark	**SC.5.E.7.3 Recognize how air temperature, barometric pressure, humidity, wind speed and direction, and precipitation determine the weather in a particular place and time. (Also assesses SC.5.E.7.4, SC.5.E.7.5, and SC.5.E.7.6.)**
Also Assesses	**SC.5.E.7.4** Distinguish among the various forms of precipitation (rain, snow, sleet, and hail), making connections to the weather in a particular place and time. **SC.5.E.7.5** Recognize that some of the weather-related differences, such as temperature and humidity, are found among different environments, such as swamps, deserts, and mountains. **SC.5.E.7.6** Describe characteristics (temperature and precipitation) of different climate zones as they relate to latitude, elevation, and proximity to bodies of water.
Benchmark Clarifications	Students will identify and/or describe how air temperature, barometric pressure, humidity, wind speed and direction, and precipitation describe weather in a particular place and time. Students will identify or distinguish the forms of precipitation (rain, snow, sleet, and hail) and their related weather conditions. Students will distinguish weather conditions among different environments. Students will describe the temperature and precipitation of different climate zones as they relate to latitude, elevation, and/or proximity to bodies of water.
Content Limits	Items assessing weather and climate are limited to conceptual understanding. Items will not assess the difference between climate and weather. Items will not address or assess the interpretation of specific characteristics used to forecast weather. Items addressing the types of clouds are limited to cumulus, cirrus, stratus, and cumulonimbus as they relate to weather but will not require differentiation among these types of clouds. Items assessing climate zones are limited to polar, tropical, and temperate.

Content Limits	Items assessing weather-related differences among different environments may include desert, grassland, rainforest, tundra, and wetland. Items will not require knowledge of specific geographic locations. Items will not assess fronts. Items may refer to common tools used to measure air temperature, barometric pressure, humidity, wind speed and direction, and precipitation but will not assess specific knowledge of the tools.
Stimulus Attributes	Scenarios may include a weather map with a key explaining weather symbols. Dual thermometers showing degrees Fahrenheit and degrees Celsius must be used if the scenario requires an illustration of a ther mometer. Wind speeds will be shown in miles per hour (mph). The phrase *air pressure* should be used rather than the phrase *barometric pressure*.
Response Attributes	None specified
Prior Knowledge	Items may require the student to apply science knowledge described in the NGSSS from lower grades. This benchmark requires prerequisite knowledge from SC.2.E.7.1, SC.2.E.7.2, SC.2.E.7.4, SC.2.E.7.5, SC.2.P.8.4, and SC.2.P.8.5.

Sample Item 11 SC.5.E.7.6

Earth has many types of climate zones. The map below shows the tundra climate zones of the Northern Hemisphere.

Tundra Zones of Earth's Northern Hemisphere



LEGEND
Tundra climate

Which of the following **best** describes this type of climate zone?

A. It is very hot because it is on the coastline.
B. It is very wet because it is below sea level.
C. It receives very little snowfall because it is close to the ocean.
★ **D.** It has very cold temperatures because it is far from the equator.

Benchmark SC.5.P.8.1

Reporting Category	Physical Science
Standard	**Big Idea 8** Properties of Matter
Benchmark	**SC.5.P.8.1 Compare and contrast the basic properties of solids, liquids, and gases, such as mass, volume, color, texture, and temperature. (Also assesses SC.3.P.8.1, SC.3.P.8.2, SC.3.P.8.3, and SC.4.P.8.1.)**
Also Assesses	**SC.3.P.8.1** Measure and compare temperatures of various samples of solids and liquids. **SC.3.P.8.2** Measure and compare the mass and volume of solids and liquids. **SC.3.P.8.3** Compare materials and objects according to properties such as size, shape, color, texture, and hardness. **SC.4.P.8.1** Measure and compare objects and materials based on their physical properties including: mass, shape, volume, color, hardness, texture, odor, taste, attraction to magnets.
Benchmark Clarifications	Students will compare and/or contrast the physical properties of solids, liquids, and/or gases. Students will describe or classify a material as a solid, liquid, or gas.
Content Limits	Items will not address or assess particle behavior in each state of matter or between states of matter. Items will not address or assess the water cycle. Items may refer to common tools used to measure basic properties of solids, liquids, and gases but will not assess specific knowledge of the tools. Items will not assess the difference between weight and mass. Items will not assess unit of measure. Items will not require unit conversions to compare data. Items will not address or assess density as a property.
Stimulus Attributes	Dual thermometers showing degrees Fahrenheit and degrees Celsius must be used if the scenario requires an illustration of a thermometer.
Response Attributes	None specified

Prior Knowledge Items may require the student to apply science knowledge described in the NGSSS from lower grades. This benchmark requires prerequisite knowledge from SC.K.P.8.1, SC.1.P.8.1, SC.2.P.8.1, SC.2.P.8.2, SC.2.P.8.3, SC.2.P.8.4, SC.2.P.8.6, and SC.1.E.5.3.

Sample Item 12 **SC.5.P.8.1**

Kyle and Jan are comparing two samples of matter. They make a table of the properties of each sample.

PROPERTIES OF SAMPLES

Property	Sample 1	Sample 2
Color	Red	Silver
Mass (grams)	30	5
Shape	Pyramid	Cube
Volume (milliliters)	40	3

Which property provides the **best** evidence that both samples are solids rather than liquids?

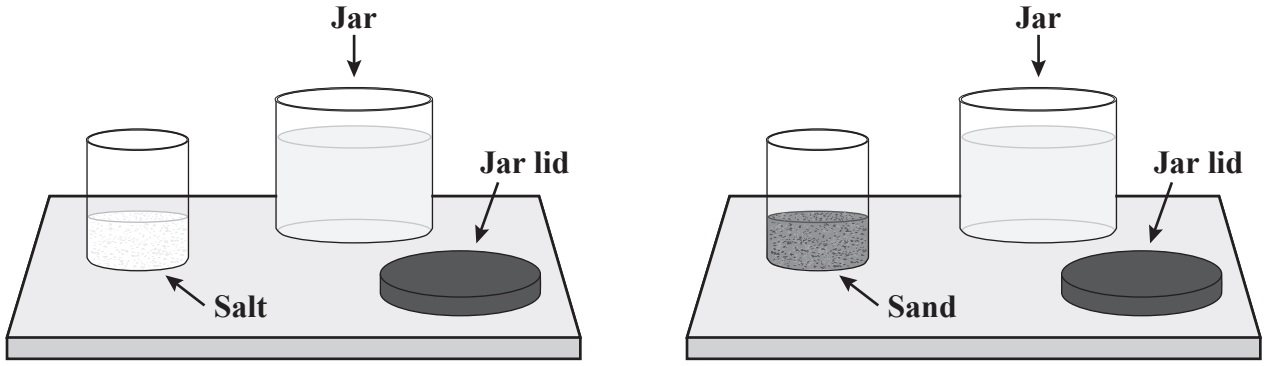
A. color
B. mass
★ **C.** shape
D. volume

Benchmark SC.5.P.8.3

Reporting Category	Physical Science
Standard	**Big Idea 8** Properties of Matter
Benchmark	**SC.5.P.8.3 Demonstrate and explain that mixtures of solids can be separated based on observable properties of their parts such as particle size, shape, color, and magnetic attraction. (Also assesses SC.5.P.8.2.)**
Also Assesses	**SC.5.P.8.2** Investigate and identify materials that will dissolve in water and those that will not and identify the conditions that will speed up or slow down the dissolving process.
Benchmark Clarification	Students will describe and/or explain how mixtures of solids can be separated. Students will identify common materials that dissolve in water. Students will identify or describe conditions that will speed up or slow down the dissolving process.
Content Limits	Items assessing conditions used to speed up or slow down the dissolving process are limited to temperature, stirring, and/or surface area. Items will not use the terms *solution, solvent, solute, saturation*, or *catalyst*. Items will not assess the difference between a mixture and a solution.
Stimulus Attributes	Dual thermometers showing degrees Fahrenheit and degrees Celsius must be used if the scenario requires an illustration of a thermometer.
Response Attributes	None specified
Prior Knowledge	Items may require the student to apply science knowledge described in the NGSSS from lower grades. This benchmark requires prerequisite knowledge from SC.K.P.8.1 and SC.1.P.8.1.

Sample Item 13 SC.5.P.8.2

Dani adds 10 grams (g) of salt to a jar of water. She then adds 10 g of sand to a second jar of water. She covers and shakes both jars and sets them on the table for five minutes. The materials Dani used are shown below.



What should Dani expect to observe after those five minutes?

A. Both the salt and sand dissolved in the water.
B. Both the salt and the sand settled to the bottom of the jar.
C. The salt settled to the bottom of the jar, and the sand dissolved in the water.
★ **D.** The salt dissolved in the water, and the sand settled to the bottom of the jar.

Benchmark SC.5.P.9.1

Reporting Category	Physical Science
Standard	**Big Idea 9** Changes in Matter
Benchmark	**SC.5.P.9.1 Investigate and describe that many physical and chemical changes are affected by temperature. (Also assesses SC.3.P.9.1 and SC.4.P.9.1.)**
Also Assesses	**SC.3.P.9.1** Describe the changes water undergoes when it changes state through heating and cooling by using familiar scientific terms such as melting, freezing, boiling, evaporation, and condensation. **SC.4.P.9.1** Identify some familiar changes in materials that result in other materials with different characteristics, such as decaying animal or plant matter, burning, rusting, and cooking.
Benchmark Clarifications	Students will describe how physical and/or chemical changes are affected by temperature. Students will describe the physical changes water undergoes as it is heated and/or cooled. Students will describe how some familiar changes in materials result in other materials with different characteristics.
Content Limit	Items will not assess particle motion in changes of states of matter.
Stimulus Attributes	None specified
Response Attributes	None specified
Prior Knowledge	Items may require the student to apply science knowledge described in the NGSSS from lower grades. This benchmark requires prerequisite knowledge from SC.K.P.9.1 and SC.2.P.9.1.

Sample Item 14 **SC.3.P.9.1**

One morning, Ryan noticed there were tiny drops of water on the grass as he walked to school. That afternoon, he did not see any drops of water on the grass when he returned home. Which of the following **best** explains what happened to the drops of water?

A. The heat from the air caused the water drops to boil.
B. The air cooled the water and caused the drops to freeze.
★ **C.** The Sun heated the water and caused the drops to evaporate.
D. The energy from the Sun caused the water drops to condense.

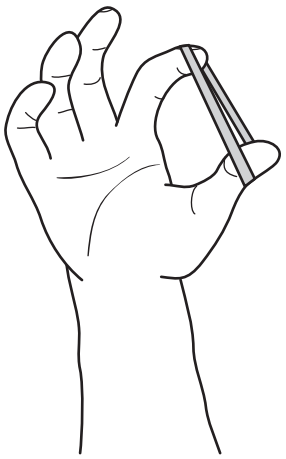
Benchmark SC.5.P.10.1

Reporting Category	Physical Science
Standard	**Big Idea 10** Forms of Energy
Benchmark	**SC.5.P.10.1 Investigate and describe some basic forms of energy, including light, heat, sound, electrical, chemical, and mechanical. (Also assesses SC.3.P.10.1, SC.3.P.10.3, SC.3.P.10.4, SC.3.P.11.1, SC.3.P.11.2, SC.4.P.10.1, and SC.4.P.10.3.)**
Also Assesses	**SC.3.P.10.1** Identify some basic forms of energy such as light, heat, sound, electrical, and mechanical. **SC.3.P.10.3** Demonstrate that light travels in a straight line until it strikes an object or travels from one medium to another. **SC.3.P.10.4** Demonstrate that light can be reflected, refracted, and absorbed. **SC.3.P.11.1** Investigate, observe, and explain that things that give off light often also give off heat. **SC.3.P.11.2** Investigate, observe, and explain that heat is produced when one object rubs against another, such as rubbing one's hands together. **SC.4.P.10.1** Observe and describe some basic forms of energy, including light, heat, sound, electrical, and the energy of motion. **SC.4.P.10.3** Investigate and explain that sound is produced by vibrating objects and that pitch depends on how fast or slow the object vibrates.
Benchmark Clarifications	Students will identify and/or describe some basic forms of energy. Students will describe that light travels in a straight line until it strikes an object or travels from one material to another. Students will explain that heat is produced when two objects are rubbed against each other. Students will explain that sound is produced by vibrations and/or that pitch depends on how fast or slow the object vibrates.
Content Limits	Items assessing basic forms of energy are limited to light, heat (thermal), sound, electrical, chemical, and mechanical energy. Items will not assess the transfer of energy. Items assessing light reflection, refraction, or absorption should use the terms *reflect*, *bend*, or *absorb* to describe light's behavior.

Stimulus Attributes	The terms *material* or *substance* should be used rather than the terms *medium* or *media*. Scenarios referring to mechanical energy should not use the terms *kinetic energy* or *potential energy*.
Response Attributes	None specified
Prior Knowledge	Items may require the student to apply science knowledge described in the NGSSS from lower grades. This benchmark requires prerequisite knowledge from SC.K.P.10.1 and SC.2.P.10.1.

Sample Item 15 **SC.4.P.10.3**

Jason stretches a rubber band between his fingers, as shown below. When he plucks the rubber band, it makes a sound.



Which of the following **best** explains why the rubber band makes a sound when Jason plucks it?

A. It heats the air.
★ **B.** It vibrates the air.
C. It absorbs energy from the air.
D. It releases molecules into the air.

Benchmark SC.5.P.10.2

Reporting Category	Physical Science
Standard	**Big Idea 10** Forms of Energy
Benchmark	**SC.5.P.10.2 Investigate and explain that energy has the ability to cause motion or create change. (Also assesses SC.3.P.10.2, SC.4.P.10.2, and SC.4.P.10.4.)**
Also Assesses	**SC.3.P.10.2** Recognize that energy has the ability to cause motion or create change. **SC.4.P.10.2** Investigate and describe that energy has the ability to cause motion or create change. **SC.4.P.10.4** Describe how moving water and air are sources of energy and can be used to move things.
Benchmark Clarifications	Students will explain that energy has the ability to cause motion or create change. Students will identify and/or describe examples where energy has caused motion or created changes. Students will describe and/or explain how water and/or air are sources of energy.
Content Limit	Items will not assess sound and chemical energy.
Stimulus Attributes	Comparative words such as *greater than*, *less than*, *faster*, or *slower* should be used when describing motion. Scenarios will not use weathering and/or erosion as a context.
Response Attributes	None specified
Prior Knowledge	Items may require the student to apply science knowledge described in the NGSSS from lower grades. This benchmark requires prerequisite knowledge from SC.K.P.10.1, SC.K.P.12.1, SC.1.P.12.1 and SC.K.P.13.1, SC.1.P.13.1, and SC.2.P.13.1.

Sample Item 16 **SC.4.P.10.2**

Frank uses a bowling ball to demonstrate how energy can cause changes. Which of the following actions would NOT demonstrate a change caused by applying energy to the ball?

★ **A.** He holds the bowling ball in both hands.
B. He spins the bowling ball with one hand.
C. He rolls the bowling ball across the floor.
D. He lifts the bowling ball to place it on a shelf.

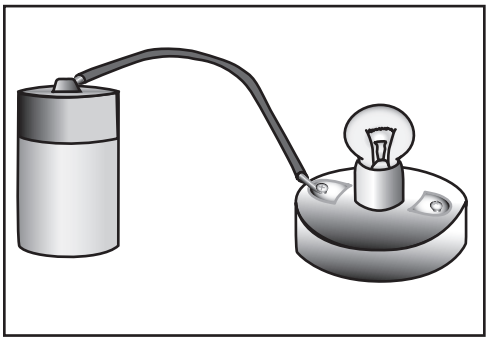
Benchmark SC.5.P.10.4

Reporting Category	Physical Science
Standard	**Big Idea 10** Forms of Energy
Benchmark	**SC.5.P.10.4 Investigate and explain that electrical energy can be transformed into heat, light, and sound energy, as well as the energy of motion. (Also assesses SC.3.E.6.1, SC.4.P.11.1, SC.4.P.11.2, SC.5.P.10.3, SC.5.P.11.1, and SC.5.P.11.2.)**
Also Assesses	**SC.3.E.6.1** Demonstrate that radiant energy from the Sun can heat objects and when the Sun is not present, heat may be lost. **SC.4.P.11.1** Recognize that heat flows from a hot object to a cold object and that heat flow may cause materials to change temperature. **SC.4.P.11.2** Identify common materials that conduct heat well or poorly. **SC.5.P.10.3** Investigate and explain that an electrically-charged object can attract an uncharged object and can either attract or repel another charged object without any contact between the objects. **SC.5.P.11.1** Investigate and illustrate the fact that the flow of electricity requires a closed circuit (a complete loop). **SC.5.P.11.2** Identify and classify materials that conduct electricity and materials that do not.
Benchmark Clarifications	Students will explain that electrical energy can be transformed into heat, light, and/or sound energy, as well as the energy of motion. Students will explain that energy from the Sun can be used to heat objects, and that when sunlight is not present, heat may be lost. Students will identify the flow of heat between hot and cold objects and/or that heat may cause objects to change temperature. Students will identify common materials that conduct heat well or poorly. Students will explain that an electrically charged object can attract an uncharged object and/or either attract or repel another charged object without any contact between the objects. Students will determine that the flow of electricity requires a closed circuit. Students will identify and/or classify materials that conduct electricity and materials that do not.

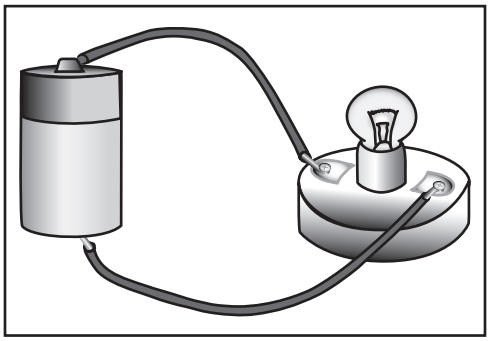
Content Limits	Items will not assess parallel and series circuits. Items assessing electricity will not refer to electrons or the movement of electrons in producing electrical charge. Items that refer to positive and negative charges in attraction and repulsion properties must be in the context of static electricity. Items will not use more than two energy conversions.
Stimulus Attribute	Scenarios are limited to abiotic systems. Scenarios referring to energy from the Sun will not use the term *radiant*.
Response Attributes	None specified
Prior Knowledge	Items may require the student to apply science knowledge described in the NGSSS from lower grades. This benchmark requires prerequisite knowledge from SC.2.P.10.1.

Sample Item 17 **SC.5.P.11.1**

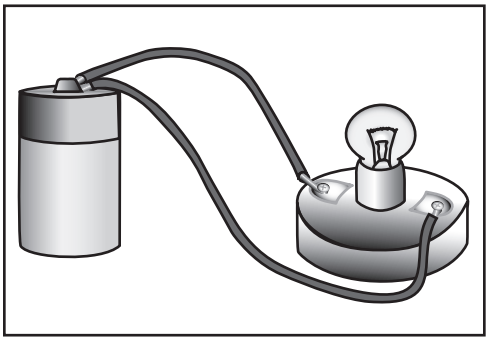
Electric circuits must be properly connected or electricity will not flow. Which of the following shows a properly connected circuit that would allow electricity to flow and light the bulb?



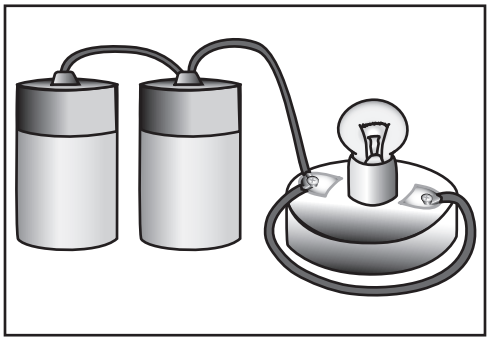
A.



★ C.



B.



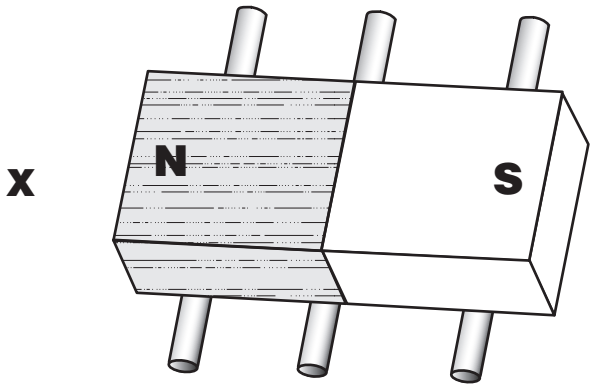
D.

Benchmark SC.5.P.13.1

Reporting Category	Physical Science
Standard	**Big Idea 13** Forces and Changes in Motion
Benchmark	**SC.5.P.13.1 Identify familiar forces that cause objects to move, such as pushes or pulls, including gravity acting on falling objects. (Also assesses SC.3.E.5.4 and SC.4.P.8.4.)**
Also Assesses	**SC.3.E.5.4** Explore the Law of Gravity by demonstrating that gravity is a force that can be overcome. **SC.4.P.8.4** Investigate and describe that magnets can attract magnetic materials and attract and repel other magnets.
Benchmark Clarifications	Students will identify familiar forces that affect how objects move. Students will identify scenarios whereby gravity is overcome. Students will identify and/or describe examples of magnetic attraction and repulsion.
Content Limits	Items assessing familiar forces are limited to pushes, pulls, friction, gravity, and magnetic force. Items may only require the interpretation of two forces at a time. Items referring to friction will only assess the force of friction as a resistance to movement. Items that assess magnetic attraction will not use the context of separating mixtures and solutions.
Stimulus Attributes	None specified
Response Attributes	None specified
Prior Knowledge	Items may require the student to apply science knowledge described in the NGSSS from lower grades. This benchmark requires prerequisite knowledge from SC.K.E.5.1, SC.K.P.13.1, SC.1.E.5.2, SC.1.P.13.1, SC.2.P.13.1, SC.2.P.13.2, SC.2.P.13.3, and SC.2.P.13.4.

Sample Item 18 SC.4.P.8.4

Bar magnets have a north pole (N) and a south pole (S). Latrisha places a bar magnet on three small straws so that it can roll. Her setup is sho wn below.



Placing which of the following objects at point X will cause the bar magnet to mo ve away from point X?

A. an iron nail
B. an aluminum can
★ **C.** the north end of another bar magnet
D. the south end of another bar magnet

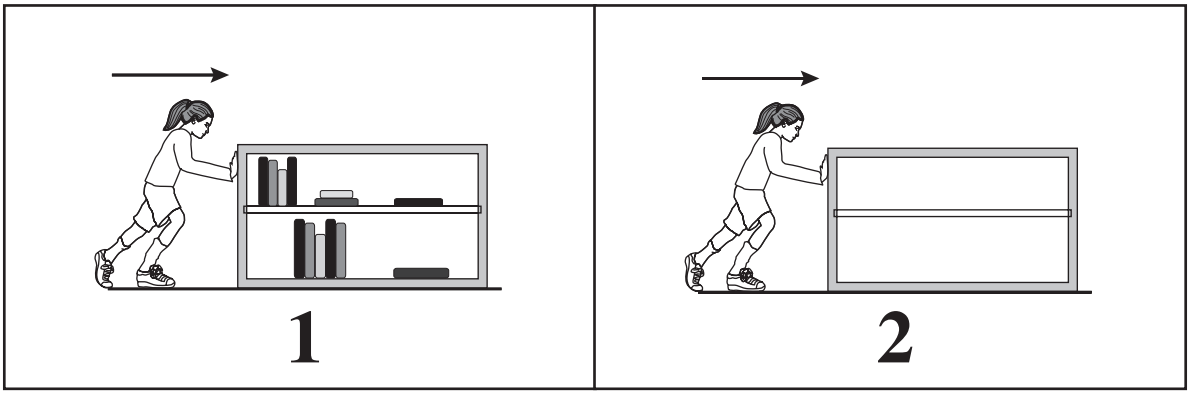
Benchmark SC.5.P.13.2

Reporting Category	Physical Science
Standard	**Big Idea 13** Forces and Changes in Motion
Benchmark	**SC.5.P.13.2 Investigate and describe that the greater the force applied to it, the greater the change in motion of a given object. (Also assesses SC.4.P.12.1, SC.4.P.12.2, SC.5.P.13.3, and SC.5.P.13.4.)**
Also Assesses	**SC.4.P.12.1** Recognize that an object in motion always changes its position and may change its direction. **SC.4.P.12.2** Investigate and describe that the speed of an object is determined by the distance it travels in a unit of time and that objects can move at different speeds. **SC.5.P.13.3** Investigate and describe that the more mass an object has, the less effect a given force will have on the object's motion. **SC.5.P.13.4** Investigate and explain that when a force is applied to an object but it does not move, it is because another opposing force is being applied by something in the environment so that the forces are balanced.
Benchmark Clarifications	Students will describe the relationship among mass, force, and motion. Students will identify and/or describe that an object in motion always changes its position and may change its direction. Students will describe that the speed of an object is determined by the distance an object travels and the time it takes the object to travel that distance. Students will describe that objects can move at different speeds.
Content Limits	Items assessing relationship between mass, force, and motion are limited to a conceptual understanding. Items will not involve mathematical calculations or formulas. Items will address a conceptual understanding of speed and not require mathematical computations. Items may require the identification of the direction of motion but not the magnitude of motion. Items may refer to balanced forces and/or unbalanced forces but not net force. Items assessing forces applied to objects of different masses are limited to pushes, pulls, and friction.

Stimulus Attribute	Scenarios should use newtons (N) as the unit of measure for forces.
Response Attributes	None specified
Prior Knowledge	Items may require the student to apply science knowledge described in the NGSSS from lower grades. This benchmark requires prerequisite knowledge from SC.K.P.13.1, SC.1.P.13.1, SC.2.P.13.1, and SC.2.P.13.4.

Sample Item 19 **SC.5.P.13.3**

Stephanie started pushing a bookcase across the room, as shown in picture 1. Then, she removed the books and continued pushing with the same force and direction, as shown in picture 2.



How does removing the books affect the motion of the bookcase?

★ **A.** The mass is decreased, making the bookcase move faster.
B. The gravity is increased, making the bookcase move slower.
C. The friction is increased, making the bookcase move slower.
D. The mechanical energy is decreased, making the bookcase move faster.

Benchmark SC.3.L.14.1

Reporting Category	Life Science
Standard	**Big Idea 14** Organization and Development of Living Organisms
Benchmark	**SC.3.L.14.1 Describe structures in plants and their roles in food production, support, water and nutrient transport, and reproduction. (Also assesses SC.3.L.14.2 and SC.4.L.16.1.)**
Also Assesses	**SC.3.L.14.2** Investigate and describe how plants respond to stimuli (heat, light, gravity), such as the way plant stems grow toward light and their roots grow downward in response to gravity. **SC.4.L.16.1** Identify processes of sexual reproduction in flowering plants, including pollination, fertilization (seed production), seed dispersal, and germination.
Benchmark Clarification	Students will identify and/or describe the parts of plants and/or the part's role. Students will describe how plants respond to stimuli. Students will describe processes of sexual reproduction in flowering plants.
Content Limits	Items assessing the structures and functions of major parts of plants are limited to stem, leaf/needle, root, flower, seed, and fruit. Items assessing sexual reproduction in flowering plants are limited to stamen, pistil, ovary, petals, sperm, and egg. Items will not assess cellular processes. Items referring to a plant's response to stimuli are limited to a conceptual understanding of a plant's response to heat, light, or gravity. Items will not use the terms *phototropism*, *geotropism*, *hydrotropism*, and *thigmotropism*.
Stimulus Attribute	Scenarios referring to how plants respond to conditions will not use the terms *stimulus* or *stimuli*.
Response Attributes	None specified
Prior Knowledge	Items may require the student to apply science knowledge described in the NGSSS from lower grades. This benchmark requires prerequisite knowledge from SC.K.L.14.3, SC.1.L.14.1, SC.1.L.14.2, and SC.1.L.14.3.

Sample Item 20 SC.3.L.14.2

Katie put a flowering plant on her kitchen table.

How would the flowers respond to light coming through the window?

A. The flowers would begin to wilt.
B. The flowers would change color.
★ **C.** The flowers would lean toward the window.
D. The flowers would open facing away from the window.

Benchmark SC.5.L.14.1

Reporting Category	Life Science
Standard	**Big Idea 14** Organization and Development of Living Organisms
Benchmark	**SC.5.L.14.1 Identify the organs in the human body and describe their functions, including the skin, brain, heart, lungs, stomach, liver, intestines, pancreas, muscles and skeleton, reproductive organs, kidneys, bladder, and sensory organs.**
Benchmark Clarification	Students will identify organs in the human body and/or describe their functions.
Content Limits	Items will not assess human body systems. Items will not require specific knowledge of the parts of organs. Items referring to the intestines may assess the small intestines and/or the large intestines. Items will not require the memorization of the names of muscles or bones. Items referring to muscles will only assess the function of muscles as a group.
Stimulus Attribute	Diagrams of the reproductive organs will not be used.
Response Attributes	None specified
Prior Knowledge	Items may require the student to apply science knowledge described in the NGSSS from lower grades. This benchmark requires prerequisite knowledge from SC.K.L.14.1, SC.K.L.14.3, and SC.2.L.14.1.

Sample Item 21 **SC.5.L.14.1**

Organs in the human body carry out different functions. Which human organ breaks down food into nutrients that can be used by the human body?

A. bladder
B. heart
C. kidneys
★ **D.** stomach

Benchmark SC.5.L.14.2

Reporting Category	Life Science
Standard	**Big Idea 14** Organization and Development of Living Organisms
Benchmark	**SC.5.L.14.2 Compare and contrast the function of organs and other physical structures of plants and animals, including humans, for example: some animals have skeletons for support — some with internal skeletons others with exoskeletons — while some plants have stems for support. (Also assesses SC.3.L.15.1 and SC.3.L.15.2.)**
Also Assesses	**SC.3.L.15.1** Classify animals into major groups (mammals, birds, reptiles, amphibians, fish, arthropods, vertebrates and invertebrates, those having live births and those which lay eggs) according to their physical characteristics and behaviors. **SC.3.L.15.2** Classify flowering and nonflowering plants into major groups such as those that produce seeds, or those like ferns and mosses that produce spores, according to their physical characteristics.
Benchmark Clarifications	Students will compare and/or contrast the function of organs and/or other physical structures of plants and/or animals. Students will classify animals into major groups according to their physical characteristics and behaviors. Students will classify flowering and/or nonflowering plants into major groups according to their physical characteristics.
Content Limits	Items will not require the classification of animals beyond the initial invertebrates grouping. Items referring to classification of vertebrates will only assess general physical characteristics and/or behaviors of mammals, birds, reptiles, amphibians, and fish. Items addressing and/or assessing the functions of organs or the comparison of physical structures are limited to the brain, heart, lungs, gills, stomach, liver, intestines, pancreas, muscles, bones, exoskeleton, testes, ovaries, kidneys, bladder, skin or body covering, eyes, ears, nose, and tongue. Items referring to the functions of plant structures are limited to flower, fruit, leaf, root, seed, and spore.

Content Limits	Items addressing the comparison of the structure and/or function of plants and animals are limited to skin compared to plant covering, skeleton compared to stem, and reproductive organs compared to flower. Items will not require specific knowledge of the parts of organs.
Stimulus Attributes	Scenarios will use common names of organisms and will not include scientific names. Scenarios requiring the classification of organisms as vertebrates or invertebrates must include a description or picture of the organisms.
Response Attributes	None specified
Prior Knowledge	Items may require the student to apply science knowledge described in the NGSSS from lower grades. This benchmark requires prerequisite knowledge from SC.K.L.14.3, SC.1.L.14.3, and SC.2.L.14.1.

Sample Item 22 **SC.5.L.14.2**

Many animals have a skeletal system that gives support to their bodies. Plants also have parts that provide support. Which part of a plant functions **most** like the skeletal system of animals?

A. flower
B. leaf
C. root
★ **D.** stem

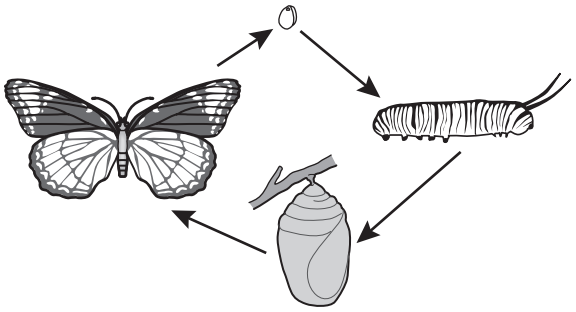
Benchmark SC.4.L.16.4

Reporting Category	Life Science
Standard	**Big Idea 16** Heredity and Reproduction
Benchmark	**SC.4.L.16.4 Compare and contrast the major stages in the life cycles of Florida plants and animals, such as those that undergo incomplete and complete metamorphosis, and flowering and nonflowering seed-bearing plants.**
Benchmark Clarification	Students will identify, compare, and/or contrast the major life cycles of Florida plants and/or animals.
Content Limits	Items will only assess the life cycles of plants and animals commonly found in Florida. Items assessing the life cycles of insects are limited to egg, larva, pupa, and adult (complete metamorphosis) or egg, nymph, and adult (incomplete metamorphosis). Items assessing the life cycles of flowering and nonflowering plants are limited to seed, seedling, and other stages of plant development. Items assessing the life cycles of animals are limited to egg, embryo, infant, adolescent, and adult stages. Items will not assess the major stages of the human life cycle.
Stimulus Attribute	Plants and animals in scenarios and art must be common to Florida.
Response Attributes	None specified
Prior Knowledge	Items may require the student to apply science knowledge described in the NGSSS from lower grades. This benchmark requires prerequisite knowledge from SC.2.L.16.1.

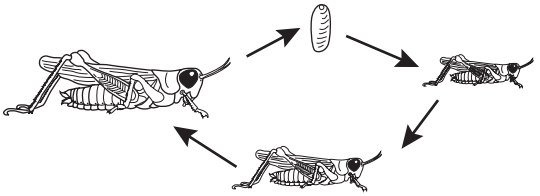
Sample Item 23 SC.4.L.16.4

The life cycle of both butterflies and grasshoppers starts at the same stage. The pictures below show the life cycle of both organisms.

Butterfly Life Cycle



Grasshopper Life Cycle



Which of the following is the beginning stage of the life cycle for both the butterfly and the grasshopper?

★ **A.** egg
B. larva
C. nymph
D. pupa

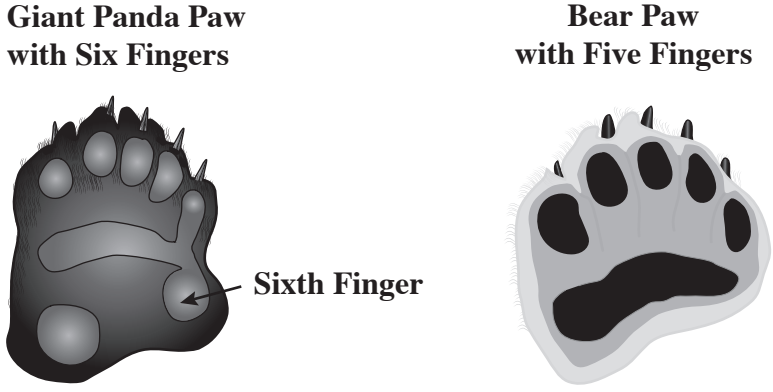
Benchmark SC.5.L.17.1

Reporting Category	Life Science
Standard	**Big Idea 17** Interdependence
Benchmark	**SC.5.L.17.1 Compare and contrast adaptations displayed by animals and plants that enable them to survive in different environments such as life cycles variations, animal behaviors and physical characteristics. (Also assesses SC.3.L.17.1, SC.4.L.16.2, SC.4.L.16.3, SC.4.L.17.1, SC.4.L.17.4, and SC.5.L.15.1.)**
Also Assesses	**SC.3.L.17.1** Describe how animals and plants respond to changing seasons. **SC.4.L.16.2** Explain that although characteristics of plants and animals are inherited, some characteristics can be affected by the environment. **SC.4.L.16.3** Recognize that animal behaviors may be shaped by heredity and learning. **SC.4.L.17.1** Compare the seasonal changes in Florida plants and animals to those in other regions of the country. **SC.4.L.17.4** Recognize ways plants and animals, including humans, can impact the environment. **SC.5.L.15.1** Describe how, when the environment changes, differences between individuals allow some plants and animals to survive and reproduce while others die or move to new locations.
Benchmark Clarifications	Students will explain, compare, and/or contrast how adaptations displayed by animals or plants enable them to survive in different environments. Students will describe or explain how animals and/or plants respond to changing seasons. Students will distinguish plant or animal characteristics that are inherited from those that are affected by the environment. Students will identify characteristics of animals that are inherited or distinguish inherited characteristics from those that are shaped by learning. Students will compare the seasonal changes in Florida plants and/or animals to those in other regions of the country. Students will identify ways in which plants and/or animals can impact the environment.

Benchmark Clarifications	Students will describe how, when the environment changes, differences between organisms allow some plants and animals to survive and reproduce while others die or move to new locations.
Content Limits	Items referring to the adaptation of organisms to different environments may address but will not assess the different stages of the organism's life cycle. Items may require knowledge of how animals living in a particular environment are adapted to survive the seasonal changes in that environment. Items will not assess renewable or nonrenewable resources.
Stimulus Attribute	The term *characteristic* should be used rather than the term *trait*.
Response Attributes	None specified
Prior Knowledge	Items may require the student to apply science knowledge described in the NGSSS from lower grades. This benchmark requires prerequisite knowledge from SC.1.L.16.1, SC.2.L.17.1, and SC.2.L.17.2.

Sample Item 24 **SC.5.L.17.1**

Giant pandas live in the mountain forests of China and eat mostly bamboo. The giant panda has a sixth "finger," while other bears have only five. The sixth finger is a large wrist bone that giant pandas are able to bend and use as a thumb. The picture below shows the paw of a giant panda with six fingers and the paw of another bear with five fingers.



Which of the following statements **best** explains why the sixth finger helps the giant panda survive in its environment?

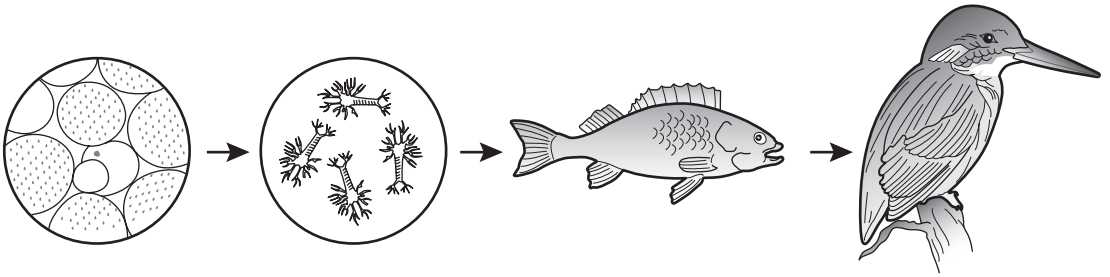
★ **A.** It helps the giant panda hold the bamboo stalks it feeds on.
B. It helps the giant panda crush the bamboo stalks before it eats them.
C. It allows the giant panda to dig in the mountain forests to hide its food.
D. It allows the giant panda to climb to the tops of mountain forests to find food.

Benchmark SC.4.L.17.3

Reporting Category	Life Science
Standard	**Big Idea 17** Interdependence
Benchmark	**SC.4.L.17.3 Trace the flow of energy from the Sun as it is transferred along the food chain through the producers to the consumers. (Also assesses SC.3.L.17.2 and SC.4.L.17.2.)**
Also Assesses	**SC.3.L.17.2** Recognize that plants use energy from the Sun, air, and water to make their own food. **SC.4.L.17.2** Explain that animals, including humans, cannot make their own food and that when animals eat plants or other animals, the energy stored in the food source is passed to them.
Benchmark Clarifications	Students will describe or explain how energy is transferred from the Sun through a food chain. Students will explain that plants make their own food using carbon dioxide, water, and energy from the Sun. Students will explain that animals obtain energy from the plants and/or animals they eat.
Content Limits	Items assessing the flow of energy from the Sun through a food chain are limited to the direction of energy flow. Items will not address or assess the amounts of energy flowing through the food chain or the efficiency of the energy transfers. Items will not address or assess cellular respiration or any other cellular process. Items will not address or assess decomposers. Items will not address or assess food webs, trophic levels, or energy pyramids. Items will not assess more than five components (links) in a food chain.
Stimulus Attributes	Scenarios addressing food chains may, but are not required to, include the Sun. Scenarios referring to consumers may use the terms *carnivore*, *herbivore*, and *omnivore*.
Response Attributes	None specified
Prior Knowledge	Items may require the student to apply science knowledge described in the NGSSS from lower grades. This benchmark requires prerequisite knowledge from SC.1.L.17.1.

Sample Item 25 SC.4.L.17.3

The Sun provides the energy to be used by the living things in the lagoon food chain shown below.



not to scale

Which of the following describes the transfer of energy from a producer to a consumer?

A. from Kingfisher to Perch
B. from Perch to Brine Shrimp
C. from Green Algae to the Sun
★ **D.** from Green Algae to Brine Shrimp

Appendix A: Directions for Item Review and FCAT 2.0 Science Item Rating Form

Directions: A series of questions is presented below. These questions are designed to assist you with your evaluation of the quality of the FCAT 2.0 test items you will be reviewing. The table on the next page is an example of the one you will use to record your rating of each test item. Review each test item independently before discussing the items with other committee members. If you identify any problem with the item during independent review, you should put a crossmark (✘) in the appropriate column. Crossmarks (✘) will indicate a problem area, and blank spaces or checks (✓) will indicate that no problem is identified.

Questions for Individual Test Items—Record your answers on your rating sheet.

1. Does the test item assess the knowledge required by the benchmark?
2. Does the content of the test item adhere to the content limits described in the *FCAT 2.0 Science Item Specifications*?
3. Are the context and language of the test item appropriate for the grade level?
4. What is the cognitive complexity of the test item for students who have mastered the benchmark at the intended grade level? Is the item best categorized as high complexity (**H**), moderate complexity (**M**), or low complexity (**L**)?
5. Is the item clearly worded and dependent on the content (does the item flow cognitively)? If the item has art, does it enhance the item? Is the art scientifically accurate and appropriate? Is the answer free of klang? (Is the answer clued in the context?)
6. Is the assigned content focus appropriate for this item? If not, is there a better or more appropriate content focus?
7. Is there only one correct answer? Record the letter of the correct answer on the rating sheet.
8. Are the options appropriate, plausible, and parallel (both grammatically and conceptually) to the correct response and appropriate for the question asked?
9. Is the item scientifically accurate?
10. Rate the overall quality of the item using these rating definition codes:

Overall Quality	
A (Accept)	**AR** (Accept as Revised)
RR (Revise and Resubmit)	**D** (Delete)

11. Do you have any additional comments? If so, record your comments on your rating sheet in the additional comments area.

FCAT 2.0 Science Item Rating Form

Signature Date _____ _____	Students in my (classroom, school, district) [circle one] are given the opportunity to learn the (Grade 5, Grade 8) [circle one] material that these items test, except as noted in my comments.

Page Number	Florida ID	Measures Benchmark	Adheres to Content Limits	Is Grade Appropriate	Appropriate Cognitive Complexity (L, M, H)	Is Clear and Free of Klang	Appropriate Content Focus	Only One Correct Answer (MC items)	Appropriate MC Options	Is Scientifically Accurate	Overall Rating A/AR/RR/D	Additional Comments

Directions for Item Review of Context-Dependent Sets

Directions: A series of questions is presented below. These questions are designed to assist you with your evaluation of the quality of the FCAT 2.0 test items you will be reviewing. The table on page A–5 is an example of the one you will use to record your rating of each context-dependent-set test item. Review each test item independently before discussing the items with other committee members. If you identify any problem with the item during independent review, you should put a crossmark (✘) in the appropriate column. Crossmarks (✘) will indicate a problem area, and blank spaces or checks (✓) will indicate that no problem is identified.

Questions for Context-Dependent Item Sets—Record your answers on the rating sheet.
Review the main context of the item set.

1. Is the context grade-level appropriate in content and language?
2. Is the main context free of klang or does it clue test items?
3. Is the context scientifically accurate?
4. Rate the overall quality of the context using these rating definition codes:

Overall Quality	
A (Accept)	**AR** (Accept as Revised)
RR (Revise and Resubmit)	**D** (Delete)

Read each item in the set.

5. Does the test item assess the knowledge required by the benchmark?
6. Does the content of the test item adhere to the content limits described in the *FCAT 2.0 Science Item Specifications?*
7. Is the item dependent on or directly related to the main context?
8. Are the context and language of the test item appropriate for this grade level?
9. What is the cognitive complexity of the test item for students who have attained the benchmark at the grade level assessed? Is the item best categorized as high complexity (**H**), moderate complexity (**M**), or low complexity (**L**)?
10. Is the answer free of klang? (Does it answer or clue other items in the set or does the main context clue an item?)
11. Is the assigned content focus appropriate for this item? If not, is there a better or more appropriate content focus?
12. Is there only one correct answer? Record the letter of the correct answer on the rating sheet.
13. Are the options appropriate, plausible, and parallel (both grammatically and conceptually) to the correct response and appropriate for the question asked?

14. Is the item scientifically accurate?
15. Rate the overall quality of the item using these rating definition codes:

Overall Quality	
A (Accept)	**AR** (Accept as Revised)
RR (Revise and Resubmit)	**D** (Delete)

16. Do you have any additional comments? If so, record your comments on your rating sheet in the additional comments area.

FCAT 2.0 Science Item Rating Form

Signature Date _____ _____	Students in my (classroom, school, district) [circle one] are given the opportunity to learn the (Grade 5, Grade 8) [circle one] material that these items test, except as noted in my comments.

Context-Dependent Set: Main Context

Page Number	Context Code	Is Grade Appropriate	Is Clear and Free of Klang	Is Scientifically Accurate	Overall Rating A/AR/RR/D	Additional Comments

Context-Dependent Set: Items

Page Number	Florida ID	Measures Benchmark	Adheres to Content Limits	Is Dependent or Related	Is Grade Appropriate	Appropriate Cognitive Complexity (L, M, H)	Is Clear and Free of Klang	Appropriate Content Focus	Only One Correct Answer (MC items)	Appropriate MC Options	Is Scientifically Accurate	Overall Rating A/AR/RR/D	Additional Comments

Appendix B: Science Content Assessed by Grade 5 FCAT 2.0 Science

Big Idea 1 The Practice of Science		
Grade 3 Benchmark	**Grade 4 Benchmark**	**Grade 5 Benchmark**
SC.3.N.1.1 Raise questions about the natural world, investigate them individually and in teams through free exploration and systematic investigations, and generate appropriate explanations based on those explorations. Assessed as SC.5.N.1.1.	**SC.4.N.1.1** Raise questions about the natural world, use appropriate reference materials that support understanding to obtain information (identifying the source), conduct both individual and team investigations through free exploration and systematic investigations, and generate appropriate explanations based on those explorations. Assessed as SC.5.N.1.1.	**SC.5.N.1.1** Define a problem, use appropriate reference materials to support scientific understanding, plan and carry out scientific investigations of various types such as: systematic observations, experiments requiring the identification of variables, collecting and organizing data, interpreting data in charts, tables, and graphics, analyze information, make predictions, and defend conclusions. Also assesses SC.3.N.1.1, SC.4.N.1.1, SC.4.N.1.6, SC.5.N.1.2, and SC.5.N.1.4. **AA** **MC**
SC.3.N.1.2 Compare the observations made by different groups using the same tools and seek reasons to explain the differences across groups. Assessed as SC.5.N.2.2.	**SC.4.N.1.2** Compare the observations made by different groups using multiple tools and seek reasons to explain the differences across groups. Assessed as SC.5.N.2.2.	**SC.5.N.1.2** Explain the difference between an experiment and other types of scientific investigation. Assessed as SC.5.N.1.1.
SC.3.N.1.3 Keep records as appropriate, such as pictorial, written, or simple charts and graphs, of investigations conducted. Not Assessed.	**SC.4.N.1.3** Explain that science does not always follow a rigidly defined method ("the scientific method") but that science does involve the use of observations and empirical evidence. Assessed as SC.5.N.2.1.	**SC.5.N.1.3** Recognize and explain the need for repeated experimental trials. Assessed as SC.5.N.2.2.

AA = annually assessed benchmark
MC = multiple choice

Standards marked as *Not Assessed* are more appropriately assessed through classroom instruction.

Appendix B: Science Content Assessed by Grade 5 FCAT 2.0 Science

Big Idea 1 The Practice of Science		
Grade 3 Benchmark	**Grade 4 Benchmark**	**Grade 5 Benchmark**
SC.3.N.1.4 Recognize the importance of communication among scientists. Not assessed.	**SC.4.N.1.4** Attempt reasonable answers to scientific questions and cite evidence in support. Not assessed.	**SC.5.N.1.4** Identify a control group and explain its importance in an experiment. Assessed as SC.5.N.1.1.
SC.3.N.1.5 Recognize that scientists question, discuss, and check each others' evidence and explanations. Assessed as SC.5.N.2.2.	**SC.4.N.1.5** Compare the methods and results of investigations done by other classmates. Assessed as SC.5.N.2.2.	**SC.5.N.1.5** Recognize and explain that authentic scientific investigation frequently does not parallel the steps of "the scientific method." Assessed as SC.5.N.2.1.
SC.3.N.1.6 Infer based on observation. Not assessed.	**SC.4.N.1.6** Keep records that describe observations made, carefully distinguishing actual observations from ideas and inferences about the observations. Assessed as SC.5.N.1.1.	**SC.5.N.1.6** Recognize and explain the difference between personal opinion/ interpretation and verified observation. Assessed as SC.5.N.2.1.
SC.3.N.1.7 Explain that empirical evidence is information, such as observations or measurements, that is used to help validate explanations of natural phenomena. Assessed as SC.5.N.2.1.	**SC.4.N.1.7** Recognize and explain that scientists base their explanations on evidence. Assessed as SC.5.N.2.1.	
	SC.4.N.1.8 Recognize that science involves creativity in designing experiments. Not assessed.	

AA = annually assessed benchmark
MC = multiple choice

Standards marked as *Not Assessed* are more appropriately assessed through classroom instruction.

Appendix B: Science Content Assessed by Grade 5 FCAT 2.0 Science

Big Idea 2 The Characteristics of Scientific Knowledge		
Grade 3 Benchmark	**Grade 4 Benchmark**	**Grade 5 Benchmark**
	SC.4.N.2.1 Explain that science focuses solely on the natural world. Not assessed.	**SC.5.N.2.1** Recognize and explain that science is grounded in empirical observations that are testable; explanation must always be linked with evidence. Also assesses SC.3.N.1.7, SC.4.N.1.3, SC.4.N.1.7, SC.5.N.1.5, and SC.5.N.1.6. **AA** **MC**
		SC.5.N.2.2 Recognize and explain that when scientific investigations are carried out, the evidence produced by those investigations should be replicable by others. Also assesses SC.3.N.1.2, SC.3.N.1.5, SC.4.N.1.2, SC.4.N.1.5, and SC.5.N.1.3. **AA** **MC**
Big Idea 3 The Role of Theories, Laws, Hypotheses, and Models		
Grade 3 Benchmark	**Grade 4 Benchmark**	**Grade 5 Benchmark**
SC.3.N.3.1 Recognize that words in science can have different or more specific meanings than their use in everyday language; for example, energy, cell, heat/cold, and evidence. Not assessed.	**SC.4.N.3.1** Explain that models can be three dimensional, two dimensional, an explanation in your mind, or a computer model. Not assessed.	
SC.3.N.3.2 Recognize that scientists use models to help understand and explain how things work. Not assessed.		

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MC = multiple choice

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Appendix B: Science Content Assessed by Grade 5 FCAT 2.0 Science

Big Idea 3 The Role of Theories, Laws, Hypotheses, and Models		
Grade 3 Benchmark	**Grade 4 Benchmark**	**Grade 5 Benchmark**
SC.3.N.3.3 Recognize that all models are approximations of natural phenomena; as such, they do not perfectly account for all observations. Not assessed.		
Big Idea 4		
Grade 3 Benchmark	**Grade 4 Benchmark**	**Grade 5 Benchmark**
Big Idea 5 Earth in Space and Time		
Grade 3 Benchmark	**Grade 4 Benchmark**	**Grade 5 Benchmark**
SC.3.E.5.1 Explain that stars can be different; some are smaller, some are larger, and some appear brighter than others; all except the Sun are so far away that they look like points of light. Assessed as SC.5.E.5.1.	**SC.4.E.5.1** Observe that the patterns of stars in the sky stay the same although they appear to shift across the sky nightly, and different stars can be seen in different seasons. Assessed as SC.4.E.5.4.	**SC.5.E.5.1** Recognize that a galaxy consists of gas, dust, and many stars, including any objects orbiting the stars. Identify our home galaxy as the Milky Way. Also assesses SC.3.E.5.1, SC.3.E.5.2, and SC.3.E.5.3. **AA** **MC**
SC.3.E.5.2 Identify the Sun as a star that emits energy; some of it in the form of light. Assessed as SC.5.E.5.1.	**SC.4.E.5.2** Describe the changes in the observable shape of the moon over the course of about a month. Assessed as SC.4.E.5.4.	**SC.5.E.5.2** Recognize the major common characteristics of all planets and compare/contrast the properties of inner and outer planets. Assessed as SC.5.E.5.3.

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Appendix B: Science Content Assessed by Grade 5 FCAT 2.0 Science

Big Idea 5 Earth in Space and Time		
Grade 3 Benchmark	**Grade 4 Benchmark**	**Grade 5 Benchmark**
SC.3.E.5.3 Recognize that the Sun appears large and bright because it is the closest star to Earth. Assessed as SC.5.E.5.1.	**SC.4.E.5.3** Recognize that Earth revolves around the Sun in a year and rotates on its axis in a 24-hour day. Assessed as SC.4.E.5.4.	**SC.5.E.5.3** Distinguish among the following objects of the Solar System – Sun, planets, moons, asteroids, comets – and identify Earth's position in it. Also assesses SC.5.E.5.2. **AA** **MC**
SC.3.E.5.4 Explore the Law of Gravity by demonstrating that gravity is a force that can be overcome. Assessed as SC.5.P.13.1.	**SC.4.E.5.4** Relate that the rotation of Earth (day and night) and apparent movements of the Sun, Moon, and stars are connected. Also assesses SC.4.E.5.1, SC.4.E.5.2, and SC.4.E.5.3. **AA** **MC**	
SC.3.E.5.5 Investigate that the number of stars that can be seen through telescopes is dramatically greater than those seen by the unaided eye. Not assessed.	**SC.4.E.5.5** Investigate and report the effects of space research and exploration on the economy and culture of Florida. Not assessed.	

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Appendix B: Science Content Assessed by Grade 5 FCAT 2.0 Science

Big Idea 6 Earth Structures		
Grade 3 Benchmark	**Grade 4 Benchmark**	**Grade 5 Benchmark**
SC.3.E.6.1 Demonstrate that radiant energy from the Sun can heat objects and when the Sun is not present, heat may be lost. Assessed as SC.5.P.10.4.	**SC.4.E.6.1** Identify the three categories of rocks: igneous, (formed from molten rock); sedimentary (pieces of other rocks and fossilized organisms); and metamorphic (formed from heat and pressure). Assessed as SC.4.E.6.2.	
	SC.4.E.6.2 Identify the physical properties of common earth-forming minerals, including hardness, color, luster, cleavage, and streak color, and recognize the role of minerals in the formation of rocks. Also assesses SC.4.E.6.1. **AA** **MC**	
	SC.4.E.6.3 Recognize that humans need resources found on Earth and that these are either renewable or nonrenewable. Also assesses SC.4.E.6.6. **AA** **MC**	
	SC.4.E.6.4 Describe the basic differences between physical weathering (breaking down of rock by wind, water, ice, temperature change, and plants) and erosion (movement of rock by gravity, wind, water, and ice). **AA** **MC**	

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Appendix B: Science Content Assessed by Grade 5 FCAT 2.0 Science

Big Idea 6 Earth Structures		
Grade 3 Benchmark	**Grade 4 Benchmark**	**Grade 5 Benchmark**
	SC.4.E.6.5 Investigate how technology and tools help to extend the ability of humans to observe very small things and very large things. Not assessed.	
	SC.4.E.6.6 Identify resources available in Florida (water, phosphate, oil, limestone, silicon, wind, and solar energy). Assessed as SC.4.E.6.3.	
Big Idea 7 Earth Systems and Patterns		
Grade 3 Benchmark	**Grade 4 Benchmark**	**Grade 5 Benchmark**
		SC.5.E.7.1 Create a model to explain the parts of the water cycle. Water can be a gas, a liquid, or a solid and can go back and for th from one state to another. Also assesses SC.5.E.7.2. **AA** **MC**
		SC.5.E.7.2 Recognize that the ocean is an integral part of the water cycle and is connected to all of Earth's water reservoirs via evaporation and precipitation processes. Assessed as SC.5.E.7.1.

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Appendix B: Science Content Assessed by Grade 5 FCAT 2.0 Science

Big Idea 7 Earth Systems and Patterns		
Grade 3 Benchmark	**Grade 4 Benchmark**	**Grade 5 Benchmark**
		SC.5.E.7.3 Recognize how air temperature, barometric pressure, humidity, wind speed and direction, and precipitation determine the weather in a particular place and time. Also assesses SC.5.E.7.4, SC.5.E.7.5, and SC.5.E.7.6. **AA** **MC**
		SC.5.E.7.4 Distinguish among the various forms of precipitation (rain, snow, sleet, and hail), making connections to the weather in a particular place and time. Assessed as SC.5.E.7.3.
		SC.5.E.7.5 Recognize that some of the weather-related differences, such as temperature and humidity, are found among different environments, such as swamps, deserts, and mountains. Assessed as SC.5.E.7.3.
		SC.5.E.7.6 Describe characteristics (temperature and precipitation) of different climate zones as they relate to latitude, elevation, and proximity to bodies of water. Assessed as SC.5.E.7.3.

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Appendix B: Science Content Assessed by Grade 5 FCAT 2.0 Science

Big Idea 7 Earth Systems and Patterns		
Grade 3 Benchmark	**Grade 4 Benchmark**	**Grade 5 Benchmark**
		SC.5.E.7.7 Design a family preparedness plan for natural disasters and identify the reasons for having such a plan. Not assessed.
Big Idea 8 Properties of Matter		
Grade 3 Benchmark	**Grade 4 Benchmark**	**Grade 5 Benchmark**
SC.3.P.8.1 Measure and compare temperatures of various samples of solids and liquids. Assessed as SC.5.P.8.1.	**SC.4.P.8.1** Measure and compare objects and materials based on their physical properties including: mass, shape, volume, color, hardness, texture, odor, taste, attraction to magnets. Assessed as SC.5.P.8.1.	**SC.5.P.8.1** Compare and contrast the basic properties of solids, liquids, and gases, such as mass, volume, color, texture, and temperature. Also assesses SC.3.P.8.1, SC.3.P.8.2, SC.3.P.8.3, and SC.4.P.8.1. **AA** **MC**
SC.3.P.8.2 Measure and compare the mass and volume of solids and liquids. Assessed as SC.5.P.8.1.	**SC.4.P.8.2** Identify properties and common uses of water in each of its states. Not assessed.	**SC.5.P.8.2** Investigate and identify materials that will dissolve in water and those that will not and identify the conditions that will speed up or slow down the dissolving process. Assessed as SC.5.P.8.3.

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Appendix B: Science Content Assessed by Grade 5 FCAT 2.0 Science

Big Idea 8 Properties of Matter		
Grade 3 Benchmark	**Grade 4 Benchmark**	**Grade 5 Benchmark**
SC.3.P.8.3 Compare materials and objects according to properties such as size, shape, color, texture, and hardness. Assessed as SC.5.P.8.1.	**SC.4.P.8.3** Explore the Law of Conservation of Mass by demonstrating that the mass of a whole object is always the same as the sum of the masses of its parts. Not assessed.	**SC.5.P.8.3** Demonstrate and explain that mixtures of solids can be separated based on observable properties of their parts such as particle size, shape, color, and magnetic attraction. Also assesses SC.5.P.8.2. **AA** **MC**
	SC.4.P.8.4 Investigate and describe that magnets can attract magnetic materials and attract and repel other magnets. Assessed as SC.5.P.13.1.	**SC.5.P.8.4** Explore the scientific theory of atoms (also called atomic theory) by recognizing that all matter is composed of parts that are too small to be seen without magnification. Not assessed.
Big Idea 9 Changes in Matter		
Grade 3 Benchmark	**Grade 4 Benchmark**	**Grade 5 Benchmark**
SC.3.P.9.1 Describe the changes water undergoes when it changes state through heating and cooling by using familiar scientific terms such as melting, freezing, boiling, evaporation, and condensation. Assessed as SC.5.P.9.1.	**SC.4.P.9.1** Identify some familiar changes in materials that result in other materials with different characteristics, such as decaying animal or plant matter, burning, rusting, and cooking. Assessed as SC.5.P.9.1.	**SC.5.P.9.1** Investigate and describe that many physical and chemical changes are affected by temperature. Also assesses SC.3.P.9.1 and SC.4.P.9.1. **AA** **MC**

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Appendix B: Science Content Assessed by Grade 5 FCAT 2.0 Science

Big Idea 10 Forms of Energy		
Grade 3 Benchmark	**Grade 4 Benchmark**	**Grade 5 Benchmark**
SC.3.P.10.1 Identify some basic forms of energy such as light, heat, sound, electrical, and mechanical. Assessed as SC.5.P.10.1.	**SC.4.P.10.1** Observe and describe some basic forms of energy, including light, heat, sound, electrical, and the energy of motion. Assessed as SC.5.P.10.1.	**SC.5.P.10.1** Investigate and describe some basic forms of energy, including light, heat, sound, electrical, chemical, and mechanical. Also assesses SC.3.P.10.1, SC.3.P.10.3, SC.3.P.10.4, SC.3.P.11.1, SC.3.P.11.2, SC.4.P.10.1, and SC.4.P.10.3. **AA** **MC**
SC.3.P.10.2 Recognize that energy has the ability to cause motion or create change. Assessed as SC.5.P.10.2.	**SC.4.P.10.2** Investigate and describe that energy has the ability to cause motion or create change. Assessed as SC.5.P.10.2.	**SC.5.P.10.2** Investigate and explain that energy has the ability to cause motion or create change. Also assesses SC.3.P.10.2, SC.4.P.10.2, and SC.4.P.10.4. **AA** **MC**
SC.3.P.10.3 Demonstrate that light travels in a straight line until it strikes an object or travels from one medium to another. Assessed as SC.5.P.10.1.	**SC.4.P.10.3** Investigate and explain that sound is produced by vibrating objects and that pitch depends on how fast or slow the object vibrates. Assessed as SC.5.P.10.1.	**SC.5.P.10.3** Investigate and explain that an electrically-charged object can attract an uncharged object and can either attract or repel another charged object without any contact between the objects. Assessed as SC.5.P.10.4.

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Big Idea 10 Forms of Energy		
Grade 3 Benchmark	**Grade 4 Benchmark**	**Grade 5 Benchmark**
SC.3.P.10.4 Demonstrate that light can be reflected, refracted, and absorbed. Assessed as SC.5.P.10.1.	**SC.4.P.10.4** Describe how moving water and air are sources of energy and can be used to move things. Assessed as SC.5.P.10.2.	**SC.5.P.10.4** Investigate and explain that electrical energy can be transformed into heat, light, and sound energy, as well as the energy of motion. Also assesses SC.3.E.6.1, SC.4.P.11.1, SC.4.P.11.2, SC.5.P.10.3, SC.5.P.11.1, and SC.5.P.11.2. **AA** **MC**
Big Idea 11 Energy Transfer and Transformations		
Grade 3 Benchmark	**Grade 4 Benchmark**	**Grade 5 Benchmark**
SC.3.P.11.1 Investigate, observe, and explain that things that give off light often also give off heat. Assessed as SC.5.P.10.1.	**SC.4.P.11.1** Recognize that heat flows from a hot object to a cold object and that heat flow may cause materials to change temperature. Assessed as SC.5.P.10.4.	**SC.5.P.11.1** Investigate and illustrate the fact that the flow of electricity requires a closed circuit (a complete loop). Assessed as SC.5.P.10.4.
SC.3.P.11.2 Investigate, observe, and explain that heat is produced when one object rubs against another, such as rubbing one's hands together. Assessed as SC.5.P.10.1.	**SC.4.P.11.2** Identify common materials that conduct heat well or poorly. Assessed as SC.5.P.10.4.	**SC.5.P.11.2** Identify and classify materials that conduct electricity and materials that do not. Assessed as SC.5.P.10.4.
Big Idea 12 Motion of Objects		
Grade 3 Benchmark	**Grade 4 Benchmark**	**Grade 5 Benchmark**
	SC.4.P.12.1 Recognize that an object in motion always changes its position and may change its direction. Assessed as SC.5.P.13.2.	

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Big Idea 12 Motion of Objects		
Grade 3 Benchmark	**Grade 4 Benchmark**	**Grade 5 Benchmark**
	SC.4.P.12.2 Investigate and describe that the speed of an object is deter mined by the distance it travels in a unit of time and that objects can move at different speeds. Assessed as SC.5.P.13.2.	
Big Idea 13 Forces and Changes in Motion		
Grade 3 Benchmark	**Grade 4 Benchmark**	**Grade 5 Benchmark**
		SC.5.P.13.1 Identify familiar forces that cause objects to move, such as pushes or pulls, including gravity acting on falling objects. Also assesses SC.3.E.5.4 and SC.4.P.8.4. **AA** **MC**
		SC.5.P.13.2 Investigate and describe that the greater the force applied to it, the g reater the change in motion of a gi ven object. Also assesses SC.4.P.12.1, SC.4.P.12.2, SC.5.P.13.3, and SC.5.P.13.4. **AA** **MC**
		SC.5.P.13.3 Investigate and describe that the more mass an object has, the less ef fect a given force will have on the object's motion. Assessed as SC.5.P.13.2.

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Appendix B: Science Content Assessed by Grade 5 FCAT 2.0 Science

Big Idea 13 Forces and Changes in Motion		
Grade 3 Benchmark	**Grade 4 Benchmark**	**Grade 5 Benchmark**
		SC.5.P.13.4 Investigate and explain that when a force is applied to an object but it does not move, it is because another opposing force is being applied by something in the environment so that the forces are balanced. Assessed as SC.5.P.13.2.
Big Idea 14 Organization and Development of Living Organisms		
Grade 3 Benchmark	**Grade 4 Benchmark**	**Grade 5 Benchmark**
SC.3.L.14.1 Describe structures in plants and their roles in food production, support, water and nutrient transport, and reproduction. Also assesses SC.3.L.14.2 and SC.4.L.16.1. **AA** **MC**		**SC.5.L.14.1** Identify the organs in the human body and describe their functions, including the skin, brain, heart, lungs, stomach, liver, intestines, pancreas, muscles and skeleton, reproductive organs, kidneys, bladder, and sensory organs. **AA** **MC**
SC.3.L.14.2 Investigate and describe how plants respond to stimuli (heat, light, gravity), such as the way plant stems grow toward light and their roots grow downward in response to gravity. Assessed as SC.3.L.14.1.		**SC.5.L.14.2** Compare and contrast the function of organs and other physical structures of plants and animals, including humans, for example: some animals have skeletons for support — some with internal skeletons others with exoskeletons — while some plants have stems for support. Also assesses SC.3.L.15.1 and SC.3.L.15.2. **AA** **MC**

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Appendix B: Science Content Assessed by Grade 5 FCAT 2.0 Science

Big Idea 15 Diversity and Evolution of Living Organisms		
Grade 3 Benchmark	**Grade 4 Benchmark**	**Grade 5 Benchmark**
SC.3.L.15.1 Classify animals into major groups (mammals, birds, reptiles, amphibians, fish, arthropods, vertebrates and invertebrates, those having live births and those which lay eggs) according to their physical characteristics and behaviors. Assessed as SC.5.L.14.2.		**SC.5.L.15.1** Describe how, when the environment changes, differences between individuals allow some plants and animals to survive and reproduce while others die or move to new locations. Assessed as SC.5.L.17.1.
SC.3.L.15.2 Classify flowering and nonflowering plants into major groups such as those that produce seeds, or those like ferns and mosses that produce spores, according to their physical characteristics. Assessed as SC.5.L.14.2.		
Big Idea 16 Heredity and Reproduction		
Grade 3 Benchmark	**Grade 4 Benchmark**	**Grade 5 Benchmark**
	SC.4.L.16.1 Identify processes of sexual reproduction in flowering plants, including pollination, fertilization (seed production), seed dispersal, and germination. Assessed as SC.3.L.14.1.	
	SC.4.L.16.2 Explain that although characteristics of plants and animals are inherited, some characteristics can be affected by the environment. Assessed as SC.5.L.17.1.	

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Appendix B: Science Content Assessed by Grade 5 FCAT 2.0 Science

Big Idea 16 Heredity and Reproduction		
Grade 3 Benchmark	**Grade 4 Benchmark**	**Grade 5 Benchmark**
	SC.4.L.16.3 Recognize that animal behaviors may be shaped by heredity and learning. Assessed as SC.5.L.17.1.	
	SC.4.L.16.4 Compare and contrast the major stages in the life cycles of Florida plants and animals, such as those that undergo incomplete and complete metamorphosis, and flowering and nonflowering seed-bearing plants. **AA** **MC**	
Big Idea 17 Interdependence		
Grade 3 Benchmark	**Grade 4 Benchmark**	**Grade 5 Benchmark**
SC.3.L.17.1 Describe how animals and plants respond to changing seasons. Assessed as SC.5.L.17.1.	**SC.4.L.17.1** Compare the seasonal changes in Florida plants and animals to those in other regions of the country. Assessed as SC.5.L.17.1.	**SC.5.L.17.1** Compare and contrast adaptations displayed by animals and plants that enable them to survive in different environments such as life cycles variations, animal behaviors and physical characteristics. Also assesses SC.3.L.17.1, SC.4.L.16.2, SC.4.L.16.3, SC.4.L.17.1, SC.4.L.17.4, and SC.5.L.15.1. **AA** **MC**

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Big Idea 17 Interdependence		
Grade 3 Benchmark	**Grade 4 Benchmark**	**Grade 5 Benchmark**
SC.3.L.17.2 Recognize that plants use energy from the Sun, air, and water to make their own food. Assessed as SC.4.L.17.3.	**SC.4.L.17.2** Explain that animals, including humans, cannot make their own food and that when animals eat plants or other animals, the energy stored in the food source is passed to them. Assessed as SC.4.L.17.3.	
	SC.4.L.17.3 Trace the flow of energy from the Sun as it is transferred along the food chain through the producers to the consumers. Also assesses SC.3.L.17.2 and SC.4.L.17.2. **AA** **MC**	
	SC.4.L.17.4 Recognize ways plants and animals, including humans, can impact the environment. Assessed as SC.5.L.17.1.	
Big Idea 18		
Grade 3 Benchmark	**Grade 4 Benchmark**	**Grade 5 Benchmark**

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Appendix C: FCAT 2.0 Science Item Writer Glossary Grade 5

The following glossary is a reference list provided for the item writers and is **not** intended to comprise a comprehensive vocabulary list for students. The definitions are not intended to provide a thorough scientific definition of the terms. Some definitions are limited by the extent of knowledge intended for the grade level. The terms and definitions in this glossary are specific to the Florida NGSSS in science for Grades 3 through 5 and the content assessed on FCAT 2.0 Science.

Absorb—To take up and store energy without reflecting or transmitting that energy.

Adaptation—A characteristic of an organism that increases its chances of survival in its environment.

Analyze—To examine methodically by separating into parts and studying their interrelatedness.

Asteroid—An object that is found in the solar system, orbits the Sun, and is much smaller than a planet.

Attraction—A term used to describe the magnetic force exerted by oppositely charged objects or to describe the gravitational force that pulls objects toward each other.

Balanced forces—Forces that are equal in size but opposite in direction. See also force and unbalanced forces.

Behavior—A plant or animal action, reaction, or activity that occurs in response to stimuli (e.g., gravity, light, temperature).

Carnivore—An animal that obtains nutrients from eating other animals.

Characteristic—A feature, quality, property, or trait of an object or organism.

Chemical change—Process by which substances are changed into different substances with different properties.

Classify—To arrange in a specific order or group by categories based on similarities.

Cleavage—A property used to describe how easily a mineral breaks apart along smooth surfaces.

Climate—The average pattern of weather that occurs in a certain location over many years.

Comet—An object made of rock, ice, dust, and gas that revolves around the Sun.

Appendix C: FCAT 2.0 Science Item Writer Glossary Grade 5

Community—Populations of different species of organisms living together in the same geographic area.

Complete metamorphosis—Type of insect development characterized by the presence of a larval stage with different feeding habits.

Conclusion—A statement that tells what an investigation showed, based on observations and data.

Condensation—The process by which water is changed from a gas (water vapor) to a liquid; a stage of the water cycle.

Conduct—To transmit heat or electricity through a medium.

Consumer—An organism in a food chain that obtains nutrients from producers or other consumers; consumers may be herbivores or carnivores.

Control group—A group in a scientific experiment that serves as a reference for comparison to the experimental group; a group that is untreated by the factor being tested.

Data—Measurements or observations collected and recorded in an experiment or investigation.

Ecosystem—All the living and nonliving things that interact with each other in an environment.

Endangered species—A species whose population is so small that it is in danger of extinction.

Environment—An area that includes all living organisms and the surrounding physical features such as air, water, soil, weather, and landforms.

Erosion—The process by which rock, soil, and other weathered earth materials are moved from one place to another.

Evaporation—The process by which water is changed from a liquid to a gas (water vapor); a stage of the water cycle.

Experiment—A scientific test or procedure that is carried out under controlled conditions to answer a scientific question.

Extinct species—A species that no longer exists.

Fertilization—The process by which the female reproductive cell (egg) is united with the male reproductive cell (sperm or pollen).

Appendix C: FCAT 2.0 Science Item Writer Glossary Grade 5

Food chain—A diagram representing the transfer of energy from the Sun through producers and a series of consumers.

Force—A push or a pull that one object exerts on another object with or without direct contact (e.g., friction, gravity). See also balanced forces and unbalanced forces.

Friction—A force that opposes motion through direct contact.

Germination—The process by which plants begin to grow from seed to spore or from seed to bud.

Hardness—A property of a mineral that describes how easily it can be scratched.

Hemisphere—Half of Earth (i.e., Northern, Southern, Eastern, Western).

Herbivore—An animal that obtains nutrients only from plants.

Humidity—A measure of the amount of water vapor in the air.

Igneous rock—A type of rock that forms from cooled magma or lava.

Incomplete metamorphosis—Type of insect development characterized by the similar appearance of pre-adults and adults.

Inference—An explanation based on evidence that is not directly observed.

Inherited trait—A trait or characteristic that is passed from parent to offspring.

Insulator—A material used to reduce or prevent the transfer of electricity, heat, or sound.

Invertebrate—An animal that lacks a backbone.

Investigation—An organized scientific study of the natural world that may include making systematic observations, asking questions, gathering information, analyzing data, summarizing results, drawing conclusions, and/or communicating results.

Larva—An early stage in the life cycle of an organism that will undergo complete metamorphosis.

Life cycle—The stages of an organism's growth and development.

Luster—A property of a mineral that describes how it appears when it reflects light.

Mass—The amount of matter a substance or object has.

Appendix C: FCAT 2.0 Science Item Writer Glossary Grade 5

Matter—Anything that takes up space and has mass.

Mechanical energy—A type of energy an object has due to its motion or position.

Metamorphic rock—A type of rock that is formed over time from existing rock due to extreme pressure and/or heat.

Mineral—A solid material formed in nature on or in Earth's crust with its own properties.

Moon—A natural object that orbits a planet.

Nutrient—A substance that an organism needs to survive and grow.

Nymph—A pre-adult insect undergoing incomplete metamorphosis.

Observation—Information about the natural world gathered through the senses and/or scientific instruments.

Omnivore—An organism that obtains nutrients from both plants and animals.

Organism—A living thing.

Ovary—The female reproductive organ that produces and contains egg cells.

Physical change—A type of change that involves the physical properties of a substance.

Pistil—The female reproductive structure of a flowering plant.

Pitch—The relative frequency (high or low) of a sound as perceived by a listener.

Planet—A large body in space that orbits a star and does not produce its own light.

Polar zone—A climate zone characterized by very little precipitation and extremely cold temperatures.

Pollen—The fine dustlike powder that contains the male reproductive cells of seed-bearing plants.

Pollinate—To transfer the pollen from the male reproductive structure to the female reproductive structure to fertilize flowering plants.

Population—All members of the same species living together at the same time in the same area.

Appendix C: FCAT 2.0 Science Item Writer Glossary Grade 5

Precipitation—A form of water (e.g., hail, rain, sleet, snow) that condenses in the atmosphere and falls to Earth's surface.

Predator—An organism that obtains nutrients from other organisms.

Predict—To state what one thinks will happen under certain conditions based on data or observation.

Prey—An organism that is hunted and/or eaten by another organism (predator).

Producer—An organism that produces its own food.

Pupa—A stage in the life cycle of an insect that occurs between larva and adult.

Reflect—To bounce light, sound, or heat off of a surface.

Repel—To force away or apart.

Reproduction—The process of making more organisms of the same kind.

Revolution—The motion of one object around another object.

Rotation—The turning of an object on its axis.

Sedimentary rock—A type of rock formed from layers of sediment.

Soil—The loose top layer of Earth's surface made of weathered rock and organic matter.

Solar system—A system of planets and other bodies that orbits a star.

Species—A group of the same kind of organisms that can mate and produce offspring that can reproduce.

Speed—The distance traveled by an object in a given amount of time.

Spore—A seedlike structure that produces a new plant (e.g., ferns or mosses).

Stamen—The male reproductive structure of a flowering plant.

Star—A large object in space that is made of gas and produces its own light.

State of matter—The form matter can take (e.g., solid, liquid, gas).

Streak—The color of the powder of a mineral when it is rubbed on a streak plate.

Appendix C: FCAT 2.0 Science Item Writer Glossary Grade 5

Technology—The use of scientific knowledge and processes to solve practical problems.

Temperate zone—A climate zone located between the tropics and the polar circles generally characterized by moderate temperatures rather than extremely hot or cold temperatures.

Testable (scientifically testable)—A term used to describe a question that can be answered through an experiment or observation.

Texture—A physical property of a solid used to describe its surface.

Trials—Multiple sets of measurements or observations in a scientific investigation.

Tropical zone—A climate zone near the equator characterized by warm temperatures.

Unbalanced forces—Forces that are unequal in size and may or may not be opposite in direction. See also balanced forces and force.

Valid—A term used to describe the certainty of data or results of an investigation or experiment.

Variable—An event, condition, or factor that can be changed or controlled in order to study or test a hypothesis in a scientific experiment.

Vertebrate—An animal that has a backbone.

Volume—The amount of space an object or substance occupies.

Water cycle—The continuous movement of water through the environment by evaporation, condensation, precipitation, and runoff.

Water vapor—The gas state of water.

Weather—The condition of the atmosphere at a given time and place.

Weathering—The process by which rocks and other surfaces are broken down.

Weight—A measure of the force of gravity on an object.

Appendix C: FCAT 2.0 Science Item Writer Glossary Grade 8

The following glossary is a reference list provided for the item writers and is **not** intended to comprise a comprehensive vocabulary list for students. The definitions are not intended to provide a thorough scientific definition of the terms. Some definitions are limited by the extent of knowledge intended for the grade level. The terms and definitions in this glossary are specific to the Florida NGSSS in science for Grades 6 through 8 and the content assessed on FCAT 2.0 Science. Knowledge of the terms in the Glossary for Grade 5 is assumed.

Acceleration—The rate at which velocity is changing. The change may involve an increase or decrease in speed and/or a change in direction. The change may be positive or negative.

Allele—Any of two or more alternate forms of a gene that an organism may have for a particular trait.

Amplitude—The maximum absolute variation of any periodic function (e.g., a wave).

Astronomical unit—A unit used to measure distances in the solar system equal to the average distance between the Sun and Earth, approximately 150 million kilometers, and abbreviated AU.

Autotroph—An organism that can produce food from inorganic materials (e.g., carbon dioxide, sunlight, water).

Binary fission—An asexual reproductive process in which a single cell divides into two cells.

Binomial nomenclature—A system used to name organisms using two words: the genus name and the species name.

Boiling point—The temperature at which a liquid changes to a gas. The boiling point of water at sea level is 100°C (212°F).

Budding—An asexual reproductive process in which an outgrowth of a parent organism detaches and forms a new individual of the same species.

Chemical properties—Characteristics of substances that describe their composition, reactivity, and how the substance changes into different substances.

Controlled variable—A factor or condition in a scientific experiment that is purposefully kept the same.

Dominant—The form of a trait that is expressed or shown when the combination of alleles for this trait is heterozygous.

Dwarf planet—A celestial body similar to a planet but orbiting in a zone that has many other objects in it (e.g., Ceres, Pluto).

Appendix C: FCAT 2.0 Science Item Writer Glossary Grade 8

Empirical evidence—Evidence based on observations or experiments rather than theory.

Eukaryote—An organism whose cells contain a nucleus surrounded by a membrane.

Evolution (scientific theory of evolution)—A cumulative change in the characteristics of organisms or populations over time from generation to generation.

F_1 generation—The first generation of offspring from the mating of parental organisms (P generation).

Fault—A crack in Earth's crust along which movement has occurred.

Fold—A bend in a layer or several layers of rock.

Heterogeneous—A type of mixture in which different parts can be easily distinguished.

Heterotroph—An organism that cannot produce its own food.

Heterozygous—A cell or organism that has two different alleles for a particular trait.

Homeostasis—The tendency of a cell, organism, or population to maintain internal stability.

Homogeneous—A type of mixture in which the different parts are blended evenly so that the mixture is the same throughout.

Homozygous—A type of cell or organism that has identical rather than different alleles for a particular trait.

Hypothesis—A statement that can be tested scientifically through experiments and/or other scientific investigations.

Infiltration—A process in which water soaks into the soil.

Kingdom—The highest Linnaean classification into which organisms are grouped; above phylum.

Law (scientific law)—A scientific principle based on many observations of naturally occurring events that demonstrate it to be without exception under certain stated conditions. See also theory.

Light-year—The distance a ray of light travels in a vacuum in one year.

Melting point—The temperature at which a solid changes to a liquid. The melting point of ice at sea level is 0°C (32°F).

Appendix C: FCAT 2.0 Science Item Writer Glossary Grade 8

Model (scientific model)—A replica or description designed to show the workings or structure of an object or system.

Molecule—The smallest unit of matter of a substance that retains all the physical and chemical properties of that substance; consists of a single atom or a group of atoms bonded together.

Nebula—A large cloudlike mass of gas and dust in space that may lead to the formation of a star.

Net force—The sum of all the forces acting on an object. When forces are balanced, the net force is zero and the object's motion will remain the same. When forces are unbalanced, the net force is nonzero and the object's motion will change.

Niche—The unique position occupied by a particular species in terms of the area it inhabits and the function it performs within the community.

Nucleus—The center region of an atom where protons and neutrons are located; also, the cell structure that contains a cell's genetic material.

Opaque—A term used to describe a material that absorbs and/or reflects light and does not allow light to pass through.

Outcome variable (dependent variable)—A factor, usually being measured or observed, that responds to, or depends on, another factor (test variable).

P generation—The parental generation in a genetic cross.

Percolation—The movement of water through rock or soil.

pH—A measure of the acidity or alkalinity of a solution based on a scale from zero to fourteen.

Pressure—The force exerted per unit area.

Prokaryote—An organism whose cells are characterized by the lack of a defined nucleus.

Recessive—The form of a trait that will be masked unless the organism is homozygous for this trait.

Regeneration—The growth of new tissues or organs to replace those lost or damaged by injury.

Repetition—Making multiple sets of measurements or observations in a scientific investigation.

Appendix C: FCAT 2.0 Science Item Writer Glossary Grade 8

Replication—The reproduction of a scientific investigation by another person to ensure accuracy.

Saturation—A condition of a solution whereby it has reached a maximum amount of solute under the given conditions.

Solute—A substance that is being dissolved by another substance.

Solvent—A substance that dissolves another substance.

Systematic observations—Observations obtained by following a preplanned method of observation.

Temperature—A measure of how hot or cold a substance is; a measure of the average kinetic energy of the particles of a substance.

Test variable (independent variable)—The variable manipulated by the experimenter in order to study changes in the outcome variable.

Theory (scientific theory)—An explanation for some naturally occurring event developed from extensive observations, experimentation, and reasoning. See also law.

Translucent—A term used to describe a material that cannot be clearly seen through but that allows some light to pass through it.

Transparent—A term used to describe a material that can be clearly seen through because it allows light waves to pass through in straight lines.

Appendix D: Periodic Table of the Elements
Grade 8 and Biology 1 EOC Assessment

Periodic Table of the Elements

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

Group	1 (1A)	2 (2A)	Transition Metals									13 (3A)	14 (4A)	15 (5A)	16 (6A)	17 (7A)	18 (8A)
Period 1	1 H Hydrogen 1.008																2 He Helium 4.003
Period 2	3 Li Lithium 6.941	4 Be Beryllium 9.012										5 B Boron 10.81	6 C Carbon 12.011	7 N Nitrogen 14.007	8 O Oxygen 15.999	9 F Fluorine 18.998	10 Ne Neon 20.180
Period 3	11 Na Sodium 22.990	12 Mg Magnesium 24.305	3 (3B)	4 (4B)	5 (5B)	6 (6B)	7 (7B)	8	9 (8B)	10	11 (1B)	12 (2B)	13 Al Aluminum 26.982	14 Si Silicon 28.086	15 P Phosphorus 30.974	16 S Sulfur 32.06	17 Cl Chlorine 35.453	18 Ar Argon 39.948
Period 4	19 K Potassium 39.098	20 Ca Calcium 40.078	21 Sc Scandium 44.956	22 Ti Titanium 47.88	23 V Vanadium 50.942	24 Cr Chromium 51.996	25 Mn Manganese 54.938	26 Fe Iron 55.847	27 Co Cobalt 58.933	28 Ni Nickel 58.693	29 Cu Copper 63.546	30 Zn Zinc 65.39	31 Ga Gallium 69.723	32 Ge Germanium 72.61	33 As Arsenic 74.922	34 Se Selenium 78.96	35 Br Bromine 79.904	36 Kr Krypton 83.80
Period 5	37 Rb Rubidium 85.468	38 Sr Strontium 87.62	39 Y Yttrium 88.906	40 Zr Zirconium 91.224	41 Nb Niobium 92.906	42 Mo Molybdenum 95.94	43 Tc Technetium 98	44 Ru Ruthenium 101.07	45 Rh Rhodium 102.906	46 Pd Palladium 106.42	47 Ag Silver 107.868	48 Cd Cadmium 112.411	49 In Indium 114.82	50 Sn Tin 118.710	51 Sb Antimony 121.757	52 Te Tellurium 127.60	53 I Iodine 126.905	54 Xe Xenon 131.29
Period 6	55 Cs Cesium 132.905	56 Ba Barium 137.327	57 La Lanthanum 138.905	72 Hf Hafnium 178.49	73 Ta Tantalum 180.948	74 W Tungsten 183.85	75 Re Rhenium 186.207	76 Os Osmium 190.2	77 Ir Iridium 192.22	78 Pt Platinum 195.08	79 Au Gold 196.967	80 Hg Mercury 200.59	81 Tl Thallium 204.383	82 Pb Lead 207.2	83 Bi Bismuth 208.980	84 Po Polonium 208.982	85 At Astatine 210	86 Rn Radon 222
Period 7	87 Fr Francium 223	88 Ra Radium 226.025	89 Ac Actinium 227.028	104 Rf Rutherfordium (261)	105 Db Dubnium (262)	106 Sg Seaborgium (263)	107 Bh Bohrium (264)	108 Hs Hassium (265)	109 Mt Meitnerium (268)									

Representative Elements

14 — Atomic number
Si — Symbol
Silicon — Name
28.086 — Average Atomic Mass

Metals ← → Nonmetals

Inner Transition Metals

Lanthanide series

58 Ce Cerium 140.12	59 Pr Praseodymium 140.908	60 Nd Neodymium 144.24	61 Pm Promethium 144.913	62 Sm Samarium 150.36	63 Eu Europium 151.96	64 Gd Gadolinium 157.25	65 Tb Terbium 158.925	66 Dy Dysprosium 162.50	67 Ho Holmium 164.930	68 Er Erbium 167.26	69 Tm Thulium 168.934	70 Yb Ytterbium 173.04	71 Lu Lutetium 174.967
90 Th Thorium 232.038	91 Pa Protactinium 231.036	92 U Uranium 238.029	93 Np Neptunium 237.048	94 Pu Plutonium 244.064	95 Am Americium 243.061	96 Cm Curium 247.070	97 Bk Berkelium 247.070	98 Cf Californium 251.080	99 Es Einsteinium 252.083	100 Fm Fermium 257.095	101 Md Mendelevium 258.099	102 No Nobelium 259.101	103 Lr Lawrencium 260.105

Actinide series

Appendix E: FCAT 2.0 Science and Biology 1 End-of-Course Assessment Test Design Summary

Length of Tests

This table provides an approximate range for the number of items on each test. These ranges include both the operational and field-test items.

Grade	Item Range
5	60–66
8	60–66
Biology 1	60–66

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