NGSSS
Science & Social Studies
Assessments

Biology 1
End-of-Course Assessment
Test Item Specifications
DRAFT

FLORIDA DEPARTMENT OF EDUCATION
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Introduction

The Next Generation Sunshine State Standards (NGSSS) for science were adopted by the Florida State Board of Education in February 2008 (available online at https://cpalms.org/public/search/Standard).

For grades 9–12, the NGSSS are divided into benchmarks that identify what a student should know and be able to do. This document, *Biology 1 End-of-Course Assessment Test Item Specifications, (Specifications)*, provides information about the benchmarks, the stimulus types, and the test items designed to assess the standards of the Biology 1 course description.

The Statewide Science Assessment measures achievement of grade 5 and grade 8 Florida students in science. The Biology 1 End-of-Course (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 the Biology 1 course description. The course description for Biology 1 is available online at https://cpalms.org/public/search/Course.

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 *Specifications* indicates the alignment of test items with the NGSSS. It also serves to provide all stakeholders with information about the format and function of the end-of-course assessments.

Scope of this Document

The *Specifications* for the Biology 1 EOC Assessment provides general guidelines for the development of all test items used in the Biology 1 EOC Assessment. Two additional *Specifications* documents provide similar information for Statewide Science Assessment grade 5 and Statewide Science Assessment grade 8.

The Overall Considerations section in this Introduction provides an explanation of the science concepts assessed by the test. The Criteria for Biology 1 End-of-Course Assessment 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, assessment 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 Biology 1 EOC Assessment.

Overall considerations are broad item-development issues that should be addressed during the development of test items. Sections of Criteria for Biology 1 End-of-Course Assessment Test Items relate more specifically to one aspect of the development (e.g., assessment 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. The individual specification and Appendix B indicate 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 course content experience and difficulty, cognitive development, and reading level. The reading level of the test items should be grade 9, except for science terms or concepts specifically addressed in the benchmarks.
4. Appendix C contains terms most likely to be included in Biology 1 EOC test items and is provided as a resource. Writers may also want to review terms associated with the Statewide Science Assessment. The item writer glossaries for grades 5 and 8 can be found in the *Statewide Science Assessment Test Item Specifications* at http://www.fldoe.org/accountability/assessments/k-12-student-assessment/science.stml. Knowledge of the terms in the grade 5 and grade 8 glossaries is assumed.
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 will not require the creation of a chart, graph, or table.
9. Biology 1 EOC Assessment items should not require use of a calculator.
10. 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.
11. Each test item should be written clearly and unambiguously to elicit the desired response.
12. 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.

13. Test items will not require memorization of the periodic table. A periodic table is provided to the student and is also found in Appendix F.
14. 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 Biology 1 students. Scenarios should be appropriate for students in terms of Biology 1 content 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. 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.
4. Item contexts and illustrations depicting individuals conducting laboratory investigations should include proper safety equipment and model safe laboratory procedures.
5. Scenarios describing scientific investigations should model current science methodology and adhere to the International Rules for Pre-college Science Research: Guidelines for Science and Engineering Fairs unless otherwise noted in the benchmark clarification statements. These rules and guidelines can be found using the link https://www.societyforscience.org/isef/international-rules/.
6. The item content should be timely and not likely to become dated.

Criteria for Biology 1 End-of-Course Assessment Test Items

All Biology 1 EOC Assessment items are in multiple-choice (MC) format. The general specifications on pages 4 through 17 cover the following criteria for the Biology 1 EOC Assessment:

- Use of Graphics
- Item Style and Format
- Scope of Test Items
- Guidelines for Item Writers
- Cognitive Complexity of Biology 1 EOC Assessment 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 shall be set in boldface with all caps and placed above or below the illustration or picture.
4. Whenever possible, the components of graphics should be labeled.

Item Style and Format

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

General Guidelines

1. The Biology 1 EOC Assessment is a computer-based assessment. All items written for this assessment should be designed and written primarily for use with a computer-based test.
2. Test items should be clear and concise, and they should use vocabulary and sentence structure appropriate for grade 9.
3. Whenever possible, test items should be written in active voice rather than in passive voice.
4. Scientific concepts should be appropriate to the content covered in the Biology 1 course description. Writers should refer to the Prior Knowledge information in the Individual Benchmark Specifications section, the instructional foundation for each benchmark grouping. The grades 6–8 benchmarks are found on pages 22–38.
5. Test items should have only one correct answer. The words *most likely* or *best* should only be used when appropriate to the question.
6. The final sentence of all test item stems must be expressed as a question.

7. The International System of Units (SI) should be used unless otherwise noted. Temperature should be given in degrees Celsius.
8. Test items requiring art should be to scale whenever possible. If needed for clarity, a *not-to-scale* text box should be included at the bottom left of the art. In items with graphics as answer options, the stem may contain the statement "Options are not to scale." This will avoid repetitive placement of the *not-to-scale* box with each option.
9. Graphics in test items should be clearly labeled and contain all necessary information.
10. Test items referring to new developments or discoveries should include phrases similar to *according to current knowledge or based on current knowledge*.
11. 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 . . .*).
12. As appropriate, boldface type should be used to emphasize key words in the test item question (e.g., **least, most, greatest, percent, best**).
13. 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 . . .*).
14. Use a variety of names, including names representing current student names and different ethnic groups appropriate for Florida.
15. Test items may express values using scientific notation; however, test items should not require calculations involving scientific notation.
16. Decimal numbers between $^{-}1$ and 1 should have a leading zero.
17. SI units should be expressed in a single type of unit when possible (e.g., 1.4 kilograms instead of 1 kilogram 400 grams).
18. Decimal notation should be used for numbers with SI units (e.g., 1.5 grams instead of $1\frac{1}{2}$ grams).
19. 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).
20. 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).
21. 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., mass (kg).

22. 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).
23. 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.
24. In the test 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 options) 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. B.
    C. 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 an 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. Options that are one word in length should be in alphabetical or reverse alphabetical order.

Context-Dependent Item Sets

Context-dependent (CD) item sets are groups of test items that are written to a common stimulus. The stimulus provides a basis for testing student understanding of science concepts or processes, critical thinking, or problem solving.

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. The reading level of the stimulus, excluding science terms, should be grade 9.
3. 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.
4. Test items will not be clued or answered by information in the passage or other test items in the CD set.
5. Test items may require the student to analyze, interpret, evaluate, and/or draw inferences from the information in the stimulus.
6. 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 a CD set.
7. Titles for passages in context-dependent sets are required.

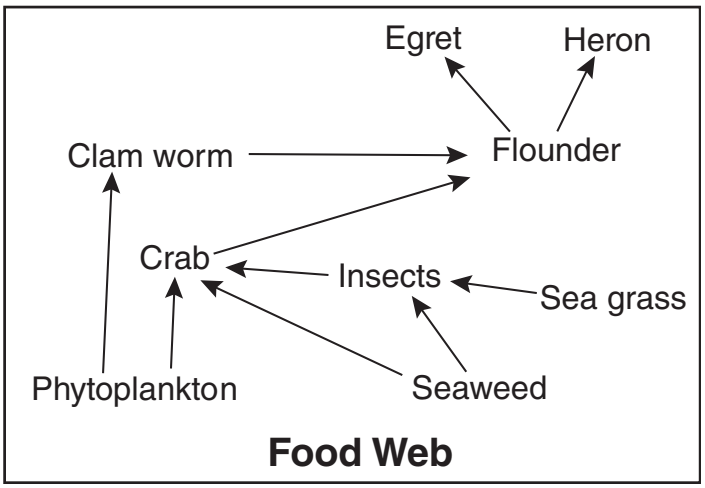
The following CD set is provided as an example of three items written to a common stimulus.

The Indian River Lagoon

An estuary is a body of water in which fresh water draining from the land mixes with salt water from the ocean. The result of this mixture is an environment with abundant plant and animal life. The Indian River Lagoon is a 156-mile-long estuary on Florida's eastern coast. It is a diverse estuary, supporting thousands of species of plants and animals.

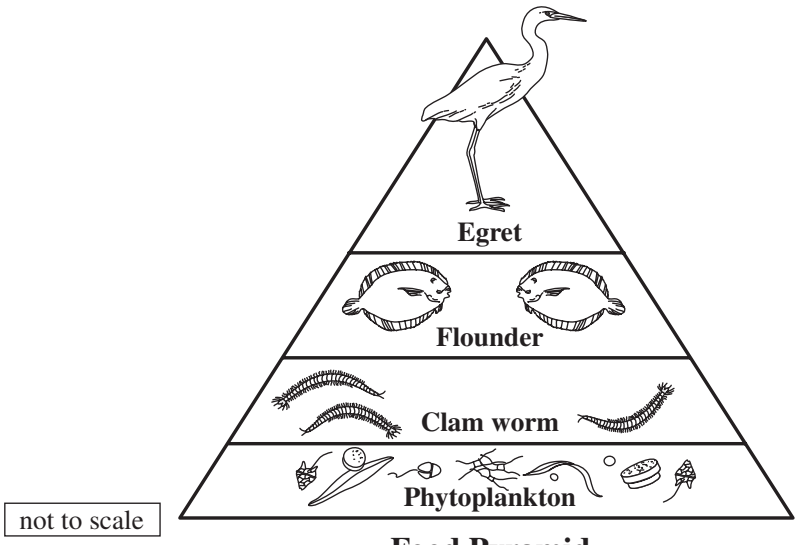
The food web in Figure 1 and food pyramid in Figure 2 are examples of the relationships that exist in the Indian River Lagoon ecosystem.

FIGURE 1



Food Web

FIGURE 2



Food Pyramid

To answer this question, refer to the "The Indian River Lagoon" passage and figures.

Which of the following has the largest population in the Indian River Lagoon ecosystem?

A. crab
B. egret
C. flounder
★**D.** phytoplankton

To answer this question, refer to the "The Indian River Lagoon" passage and figures.

Which of the following statements **most** accurately describes the energy transfer between the levels of the food pyramid in the Indian River Lagoon?

A. Energy stays in the phytoplankton at the lowest level.
B. Energy is released into the environment only from the egret.
★**C.** Energy travels up from the phytoplankton to the clam worm.
D. Energy moves from the flounder to both the clam worm and egret.

To answer this question, refer to the "The Indian River Lagoon" passage and figures.

In the Indian River Lagoon ecosystem, many organisms compete with one another for food sources. Which organism in the food web competes with the egret for food?

A. crab
★**B.** heron
C. flounder
D. clam worm

Scope of Test Items

The scope of Biology 1 EOC Assessment test items is presented in Appendix B. Appendix B is based on the Biology 1 course description. 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

Biology 1 EOC Assessment 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 their best. Item writers are also expected to use their best judgment in writing 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 the Biology 1 EOC Assessment 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 FDOE, 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 an explanation of why a student would choose a certain distractor.

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

- be written to the appropriate cognitive complexity;
- be written to the appropriate content focus;
- include the content source(s) for the test items;
- have a balance in location of the correct answer within benchmarks;
- have a balance and variety of names;
- use names representative of high school students in Florida; and
- be scientifically accurate.

Cognitive Complexity of Biology 1 End-of-Course Assessment 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 Biology 1 EOC Assessment 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 test items is currently categorized in two ways: **item difficulty** and **cognitive complexity**.

Item Difficulty

After a test item appears on a test, item difficulty refers to the actual percentage of students who chose the correct answer. The classification scheme used for item difficulty is based on the following:

Easy	More than 70 percent of the students responded correctly.
Average	Between 40 percent and 70 percent of the students responded correctly.
Challenging	Less than 40 percent of the students responded correctly.

Cognitive Complexity

Cognitive complexity refers to the cognitive demand associated with a test item. The cognitive classification system implemented by FDOE is based upon Dr. Norman L. Webb's Depth of Knowledge (DOK) levels. 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 Statewide Science and EOC assessments based on the NGSSS and on 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.

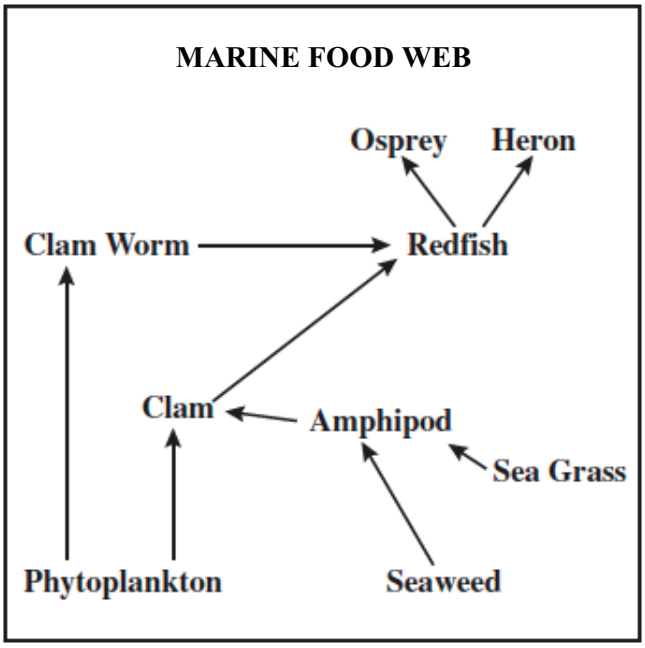
The categories—low complexity, moderate complexity, and high complexity—form an ordered description of the demands a test item may make on a student. For example, low-complexity test items may require a student to solve a one-step problem. Moderate-complexity test items may require multiple steps. However, the number of steps is not always indicative of cognitive level. 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 Statewide Science Assessment 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 the Biology 1 EOC Assessment. 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.

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.

A marine food web is shown below.



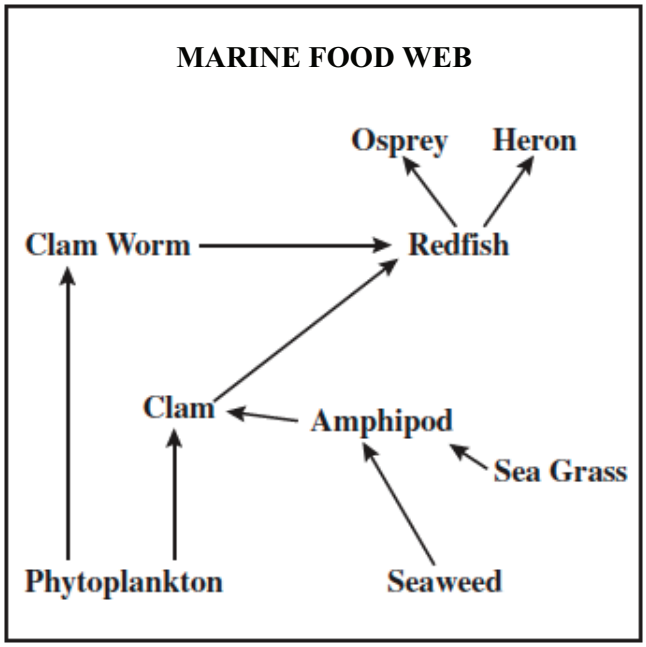
Which of the following organisms is a consumer in this food web?

A. seaweed
B. sea grass
★**C.** clam worm
D. phytoplankton

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.

A marine food web is shown below.



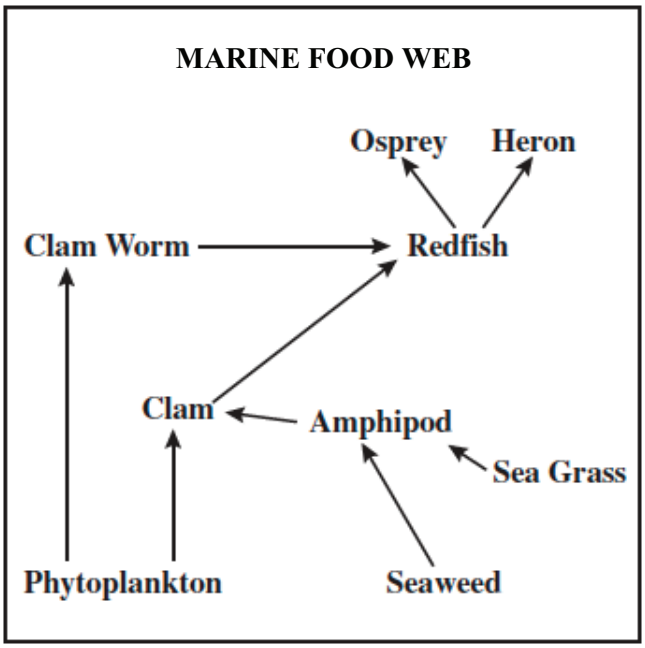
Which of the following organisms is found in the trophic level with the greatest biomass that sustains the ecosystem represented by this food web?

A. amphipod
B. heron
C. redfish
★ **D.** seaweed

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.

A marine food web is shown below.



Which of following is a **long-term** effect on the removal of the redfish from the ecosystem represented by this food web?

A. The osprey population will increase.
B. The amphipod population will increase.
★ **C.** The clam worm population will increase.
D. The phytoplankton population will increase.

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 Science Activities across Cognitive-Complexity Levels		
Low-Complexity Science	**Moderate-Complexity Science**	**High-Complexity Science**
• Retrieve information from a chart, table, diagram, or graph. • Recognize a standard scientific representation of a simple phenomenon or identify common examples. • Complete a familiar single-step procedure or solve a problem using a known formula.	• Interpret data from a chart, table, or simple graph. • Determine the best way to organize or present data from observations, an investigation, or experiments. • Describe or explain examples and nonexamples of scientific processes or concepts. • Specify or explain relationships among different groups, facts, properties, or variables. • Differentiate structure and functions of different organisms or systems. • Predict or determine the next logical step or outcome. • Apply and use concepts from a standard scientific model or theory.	• Analyze data from an investigation or experiment and formulate a conclusion. • Develop a generalization from multiple data sources. • Analyze and evaluate an experiment with multiple variables. • Analyze an investigation or experiment to identify a flaw and propose a method for correcting it. • Analyze a problem, situation, or system and make long-term predictions. • Interpret, explain, or solve a problem involving complex spatial relationships.

The table below presents the range for the percent of raw score points by cognitive complexity on the Statewide Science Assessments for grade 5 and grade 8 and the Biology 1 EOC Assessment.

Percentage of Points by Cognitive-Complexity Level for Statewide Science Assessments and Biology 1 EOC Assessment

Assessment	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.

The FDOE 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 Biology 1 End-of-Course Assessment Test Items

Prior to appearing on any Florida state assessment, all science test items must pass several levels of review as part of the test item development process. Florida educators and citizens, in conjunction with the FDOE and the assessment 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 intent of 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 Statewide Science Assessment and EOC assessment criteria and to measure the content in the NGSSS for science.

Review of Test Items

The FDOE and the assessment 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 the *Specifications* for test items. Separate reviews for bias and sensitivity issues are also conducted as noted above.

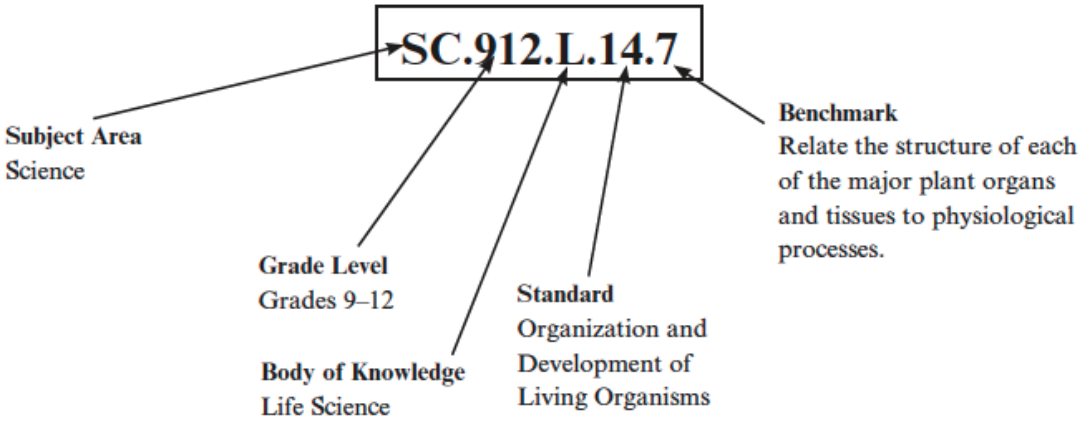
Due to the theory-based nature of the content area, all potential science test items undergo an extra level of scrutiny. A committee of university-level science researchers, university-level faculty, and practicing scientists from the private sector reviews the test items to ensure the accuracy and currency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

Guide to the Individual Benchmark Specifications

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 **Standard**.
- The number in the *last position* identifies the specific **Benchmark** under the Standard.



Grades 9–12	
Body of Knowledge	Life Science
Standard 14	Organization and Development of Living Organisms
SC.912.L.14.7	Relate the structure of each of the major plant organs and tissues to physiological processes.

Definitions of Benchmark Specifications

The *Specifications* identifies how the benchmarks in Florida's NGSSS are assessed on the Biology 1 EOC Assessment. For each benchmark assessed in science, the following information is provided in the Individual Benchmark Specifications section.

Reporting Category	refers to the category of related benchmarks from the NGSSS that are used to summarize and report achievement for the Biology 1 EOC Assessment. There are three reporting categories for the Biology 1 EOC Assessment: Molecular and Cellular Biology; Classification, Heredity, and Evolution; and Organisms, Populations, and Ecosystems.
Standard	refers to the standard statement presented in the NGSSS.
Benchmark	refers to the benchmark statement presented in the NGSSS. The benchmarks are specific statements of expected student achievement. 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 benchmark statement and are stated 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 the 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.
Assessment Limits	are intended to define for item writers the range of content knowledge and degree of difficulty that should be assessed in the test items for the benchmark. are used by item writers in conjunction with the Overall Considerations, Item Contexts, and the General Guidelines of the Item Style and Format sections in the *Specifications*. The assessment 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 science 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 6–8 Science Benchmarks

The NGSSS for science are organized by grade level for grades K–8. Although 18 Big Ideas thread throughout all grade levels and build in rigor and depth as students advance, not all grades have benchmarks for each Big Ideas. The benchmarks for grades 6–8 serve as a foundation for the grades 9–12 benchmarks. For that reason, the grades 6–8 science benchmarks are included in this document. In the Individual Benchmark Specifications for Biology 1 End-of-Course Assessment section, grades 6–8 benchmarks are cited in the Prior Knowledge sections.

Big Idea 1 The Practice of Science		
Grade 6	**Grade 7**	**Grade 8**
SC.6.N.1.1 Define a problem from the sixth grade curriculum: use appropriate reference materials to support scientific understanding; plan and carry out scientific investigations of various types, such as systematic observations or experiments; identify variables; collect and organize data; interpret data in charts, tables, and graphics; analyze information; make predictions; and defend conclusions.	**SC.7.N.1.1** Define a problem from the seventh grade curriculum: use appropriate reference materials to support scientific understanding; plan and carry out scientific investigations of various types, such as systematic observations or experiments; identify variables; collect and organize data; interpret data in charts, tables, and graphics; analyze information; make predictions; and defend conclusions.	**SC.8.N.1.1** Define a problem from the eighth grade curriculum using appropriate reference materials to support scientific understanding; plan and carry out scientific investigations of various types, such as systematic observations or experiments; identify variables; collect and organize data; interpret data in charts, tables, and graphics; analyze information; make predictions; and defend conclusions.
SC.6.N.1.2 Explain why scientific investigations should be replicable.	**SC.7.N.1.2** Differentiate replication (by others) from repetition (multiple trials).	**SC.8.N.1.2** Design and conduct a study using repeated trials and replication.
SC.6.N.1.3 Explain the difference between an experiment and other types of scientific investigation, and explain the relative benefits and limitations of each.	**SC.7.N.1.3** Distinguish between an experiment (which must involve the identification and control of variables) and other forms of scientific investigation, and explain that not all scientific knowledge is derived from experimentation.	**SC.8.N.1.3** Use phrases such as “results support” or “fail to support” in science, understanding that science does not offer conclusive “proof” of a knowledge claim.
SC.6.N.1.4 Discuss, compare, and negotiate methods used, results obtained, and explanations among groups of students conducting the same investigation.	**SC.7.N.1.4** Identify test variables (independent variables) and outcome variables (dependent variables) in an experiment.	**SC.8.N.1.4** Explain how hypotheses are valuable if they lead to further investigations, even if they turn out not to be supported by the data.

Grades 6–8 Science Benchmarks

Big Idea 1 The Practice of Science		
Grade 6	**Grade 7**	**Grade 8**
SC.6.N.1.5 Recognize that science involves creativity, not just in designing experiments, but also in creating explanations that fit evidence.	**SC.7.N.1.5** Describe the methods used in the pursuit of a scientific explanation as seen in different fields of science such as biology, geology, and physics.	**SC.8.N.1.5** Analyze the methods used to develop a scientific explanation as seen in different fields of science.
	SC.7.N.1.6 Explain that empirical evidence is the cumulative body of observations of a natural phenomenon on which scientific explanations are based.	**SC.8.N.1.6** Understand that scientific investigations involve the collection of relevant empirical evidence; the use of logical reasoning; and the application of imagination in devising hypotheses, predictions, explanations, and models to make sense of the collected evidence.
	SC.7.N.1.7 Explain that scientific knowledge is the result of a great deal of debate and confirmation within the science community.	

Big Idea 2 The Characteristics of Scientific Knowledge		
Grade 6	**Grade 7**	**Grade 8**
SC.6.N.2.1 Distinguish science from other activities involving thought.	**SC.7.N.2.1** Identify an instance from the history of science in which scientific knowledge has changed when new evidence or new interpretations are encountered.	**SC.8.N.2.1** Distinguish between scientific and pseudoscientific ideas.
SC.6.N.2.2 Explain that scientific knowledge is durable because it is open to change as new evidence or interpretations are encountered.		**SC.8.N.2.2** Discuss what characterizes science and its methods.

Grades 6–8 Science Benchmarks

Big Idea 2 The Characteristics of Scientific Knowledge		
Grade 6	**Grade 7**	**Grade 8**
SC.6.N.2.3 Recognize that scientists who make contributions to scientific knowledge come from all kinds of backgrounds and possess varied talents, interests, and goals.		
Big Idea 3 The Role of Theories, Laws, Hypotheses, and Models		
Grade 6	**Grade 7**	**Grade 8**
SC.6.N.3.1 Recognize and explain that a scientific theory is a well-supported and widely accepted explanation of nature and is not simply a claim posed by an individual. Thus, the use of the term theory in science is very different than how it is used in everyday life.	**SC.7.N.3.1** Recognize and explain the difference between theories and laws, and give several examples of scientific theories and the evidence that supports them.	**SC.8.N.3.1** Select models useful in relating the results of their own investigations.
SC.6.N.3.2 Recognize and explain that a scientific law is a description of a specific relationship under given conditions in the natural world. Thus, scientific laws are different from societal laws.	**SC.7.N.3.2** Identify the benefits and limitations of the use of scientific models.	**SC.8.N.3.2** Explain why theories may be modified but are rarely discarded.
SC.6.N.3.3 Give several examples of scientific laws.		
SC.6.N.3.4 Identify the role of models in the context of the sixth grade science benchmarks.		

Grades 6–8 Science Benchmarks

Big Idea 4 Science and Society		
Grade 6	**Grade 7**	**Grade 8**
		SC.8.N.4.1 Explain that science is one of the processes that can be used to inform decision making at the community, state, national, and international levels.
		SC.8.N.4.2 Explain how political, social, and economic concerns can affect science, and vice versa.
Big Idea 5 Earth in Space and Time		
Grade 6	**Grade 7**	**Grade 8**
		SC.8.E.5.1 Recognize that there are enormous distances between objects in space, and apply our knowledge of light and space travel to understand this distance.
		SC.8.E.5.2 Recognize that the universe contains many billions of galaxies and that each galaxy contains many billions of stars.
		SC.8.E.5.3 Distinguish the hierarchical relationships between planets and other astronomical bodies relative to solar system, galaxy, and universe, including distance, size, and composition.
		SC.8.E.5.4 Explore the Law of Universal Gravitation by explaining the role that gravity plays in the formation of planets, stars, and solar systems and in determining their motions.

Grades 6–8 Science Benchmarks

Big Idea 5 Earth in Space and Time		
Grade 6	**Grade 7**	**Grade 8**
		SC.8.E.5.5 Describe and classify specific physical properties of stars: apparent magnitude (brightness), temperature (color), size, and luminosity (absolute brightness).
		SC.8.E.5.6 Create models of solar properties including: rotation, structure of the Sun, convection, sunspots, solar flares, and prominences.
		SC.8.E.5.7 Compare and contrast the properties of objects in the Solar System, including the Sun, planets, and moons to those of Earth, such as gravitational force, distance from the Sun, speed, movement, temperature, and atmospheric conditions.
		SC.8.E.5.8 Compare various historical models of the Solar System, including geocentric and heliocentric.
		SC.8.E.5.9 Explain the impact of objects in space on each other including: 1. the Sun on the Earth, including seasons and gravitational attraction; 2. the Moon on the Earth, including phases, tides, and eclipses, and the relative position of each body.

Grades 6–8 Science Benchmarks

Big Idea 5 Earth in Space and Time		
Grade 6	**Grade 7**	**Grade 8**
		SC.8.E.5.10 Assess how technology is essential to science for such purposes as access to outer space and other remote locations, sample collection, measurement, data collection and storage, computation, and communication of information.
		SC.8.E.5.11 Identify and compare characteristics of the electromagnetic spectrum such as wavelength, frequency, use, and hazards, and recognize its application to an understanding of planetary images and satellite photographs.
		SC.8.E.5.12 Summarize the effects of space exploration on the economy and culture of Florida.
Big Idea 6 Earth Structures		
Grade 6	**Grade 7**	**Grade 8**
SC.6.E.6.1 Describe and give examples of ways in which Earth's surface is built up and torn down by physical and chemical weathering, erosion, and deposition.	**SC.7.E.6.1** Describe the layers of the solid Earth, including the lithosphere, the hot convecting mantle, and the dense metallic liquid and solid cores.	
SC.6.E.6.2 Recognize that there are a variety of different landforms on Earth's surface such as coastlines, dunes, rivers, mountains, glaciers, deltas, and lakes, and relate these landforms as they apply to Florida.	**SC.7.E.6.2** Identify the patterns within the rock cycle and relate them to surface events (weathering and erosion) and subsurface events (plate tectonics and mountain building).	

Grades 6–8 Science Benchmarks

Big Idea 6 Earth Structures		
Grade 6	**Grade 7**	**Grade 8**
	SC.7.E.6.3 Identify current methods for measuring the age of Earth and its parts, including the law of superposition and radioactive dating.	
	SC.7.E.6.4 Explain and give examples of how physical evidence supports scientific theories that Earth has evolved over geologic time due to natural processes.	
	SC.7.E.6.5 Explore the scientific theory of plate tectonics by describing how the movement of Earth's crustal plates causes both slow and rapid changes in Earth's surface, including volcanic eruptions, earthquakes, and mountain building.	
	SC.7.E.6.6 Identify the impact that humans have had on Earth, such as deforestation, urbanization, desertification, erosion, air and water quality, changing the flow of water.	
	SC.7.E.6.7 Recognize that heat flow and movement of material within Earth causes earthquakes and volcanic eruptions and creates mountains and ocean basins.	
Big Idea 7 Earth Systems and Patterns		
Grade 6	**Grade 7**	**Grade 8**
SC.6.E.7.1 Differentiate among radiation, conduction, and convection, the three mechanisms by which heat is transferred through Earth's system.		

Grades 6–8 Science Benchmarks

Big Idea 7 Earth Systems and Patterns		
Grade 6	**Grade 7**	**Grade 8**
SC.6.E.7.2 Investigate and apply how the cycling of water between the atmosphere and hydrosphere has an effect on weather patterns and climate.		
SC.6.E.7.3 Describe how global patterns such as the jet stream and ocean currents influence local weather in measurable terms such as temperature, air pressure, wind direction and speed, and humidity and precipitation.		
SC.6.E.7.4 Differentiate and show interactions among the geosphere, hydrosphere, cryosphere, atmosphere, and biosphere.		
SC.6.E.7.5 Explain how energy provided by the Sun influences global patterns of atmospheric movement and the temperature differences between air, water, and land.		
SC.6.E.7.6 Differentiate between weather and climate.		
SC.6.E.7.7 Investigate how natural disasters have affected human life in Florida.		
SC.6.E.7.8 Describe ways human beings protect themselves from hazardous weather and sun exposure.		

Grades 6–8 Science Benchmarks

Big Idea 7 Earth Systems and Patterns		
Grade 6	**Grade 7**	**Grade 8**
SC.6.E.7.9 Describe how the composition and structure of the atmosphere protects life and insulates the planet.		
Big Idea 8 Properties of Matter		
Grade 6	**Grade 7**	**Grade 8**
		SC.8.P.8.1 Explore the scientific theory of atoms (also known as atomic theory) by using models to explain the motion of particles in solids, liquids, and gases.
		SC.8.P.8.2 Differentiate between weight and mass, recognizing that weight is the amount of gravitational pull on an object and is distinct from, though proportional to, mass.
		SC.8.P.8.3 Explore and describe the densities of various materials through measurement of their masses and volumes.
		SC.8.P.8.4 Classify and compare substances on the basis of characteristic physical properties that can be demonstrated or measured: for example, density; thermal or electrical conductivity; solubility; magnetic properties; melting and boiling points; and know that these properties are independent of the amount of the sample.

Grades 6–8 Science Benchmarks

Big Idea 8 Properties of Matter		
Grade 6	**Grade 7**	**Grade 8**
		SC.8.P.8.5 Recognize that there are a finite number of elements and that their atoms combine in a multitude of ways to produce compounds that make up all of the living and nonliving things that we encounter.
		SC.8.P.8.6 Recognize that elements are grouped in the periodic table according to similarities of their properties.
		SC.8.P.8.7 Explore the scientific theory of atoms (also known as atomic theory) by recognizing that atoms are the smallest unit of an element and are composed of subatomic particles (electrons surrounding a nucleus containing protons and neutrons).
		SC.8.P.8.8 Identify basic examples of and compare and classify the properties of compounds, including acids, bases, and salts.
		SC.8.P.8.9 Distinguish among mixtures (including solutions) and pure substances.

Grades 6–8 Science Benchmarks

Big Idea 9 Changes in Matter		
Grade 6	**Grade 7**	**Grade 8**
		SC.8.P.9.1 Explore the Law of Conservation of Mass by demonstrating and concluding that mass is conserved when substances undergo physical and chemical changes.
		SC.8.P.9.2 Differentiate between physical changes and chemical changes.
		SC.8.P.9.3 Investigate and describe how temperature influences chemical changes.
Big Idea 10 Forms of Energy		
Grade 6	**Grade 7**	**Grade 8**
	SC.7.P.10.1 Illustrate that the Sun's energy arrives as radiation with a wide range of wavelengths, including infrared, visible, and ultraviolet, and that white light is made up of a spectrum of many different colors.	
	SC.7.P.10.2 Observe and explain that light can be reflected, refracted, and/or absorbed.	
	SC.7.P.10.3 Recognize that light waves, sound waves, and other waves move at different speeds in different materials.	

Grades 6–8 Science Benchmarks

Big Idea 11 Energy Transfer and Transformations		
Grade 6	**Grade 7**	**Grade 8**
SC.6.P.11.1 Explore the Law of Conservation of Energy by differentiating between potential and kinetic energy. Identify situations where kinetic energy is transformed into potential energy and vice versa.	**SC.7.P.11.1** Recognize that adding heat to or removing heat from a system may result in a temperature change and possibly a change of state.	
	SC.7.P.11.2 Investigate and describe the transformation of energy from one form to another.	
	SC.7.P.11.3 Cite evidence to explain that energy cannot be created nor destroyed, only changed from one form to another.	
	SC.7.P.11.4 Observe and describe that heat flows in predictable ways, moving from warmer objects to cooler ones until they reach the same temperature.	
Big Idea 12 Motion of Objects		
Grade 6	**Grade 7**	**Grade 8**
SC.6.P.12.1 Measure and graph distance versus time for an object moving at a constant speed. Interpret this relationship.		
Big Idea 13 Forces and Changes in Motion		
Grade 6	**Grade 7**	**Grade 8**
SC.6.P.13.1 Investigate and describe types of forces including contact forces and forces acting at a distance, such as electrical, magnetic, and gravitational.		

Grades 6–8 Science Benchmarks

Big Idea 13 Forces and Changes in Motion		
Grade 6	**Grade 7**	**Grade 8**
SC.6.P.13.2 Explore the Law of Gravity by recognizing that every object exerts gravitational force on every other object and that the force depends on how much mass the objects have and how far apart they are.		
SC.6.P.13.3 Investigate and describe that an unbalanced force acting on an object changes its speed, or direction of motion, or both.		
Big Idea 14 Organization and Development of Living Organisms		
Grade 6	**Grade 7**	**Grade 8**
SC.6.L.14.1 Describe and identify patterns in the hierarchical organization of organisms from atoms to molecules and cells to tissues to organs to organ systems to organisms.		
SC.6.L.14.2 Investigate and explain the components of the scientific theory of cells (cell theory): all organisms are composed of cells (single-celled or multicellular), all cells come from preexisting cells, and cells are the basic unit of life.		
SC.6.L.14.3 Recognize and explore how cells of all organisms undergo similar processes to maintain homeostasis, including extracting energy from food, getting rid of waste, and reproducing.		

Grades 6–8 Science Benchmarks

Big Idea 14 Organization and Development of Living Organisms		
Grade 6	**Grade 7**	**Grade 8**
SC.6.L.14.4 Compare and contrast the structure and function of major organelles of plant and animal cells, including cell wall, cell membrane, nucleus, cytoplasm, chloroplasts, mitochondria, and vacuoles.		
SC.6.L.14.5 Identify and investigate the general functions of the major systems of the human body (digestive, respiratory, circulatory, reproductive, excretory, immune, nervous, and musculoskeletal) and describe ways these systems interact with each other to maintain homeostasis.		
SC.6.L.14.6 Compare and contrast types of infectious agents that may infect the human body, including viruses, bacteria, fungi, and parasites.		
Big Idea 15 Diversity and Evolution of Living Organisms		
Grade 6	**Grade 7**	**Grade 8**
SC.6.L.15.1 Analyze and describe how and why organisms are classified according to shared characteristics, with emphasis on the Linnaean system combined with the concept of Domains.	**SC.7.L.15.1** Recognize that fossil evidence is consistent with the scientific theory of evolution that living things evolved from earlier species.	

Grades 6–8 Science Benchmarks

Big Idea 15 Diversity and Evolution of Living Organisms		
Grade 6	**Grade 7**	**Grade 8**
	SC.7.L.15.2 Explore the scientific theory of evolution by recognizing and explaining ways in which genetic variation and environmental factors contribute to evolution by natural selection and diversity of organisms.	
	SC.7.L.15.3 Explore the scientific theory of evolution by relating how the inability of a species to adapt within a changing environment may contribute to the extinction of that species.	
Big Idea 16 Heredity and Reproduction		
Grade 6	**Grade 7**	**Grade 8**
	SC.7.L.16.1 Understand and explain that every organism requires a set of instructions that specifies its traits, that this hereditary information (DNA) contains genes located in the chromosomes of each cell, and that heredity is the passage of these instructions from one generation to another.	
	SC.7.L.16.2 Determine the probabilities for genotype and phenotype combinations using Punnett squares and pedigrees.	
	SC.7.L.16.3 Compare and contrast the general processes of sexual reproduction requiring meiosis and asexual reproduction requiring mitosis.	

Grades 6–8 Science Benchmarks

Big Idea 16 Heredity and Reproduction		
Grade 6	**Grade 7**	**Grade 8**
	SC.7.L.16.4 Recognize and explore the impact of biotechnology (cloning, genetic engineering, artificial selection) on the individual, society, and the environment.	
Big Idea 17 Interdependence		
Grade 6	**Grade 7**	**Grade 8**
	SC.7.L.17.1 Explain and illustrate the roles of and relationships among producers, consumers, and decomposers in the process of energy transfer in a food web.	
	SC.7.L.17.2 Compare and contrast the relationships among organisms such as mutualism, predation, parasitism, competition, and commensalism.	
	SC.7.L.17.3 Describe and investigate various limiting factors in the local ecosystem and their impact on native populations, including food, shelter, water, space, disease, parasitism, predation, and nesting sites.	

Grades 6–8 Science Benchmarks

Big Idea 18 Matter and Energy Transformations		
Grade 6	**Grade 7**	**Grade 8**
		SC.8.L.18.1 Describe and investigate the process of photosynthesis, such as the roles of light, carbon dioxide, water, and chlorophyll; production of food; release of oxygen.
		SC.8.L.18.2 Describe and investigate how cellular respiration breaks down food to provide energy and releases carbon dioxide.
		SC.8.L.18.3 Construct a scientific model of the carbon cycle to show how matter and energy are continuously transferred within and between organisms and their physical environment.
		SC.8.L.18.4 Cite evidence that living systems follow the Laws of Conservation of Mass and Energy.

Individual Benchmark Specifications for Biology 1 End-of-Course Assessment

This section of the *Specifications* describes how the science benchmarks are assessed on the Biology 1 EOC Assessment. The benchmarks in the Biology 1 course description serve as the foundation for this assessment.

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 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.

Benchmark SC.912.N.1.1

Reporting Category Items for this benchmark grouping will be placed in the appropriate reporting category based on the content of the item.

Standard **Standard 1** The Practice of Science

Benchmark **SC.912.N.1.1 Define a problem based on a specific body of knowledge, for example: biology, chemistry, physics, and Earth/ space science, and do the following:**

1. **pose questions about the natural world;**
2. **conduct systematic observations;**
3. **examine books and other sources of information to see what is already known;**
4. **review what is known in light of empirical evidence;**
5. **plan investigations;**
6. **use tools to gather, analyze, and interpret data (this includes the use of measurement in metric and other systems, and also the generation and interpretation of graphical representations of data, including data tables and graphs);**
7. **pose answers, explanations, or descriptions of events;**
8. **generate explanations that explicate or describe natural phenomena (inferences);**
9. **use appropriate evidence and reasoning to justify these explanations to others;**
10. **communicate results of scientific investigations; and**
11. **evaluate the merits of the explanations produced by others. (Also assesses SC.912.N.1.4, SC.912.N.1.6, SC.912.L.14.4.)**

Also Assesses **SC.912.N.1.4** Identify sources of information, and assess their reliability according to the strict standards of scientific investigation.

SC.912.N.1.6 Describe how scientific inferences are drawn from scientific observations, and provide examples from the content being studied.

SC.912.L.14.4 Compare and contrast structure and function of various types of microscopes.

Benchmark Clarifications The student will evaluate the plan and/or design of a scientific investigation using evidence of scientific thinking and/or problem solving.

The student will analyze and interpret data to make predictions and/or defend conclusions.

Benchmark Clarifications	The student will evaluate the merits of scientific explanations produced by others. The student will assess the reliability of sources of information according to scientific standards. The student will identify examples of scientific inferences made from observations. The student will compare and/or contrast the structure and function of the compound microscope, dissecting microscope, scanning electron microscope, and/or the transmission electron microscope. The student will determine the appropriate situations in which each microscope is used.
Assessment Limits	None specified
Stimulus Attributes	Scenarios will be placed in the context of experimental design, experiment(s), scientific investigation(s), or scientific observation(s) in the field of biology. Scenarios may include a diagram/illustration/graph/data table.
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 of SC.6.N.1.1, SC.6.N.1.2, SC.6.N.1.3, SC.6.N.1.4, SC.6.N.1.5, SC.7.N.1.1, SC.7.N.1.2, SC.7.N.1.3, SC.7.N.1.4, SC.7.N.1.5, SC.7.N.1.6, SC.7.N.1.7, SC.8.N.1.1, SC.8.N.1.2, SC.8.N.1.3, SC.8.N.1.4, SC.8.N.1.5, and SC.8.N.1.6.

Sample Item 1 SC.912.N.1.1

An osmosis investigation was conducted using 20 chicken eggs to represent cells with semipermeable membranes. The eggs were first soaked in vinegar to dissolve the shell. The eggs were then transferred to corn syrup for 24 hours and then to distilled water for 24 hours. The mass, in grams (g), of each egg was measured before and after each soaking to determine how much water diffused into or out of the eggs. The table below shows the average mass of the eggs at each step of the investigation.

OSMOSIS IN CELLS

Solution	Average Mass of Eggs Before Soaking (g)	Average Mass of Eggs After Soaking (g)	Difference in Average Mass (g)	Percent Change in Average Mass
Vinegar (95% water)	71.2	98.6	27.4	+38.5%
Corn syrup (5% water)	98.6	64.5	34.1	-34.6%
Distilled water (100% water)	64.5	105.3	40.8	+63.3%

Based on this experiment, which of the following should be inferred about cells with semipermeable membranes?

A. Substances other than water may also cross the cell membrane.
B. Substances other than water may block pores in the cell membrane.
★**C.** Water enters the cell when placed in environments of high water concentration.
D. Water leaves the cell when placed in environments with a low concentration of solutes.

Benchmark SC.912.L.14.1

Reporting Category	Molecular and Cellular Biology
Standard	**Standard 14** Organization and Development of Living Organisms
Benchmark	**SC.912.L.14.1 Describe the scientific theory of cells (cell theory), and relate the history of its discovery to the process of science. (Also assesses SC.912.N.1.3, SC.912.N.2.1, SC.912.N.3.1, and SC.912.N.3.4.)**
Also Assesses	**SC.912.N.1.3** Recognize that the strength or usefulness of a scientific claim is evaluated through scientific argumentation, which depends on critical and logical thinking, and the active consideration of alternative scientific explanations to explain the data presented. **SC.912.N.2.1** Identify what is science, what clearly is not science, and what superficially resembles science (but fails to meet the criteria for science). **SC.912.N.3.1** Explain that a scientific theory is the culmination of many scientific investigations drawing together all the current evidence concerning a substantial range of phenomena; thus, a scientific theory represents the most powerful explanation scientists have to offer. **SC.912.N.3.4** Recognize that theories do not become laws, nor do laws become theories; theories are well-supported explanations, and laws are well-supported descriptions.
Benchmark Clarifications	The student will describe and/or explain the cell theory. The student will describe how continuous investigations and new scientific information influenced the development of the cell theory. The student will identify ways in which a scientific claim is evaluated (e.g., through scientific argumentation, critical and logical thinking, and consideration of alternative explanations). The student will identify the criteria that differentiate science from nonscience and pseudoscience. The student will explain the development of the scientific theory of cells (cell theory). The student will recognize the differences between theories and laws.
Assessment Limits	Items may assess how contributions of scientists such as Hooke, Van Leeuwenhoek, Schleiden, Schwann, and/or Virchow aided in the development of the cell theory but will not assess what each scientist contributed.

Assessment Limits	Items assessing a scientific claim, the development of a theory, or the differences between theories and laws are limited to the cell theory.
Stimulus Attributes	None specified
Response Attribute	Responses in items referring to scientific claims, identifying what is science, understanding the development of a theory, and recognizing the difference between theories and laws should be specific to the context of the item instead of generic statements.
Prior Knowledge	Items may require the student to apply science knowledge described in the NGSSS from lower grades. This benchmark requires prerequisite knowledge of SC.6.L.14.2, SC.8.E.5.10, SC.6.N.2.1, SC.6.N.2.2, SC.6.N.3.1, SC.6.N.3.2, SC.6.N.3.3, SC.7.N.1.7, SC.7.N.2.1, SC.7.N.3.1, SC.8.N.1.5, SC.8.N.2.1, SC.8.N.2.2, and SC.8.N.3.2.

Sample Item 2 SC.912.L.14.1

The cell theory was first proposed in 1838. Evidence obtained through additional scientific investigations resulted in the current cell theory. Which statement describes a component of the original cell theory that was removed because of the new scientific knowledge?

A. All living things are made of cells.
B. All cells come from other preexisting cells.
★**C.** Cells form through spontaneous generation.
D. Cells are the basic structural and functional units of life.

Benchmark SC.912.L.14.3

Reporting Category	Molecular and Cellular Biology
Standard	**Standard 14** Organization and Development of Living Organisms
Benchmark	**SC.912.L.14.3 Compare and contrast the general structures of plant and animal cells. Compare and contrast the general structures of prokaryotic and eukaryotic cells. (Also assesses SC.912.L.14.2.)**
Also Assesses	**SC.912.L.14.2** Relate structure to function for the components of plant and animal cells. Explain the role of cell membranes as a highly selective barrier (passive and active transport).
Benchmark Clarifications	The student will compare and/or contrast the structures found in plant cells and in animal cells. The student will compare and/or contrast the structures found in prokaryotic cells and in eukaryotic cells. The student will describe and/or explain how structures of cellular components are directly related to their function in the cell. The student will explain the role of the cell membrane during active and passive transport.
Assessment Limits	Items will not address protists or fungi or assess cellular structures unique to protists or fungi. Items referring to prokaryotic structures are limited to the cell wall, cell membrane (plasma membrane), cytoplasm, plasmids, nucleoid region, ribosomes, and flagella. Items referring to eukaryotic structures are limited to the cell wall, cell membrane (plasma membrane), cytoplasm, nucleus, nuclear envelope, nucleolus, chromatin, chromosomes, ribosomes, endoplasmic reticulum, microtubules, microfilaments, vesicles, vacuoles, mitochondria, Golgi apparatus, chloroplasts, lysosomes, cilia, and flagella. Items referring to the role of the cell membrane may address hypotonic, hypertonic, and/or isotonic solutions; however, the assessment should focus on processes and not terminology.
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 of SC.6.L.14.3 and SC.6.L.14.4.

Sample Item 3 SC.912.L.14.3

There are some similarities between prokaryotic and eukaryotic cells. Which of the following structures is found in both prokaryotic and eukaryotic cells?

A. lysosome
B. mitochondrion
C. nucleus
★**D.** ribosome

Benchmark SC.912.L.14.7

Reporting Category	Organisms, Populations, and Ecosystems
Standard	**Standard 14** Organization and Development of Living Organisms
Benchmark	**SC.912.L.14.7 Relate the structure of each of the major plant organs and tissues to physiological processes.**
Benchmark Clarification	The student will explain how the structures of plant tissues and organs are directly related to their roles in physiological processes.
Assessment Limits	Items will assess the function of plant tissues and organs in the context of physiological processes. Items will not assess specific functions of structures within organs and tissues in isolation. Items assessing plant organs are limited to roots, stems, leaves, flowers, fruits, and cones. Items referring to physiological processes are limited to photosynthesis, cellular respiration, transpiration, growth, and reproduction. Items assessing plant tissues are limited to meristematic, ground, dermal, and vascular tissues. Items referring to plant structures are limited to cambium, guard cells, phloem, root hairs, root cap, seed, stomata, xylem, stamen, pistil, ovary, petals, sperm, egg, sepal, filament, anther, style, and stigma. Items will not address or assess mitosis or meiosis.
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 of SC.6.L.14.1 and SC.6.L.14.4.

Sample Item 4 SC.912.L.14.7

Terrestrial plants have stomata on the surface of their leaves. Which of the following **best** explains how the structure of the leaf is used in processes that occur in the plant?

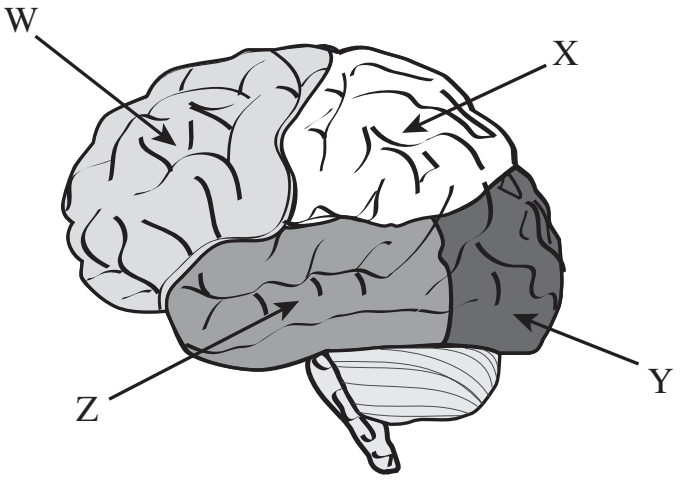
A. Water enters the plant through the surface of the leaf for transpiration.
★**B.** Gases for photosynthesis are exchanged through the surface of the leaf.
C. Energy for cellular reproduction is absorbed through the surface of the leaf.
D. Carbon dioxide enters the plant through the surface of the leaf for cellular respiration.

Benchmark SC.912.L.14.26

Reporting Category	Organisms, Populations, and Ecosystems
Standard	**Standard 14** Organization and Development of Living Organisms
Benchmark	**SC.912.L.14.26 Identify the major parts of the brain on diagrams or models.**
Benchmark Clarification	The student will identify the major parts of the brain on diagrams.
Assessment Limits	Items are limited to the cerebrum, cerebellum, pons, medulla oblongata, brain stem, frontal lobe, parietal lobe, occipital lobe, and temporal lobe. Items will not assess the function of the major parts of the brain.
Stimulus Attribute	Items will include diagrams of the brain.
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.6.L.14.5.

Sample Item 5 SC.912.L.14.26

The diagram below shows the four lobes of the human brain.



Which of the labeled arrows indicates the temporal lobe?

A. W
B. X
C. Y
★**D.** Z

Benchmark SC.912.L.14.36

Reporting Category	Organisms, Populations, and Ecosystems
Standard	**Standard 14** Organization and Development of Living Organisms
Benchmark	**SC.912.L.14.36 Describe the factors affecting blood flow through the cardiovascular system.**
Benchmark Clarification	The student will identify factors that affect blood flow or describe how these factors affect blood flow through the cardiovascular system.
Assessment Limits	Items may assess factors such as blood pressure, blood volume, resistance, blood viscosity, disease, and exercise and their effects on blood flow.
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.6.L.14.5.

Sample Item 6 SC.912.L.14.36

The rate at which blood flows through the human body changes in response to many factors. Which statement describes one of these factors and its effect on blood flow?

A. The narrowing of blood vessels increases pressure and leads to faster blood flow.
★**B.** High blood viscosity increases the resistance in the blood vessels and leads to slower blood flow.
C. Low blood pH decreases the rate of diffusion through the blood vessels and leads to slower blood flow.
D. The changing of the shape of red blood cells to a crescent shape decreases resistance and leads to faster blood flow.

Benchmark SC.912.L.14.52

Reporting Category	Organisms, Populations, and Ecosystems
Standard	**Standard 14** Organization and Development of Living Organisms
Benchmark	**SC.912.L.14.52 Explain the basic functions of the human immune system, including specific and nonspecific immune response, vaccines, and antibiotics. (Also assesses SC.912.L.14.6.)**
Also Assesses	**SC.912.L.14.6** Explain the significance of genetic factors, environmental factors, and pathogenic agents to health from the perspectives of both individual and public health.
Benchmark Clarifications	The student will identify and/or explain the basic functions of the human immune system, including specific and nonspecific immune responses. The student will describe the basic function of vaccines. The student will describe the basic function of antibiotics. The student will explain the significance of genetic factors, environmental factors, and/or pathogenic agents to health from the perspective of both individual and/or public health.
Assessment Limits	Items assessing the mode of action of antibiotics are limited to a conceptual understanding and will not require knowledge regarding a specific antibiotic. Items assessing the significance of genetic factors, environmental factors, and pathogenic agents to health are limited to a conceptual understanding.
Stimulus Attribute	Scenarios are limited to those commonly included in a biology course.
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 of SC.6.L.14.6, SC.6.E.7.8, SC.8.N.4.1, and SC.8.N.4.2.

Sample Item 7 SC.912.L.14.52

A student accidentally cut her finger while collecting soil samples. Which of the following is the first response by the student's immune system?

★ **A.** White blood cells move from blood vessels to the injured area and engulf pathogens.
B. Plasma cells release antibodies into the bloodstream that attach to the pathogens to be destroyed.
C. A chemical message signals a fever response that inhibits the growth and reproduction of pathogens.
D. A chemical message directs the movement of T cells to the location of the injury to destroy pathogens in the area.

Benchmark SC.912.L.15.1

Reporting Category	Classification, Heredity, and Evolution
Standard	**Standard 15** Diversity and Evolution of Living Organisms
Benchmark	**SC.912.L.15.1 Explain how the scientific theory of evolution is supported by the fossil record, comparative anatomy, comparative embryology, biogeography, molecular biology, and observed evolutionary change. (Also assesses SC.912.L.15.10, SC.912.N.1.3, SC.912.N.1.4, SC.912.N.1.6, SC.912.N.2.1, SC.912.N.3.1, and SC.912.N.3.4.)**
Also Assesses	**SC.912.L.15.10** Identify basic trends in hominid evolution from early ancestors six million years ago to modern humans, including brain size, jaw size, language, and manufacture of tools. **SC.912.N.1.3** Recognize that the strength or usefulness of a scientific claim is evaluated through scientific argumentation, which depends on critical and logical thinking, and the active consideration of alternative scientific explanations to explain the data presented. **SC.912.N.1.4** Identify sources of information, and assess their reliability according to the strict standards of scientific investigation. **SC.912.N.1.6** Describe how scientific inferences are drawn from scientific observations, and provide examples from the content being studied. **SC.912.N.2.1** Identify what is science, what clearly is not science, and what superficially resembles science (but fails to meet the criteria for science). **SC.912.N.3.1** Explain that a scientific theory is the culmination of many scientific investigations drawing together all the current evidence concerning a substantial range of phenomena; thus, a scientific theory represents the most powerful explanation scientists have to offer. **SC.912.N.3.4** Recognize that theories do not become laws, nor do laws become theories; theories are well-supported explanations, and laws are well-supported descriptions.
Benchmark Clarifications	The student will identify evidence from and/or explain how the scientific theory of evolution is supported by the fossil record, comparative anatomy, comparative embryology, biogeography, molecular biology, and observable evolutionary change. The student will identify examples of and basic trends in hominid evolution from early ancestors to modern humans.

Benchmark Clarifications

The student will identify ways in which a scientific claim is evaluated (e.g., through scientific argumentation, critical and logical thinking, and consideration of alternative explanations).

The student will assess the reliability of sources of information according to scientific standards.

The student will identify examples of scientific inferences made from observations.

The student will identify the criteria that differentiate science from nonscience and pseudoscience.

The student will explain the development of the scientific theory of evolution.

The student will recognize the differences between theories and laws.

Assessment Limits

Items assessing evolution will focus on a conceptual understanding of the supporting scientific evidence.

Items assessing the fossil record must focus on the fossil rather than geologic formations in isolation.

Items assessing the fossil record will not require understanding of the specific mechanisms used for relative dating and radioactive dating.

Items will not require the memorization of the geologic time scale, including era, period, and/or epoch.

Items will not assess the origin of Earth.

Items will not assess specific knowledge of the formation of microspheres or the evolution of RNA and DNA.

Items will not address or assess the endosymbiotic theory.

Items referring to adaptive radiation, convergent evolution, coevolution, or punctuated equilibrium should focus on the concepts rather than on the definition of the terms.

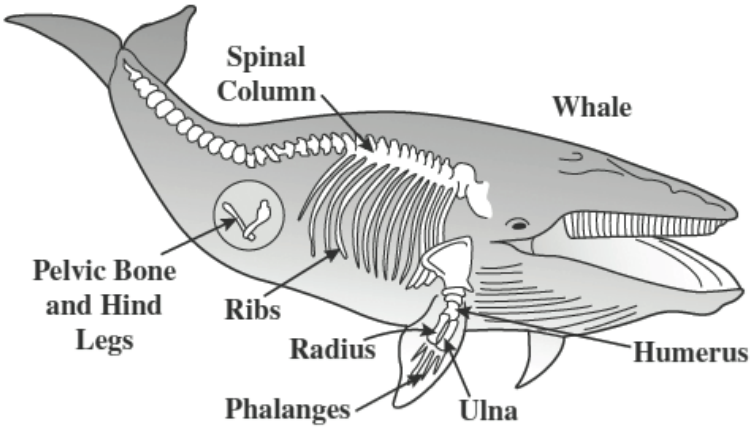
Items will not assess types of genetic mutation or how these mutations occur.

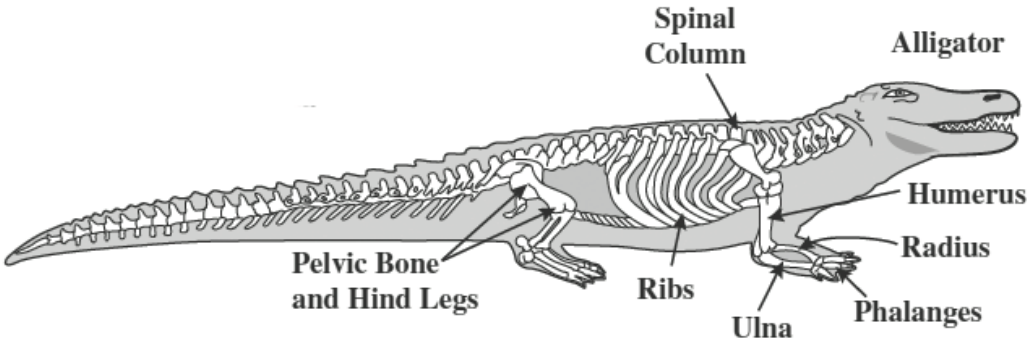
Items referring to comparative anatomy and comparative embryology will assess anatomical similarities such as homologous structures and vestigial organs but will not require specific knowledge of embryologic stages or structures.

Assessment Limits	Items will not require knowledge of changes to specific species or geographic location of those species. Items will not assess genes, alleles, genetic drift, or gene flow. Items may assess how the contributions of scientists such as Darwin, Lamarck, Lyell, Malthus, Mendel, or Wallace aided in the development of the scientific theory of evolution but will not assess what each scientist contributed. Items will not require memorization of the names of specific human fossils or the names of the different hominid species. Items referring to the development of language or the manufacturing of tools will relate this development to changes in the skull or brain size. Items assessing a scientific claim, the development of a theory, or the differences between theories and laws are limited to the scientific theory of evolution. Items will not assess the differences among intelligent design, creationism, and the scientific theory of evolution.
Stimulus Attributes	Scenarios referring to specific species will include a description of the species in relation to the context of the item. Scenarios addressing scientific inferences are limited to the scientific theory of evolution and/or trends in hominid evolution.
Response Attribute	Responses in items referring to scientific claims, sources of information, scientific inferences, identifying what is science, understanding the development of a theory, and recognizing the difference between theories and laws should be specific to the context of the item instead of generic statements.
Prior Knowledge	Items may require the student to apply science knowledge described in the NGSSS from lower grades. This benchmark requires prerequisite knowledge of SC.7.L.15.1, SC.7.L.15.2, SC.7.L.15.3, SC.8.E.5.10, SC.6.N.2.1, SC.6.N.2.2, SC.6.N.3.1, SC.6.N.3.2, SC.6.N.3.3, SC.7.N.1.6, SC.7.N.1.7, SC.7.N.2.1, SC.7.N.3.1, SC.8.N.1.6, SC.8.N.2.1, SC.8.N.2.2, and SC.8.N.3.2.

Sample Item 8 SC.912.L.15.1

The scientific theory of evolution is supported by different types of evidence. The diagrams below show the skeletons of two different animal species. The diagrams are not to scale.





How does comparing the skeletons of these animals **best** provide support for the scientific theory of evolution?

A. It provides information about the organisms' habitats.
B. It provides information to determine the organisms' ages.
★**C.** It shows a possibility of common ancestry between organisms.
D. It shows a possibility of comparing embryological differences between organisms.

Benchmark SC.912.L.15.6

Reporting Category	Classification, Heredity, and Evolution
Standard	**Standard 15** Diversity and Evolution of Living Organisms
Benchmark	**SC.912.L.15.6 Discuss distinguishing characteristics of the domains and kingdoms of living organisms. (Also assesses SC.912.L.15.4, SC.912.L.15.5, SC.912.N.1.3, and SC.912.N.1.6.)**
Also Assesses	**SC.912.L.15.4** Describe how and why organisms are hierarchically classified and based on evolutionary relationships. **SC.912.L.15.5** Explain the reasons for changes in how organisms are classified. **SC.912.N.1.3** Recognize that the strength or usefulness of a scientific claim is evaluated through scientific argumentation, which depends on critical and logical thinking, and the active consideration of alternative scientific explanations to explain the data presented. **SC.912.N.1.6** Describe how scientific inferences are drawn from scientific observations and provide examples from the content being studied.
Benchmark Clarifications	The student will classify organisms based on the distinguishing characteristics of the domains and/or kingdoms of living organisms. The student will identify and/or describe how and/or why organisms are hierarchically classified based on evolutionary relationships. The student will identify and/or explain the reasons for changes in how organisms are classified. The student will identify ways in which a scientific claim is evaluated (e.g., through scientific argumentation, critical and logical thinking, and consideration of alternative explanations). The student will identify examples of scientific inferences made from observations.
Assessment Limits	Items referring to distinguishing characteristics of living organisms are limited to the domains Archaea, Bacteria, and Eukarya and the kingdoms Protista, Fungi, Plantae, and Animalia. Items will not require knowledge of specific organisms classified in any domain or kingdom; items should describe the characteristics of an organism and assess its classification.

Assessment Limits	Items may refer to prokaryotic, eukaryotic, unicellular and/or multicellular organisms, autotrophs, and/or heterotrophs, but they will not assess the definition of those terms. Items referring to changes in classification systems should be conceptual and will not require specific knowledge of those changes. Items may address evolutionary classification, phylogeny, and the use of cladograms, but they will not assess the definition of those terms. Items assessing a scientific claim are limited to the classification of organisms.
Stimulus Attribute	Scenarios addressing scientific inferences are limited to classification.
Response Attribute	Responses in items referring to scientific claims and scientific inferences should be specific to the context of the item instead of generic statements.
Prior Knowledge	Items may require the student to apply science knowledge described in the NGSSS from lower grades. This benchmark requires prerequisite knowledge of SC.6.L.15.1, SC.6.N.2.2, SC.7.N.1.6, SC.7.N.1.7, SC.7.N.2.1, and SC.8.N.1.6.

Sample Item 9 SC.912.L.15.6

Organisms classified as fungi have unique characteristics. Which of the following characteristics is found only in organisms classified in the kingdom Fungi?

A. single cells without a nucleus
B. multicellular with chloroplasts
★**C.** multicellular filaments that absorb nutrients
D. colonies of single, photosynthetic cells that reproduce asexually

Benchmark SC.912.L.15.8

Reporting Category	Classification, Heredity, and Evolution
Standard	**Standard 15** Diversity and Evolution of Living Organisms
Benchmark	**SC.912.L.15.8 Describe the scientific explanations of the origin of life on Earth. (Also assesses SC.912.N.1.3, SC.912.N.1.4, and SC.912.N.2.1.)**
Also Assesses	**SC.912.N.1.3** Recognize that the strength or usefulness of a scientific claim is evaluated through scientific argumentation, which depends on critical and logical thinking, and the active consideration of alternative scientific explanations to explain the data presented. **SC.912.N.1.4** Identify sources of information, and assess their reliability according to the strict standards of scientific investigation. **SC.912.N.2.1** Identify what is science, what clearly is not science, and what superficially resembles science (but fails to meet the criteria for science).
Benchmark Clarifications	The student will describe scientific explanations of the origin of life on Earth. The student will identify situations or conditions contributing to the origin of life on Earth. The student will identify ways in which a scientific claim is evaluated (e.g., through scientific argumentation, critical and logical thinking, and consideration of alternative explanations). The student will assess the reliability of sources of information according to scientific standards. The student will identify the criteria that differentiate science from nonscience and pseudoscience.
Assessment Limits	Items may address the conditions required for the origin of life on Earth but will not require specific knowledge of the age of Earth or its eras, periods, or epochs. Items may assess how contributions of scientists such as Pasteur, Oparin, Miller and Urey, Margulis, or Fox aided in the development of the scientific explanation of the origin of life but will not assess what each scientist contributed. Items assessing the origin of organic molecules, chemical evolution, and/or eukaryotic cells should be conceptual.

Assessment Limits	Items may refer to the endosymbiotic theory but will not assess the term in isolation. Items assessing a scientific claim are limited to the scientific explanations of the origin of life on Earth.
Stimulus Attributes	None specified
Response Attribute	Responses in items referring to scientific claims, sources of information, scientific inferences, and identifying what is science should be specific to the context of the item instead of generic statements.
Prior Knowledge	Items may require the student to apply science knowledge described in the NGSSS from lower grades. This benchmark requires prerequisite knowledge of SC.8.L.18.1, SC.7.E.6.3, SC.7.E.6.4, SC.6.E.7.9, SC.6.N.2.1, SC.6.N.2.2, SC.7.N.1.7, SC.7.N.2.1, SC.8.N.2.1, and SC.8.N.2.2.

Sample Item 10 SC.912.L.15.8

One of the accepted scientific theories describing the origin of life on Earth is known as chemical evolution. According to this theory, which of the following events would need to occur **first** for life to evolve?

A. onset of photosynthesis
B. origination of genetic material
★**C.** synthesis of organic molecules
D. formation of the plasma membrane

Benchmark SC.912.L.15.13

Reporting Category	Classification, Heredity, and Evolution
Standard	**Standard 15** Diversity and Evolution of Living Organisms
Benchmark	**SC.912.L.15.13 Describe the conditions required for natural selection, including: overproduction of offspring, inherited variation, and the struggle to survive, which result in differential reproductive success. (Also assesses SC.912.L.15.14, SC.912.L.15.15, and SC.912.N.1.3.)**
Also Assesses	**SC.912.L.15.14** Discuss mechanisms of evolutionary change other than natural selection such as genetic drift and gene flow. **SC.912.L.15.15** Describe how mutation and genetic recombination increase genetic variation. **SC.912.N.1.3** Recognize that the strength or usefulness of a scientific claim is evaluated through scientific argumentation, which depends on critical and logical thinking, and the active consideration of alternative scientific explanations to explain the data presented.
Benchmark Clarifications	The student will explain and/or describe the conditions required for natural selection that result in differential reproductive success. The student will explain and/or describe the scientific mechanisms, such as genetic drift, gene flow, and nonrandom mating, resulting in evolutionary change. The student will explain and/or describe how mutation and genetic recombination increase genetic variation. The student will identify ways in which a scientific claim is evaluated (e.g., through scientific argumentation, critical and logical thinking, and consideration of alternative explanations).
Assessment Limits	Items will not address descent with modification or common descent. Items addressing mutation and genetic recombination in relation to increasing genetic variation must be assessed in the context of evolution. Items will not assess the Hardy-Weinberg principle or genetic equilibrium. Items may address how meiosis contributes to genetic variation but will not assess the steps or stages of meiosis. Items assessing a scientific claim are limited to the topics discussed in SC.912.L.15.13, SC.912.L.15.14, and SC.912.L.15.15.

Stimulus Attributes	None specified
Response Attribute	Responses in items referring to scientific claims should be specific to the context of the item instead of generic statements.
Prior Knowledge	Items may require the student to apply science knowledge described in the NGSSS from lower grades. This benchmark requires prerequisite knowledge of SC.7.L.15.2, SC.7.L.15.3, SC.7.L.16.1, SC.7.L.16.3, SC.7.L.17.3, SC.6.N.2.2, SC.7.N.1.7, and SC.7.N.2.1.

Sample Item 11 SC.912.L.15.13

Over time, the climate of an island became drier, which resulted in changes to the populations of various island finch species. Finch populations with a certain beak shape thrived, while those not having that beak shape decreased. Which of the following describes a necessary condition for these changes in the finch populations to occur?

A. fewer mutations
★**B.** limited food resources
C. limited beak variations
D. overproduction of offspring

Benchmark SC.912.L.16.1

Reporting Category	Classification, Heredity, and Evolution
Standard	**Standard 16** Heredity and Reproduction
Benchmark	**SC.912.L.16.1 Use Mendel's laws of segregation and independent assortment to analyze patterns of inheritance. (Also assesses SC.912.L.16.2.)**
Also Assesses	**SC.912.L.16.2** Discuss observed inheritance patterns caused by various modes of inheritance, including dominant, recessive, codominant, sex-linked, polygenic, and multiple alleles.
Benchmark Clarifications	The student will use Mendel's laws of segregation and independent assortment to analyze patterns of inheritance. The student will identify, analyze, and/or predict inheritance patterns caused by various modes of inheritance.
Assessment Limits	Items referring to general dominant and recessive traits may address but will not assess the P and F1 generations. Items addressing dihybrid crosses or patterns that include codominance, incomplete dominance, multiple alleles, sex-linkage, or polygenic inheritance may assess the P and F_1 generations.
Stimulus Attributes	Inheritance outcomes may be expressed in percent, ratios, or fractions. Scenarios may refer to codominance or incomplete dominance but not both codominance and incomplete dominance. Punnett squares and pedigrees may be used to predict outcomes of a cross.
Response Attribute	Options may include codominance or incomplete dominance but not both.
Prior Knowledge	Items may require the student to apply science knowledge described in the NGSSS from lower grades. This benchmark requires prerequisite knowledge of SC.7.L.16.1 and SC.7.L.16.2.

Sample Item 12 SC.912.L.16.2

Hemophilia is a sex-linked, recessive trait. Which of the following describes the probability of hemophilia in the offspring of a man who does not have hemophilia and a woman who is a heterozygous carrier?

★ **A.** There is a 0% chance that their daughters will have hemophilia.
B. There is a 25% chance that their sons will have hemophilia.
C. There is a 50% chance that their daughters will have hemophilia.
D. There is a 100% chance that their sons will have hemophilia.

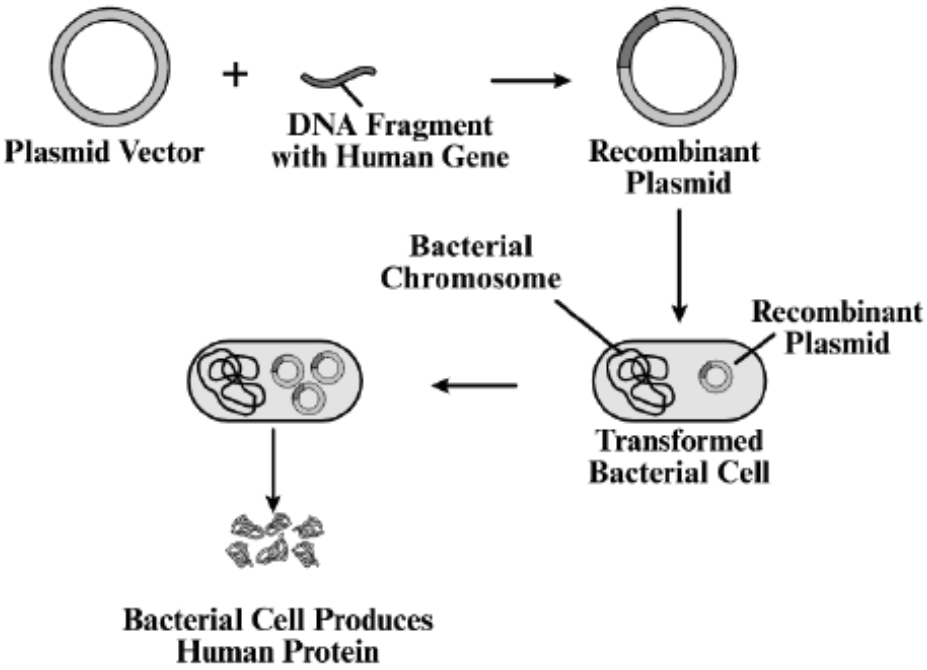
Benchmark SC.912.L.16.3

Reporting Category	Molecular and Cellular Biology
Standard	**Standard 16** Heredity and Reproduction
Benchmark	**SC.912.L.16.3 Describe the basic process of DNA replication and how it relates to the transmission and conservation of the genetic information. (Also assesses SC.912.L.16.4, SC.912.L.16.5, and SC.912.L.16.9.)**
Also Assesses	**SC.912.L.16.4** Explain how mutations in the DNA sequence may or may not result in phenotypic change. Explain how mutations in gametes may result in phenotypic changes in offspring. **SC.912.L.16.5** Explain the basic processes of transcription and translation and how they result in the expression of genes. **SC.912.L.16.9** Explain how and why the genetic code is universal and is common to almost all organisms.
Benchmark Clarifications	The student will describe the process of DNA replication and/or its role in the transmission and conservation of genetic information. The student will describe gene and chromosomal mutations. The student will explain how mutations may or may not result in a phenotypic change. The student will explain the basic processes of transcription and/or translation and their roles in the expression of genes. The student will explain how or why the genetic code (mRNA codon chart) is common to almost all organisms. The student will explain how similarities in the genetic sequences of organisms are due to common ancestry and the process of inheritance.
Assessment Limits	Items may refer to, but will not assess, the cell cycle, mitosis, and/or meiosis. Items requiring the analysis of base pairs for gene mutations are limited to changes in a single gene. Items will not require memorization of specific conditions resulting from chromosomal mutations. Items may refer to the process of meiosis in the context of mutations but will not assess meiosis in isolation. Items addressing transcription or translation will not require specific knowledge of initiation, elongation, or termination.

Stimulus Attribute	Scenarios requiring the use of a codon table must include a codon table.
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 of SC.7.L.16.1 and SC.7.L.16.4.

Sample Item 13 SC.912.L.16.9

Genes for proteins can be cloned and inserted into bacteria, as shown in the diagram below.



Why can bacteria recognize a human gene and then produce a human protein?

A. DNA replication in bacteria and humans is the same.
B. Bacterial cells contain the same organelles as human cells.
★**C.** The basic components of DNA are the same in humans and bacteria.
D. Bacterial cells and human cells contain the same kind of chromosomes.

Benchmark SC.912.L.16.10

Reporting Category	Organisms, Populations, and Ecosystems
Standard	**Standard 16** Heredity and Reproduction
Benchmark	**SC.912.L.16.10 Evaluate the impact of biotechnology on the individual, society, and the environment, including medical and ethical issues.**
Benchmark Clarification	The student will evaluate examples and/or explain the possible impact of biotechnology on the individual, society, and/or the environment.
Assessment Limits	Items may assess current issues but will not require knowledge of specific biotechnologies or specific medical issues. Items assessing the possible impacts of biotechnology will not assess monetary impacts.
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 of SC.7.L.16.4, SC.8.E.5.10, SC.8.N.4.1, and SC.8.N.4.2.

Sample Item 14 SC.912.L.16.10

While genetic engineering has positive benefits, there are also concerns associated with widespread use of genetic engineering in agriculture. If many farmers begin to plant more genetically modified crops that have an increased tolerance to insects, which of the following may result?

A. an increase in the use of pesticides
★**B.** a decrease in genetic diversity of the crops
C. an increase in the contamination of the water supply
D. a decrease in crop productivity on these treated fields

Benchmark SC.912.L.16.13

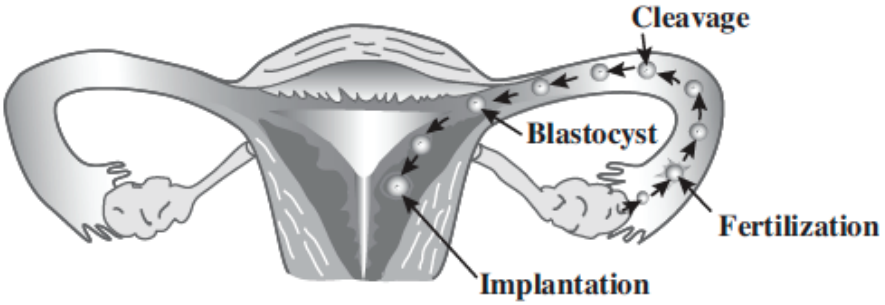
Reporting Category	Organisms, Populations, and Ecosystems
Standard	**Standard 16** Heredity and Reproduction
Benchmark	**SC.912.L.16.13 Describe the basic anatomy and physiology of the human reproductive system. Describe the process of human development from fertilization to birth and major changes that occur in each trimester of pregnancy.**
Benchmark Clarifications	The student will identify and/or describe the basic anatomy and physiology of the human reproductive system. The student will describe the process of human development from the zygotic stage to the end of the third trimester and birth.
Assessment Limits	Items referring to the male human reproductive system are limited to the seminal vesicle, prostate gland, vas deferens, urethra, epididymis, scrotum, penis, and testes. Items referring to the female human reproductive system are limited to the ovaries, oviduct (fallopian tube), uterus, cervix, and vagina. Items assessing the function of the placenta, umbilical cord, amniotic sac, and amniotic fluid are limited to how these structures relate to the development of the fetus. Items will not assess physiological or hormonal changes of the mother during pregnancy. Items assessing the production of hormones in the context of the physiology of the human reproductive system are limited to knowledge of the relationship between structures and the production of hormones. Items will not assess hormonal control during pregnancy. Items may refer to the early stages of development (implantation, morula, blastocyst, gastrulation, neurulation) but will not assess the definition of these terms in isolation. Items referring to changes in each trimester are limited to normal human development. Items will not assess specific knowledge of malformations in the human fetus, miscarriages, maternal preexisting conditions, genetic conditions, or the impact of exposure to environmental conditions. Items will not assess the utilization of technology to assist in or prevent fertilization or monitor development of the fetus. Items will not address or assess the menstrual cycle.

Stimulus Attribute	Illustrations or diagrams may be used.
Response Attribute	Responses will not include diagrams of fetuses at different stages of fetal development.
Prior Knowledge	Items may require the student to apply science knowledge described in the NGSSS from lower grades. This benchmark requires prerequisite knowledge of SC.6.L.14.5.

Sample Item 15 SC.912.L.16.13

A fertilized egg undergoes several stages before it is successfully implanted. The diagram below shows these stages as the fertilized egg travels through the female human reproductive system.

FEMALE HUMAN REPRODUCTIVE SYSTEM



In which of the following structures of the female human reproductive system is the blastocyst implanted during normal human development?

A. ovary
★**B.** uterus
C. vagina
D. amniotic sac

Benchmark SC.912.L.16.17

Reporting Category	Molecular and Cellular Biology
Standard	**Standard 16** Heredity and Reproduction
Benchmark	**SC.912.L.16.17 Compare and contrast mitosis and meiosis and relate to the processes of sexual and asexual reproduction and their consequences for genetic variation. (Also assesses SC.912.L.16.8, SC.912.L.16.14, and SC.912.L.16.16.)**
Also Assesses	**SC.912.L.16.8** Explain the relationship between mutation, cell cycle, and uncontrolled cell growth potentially resulting in cancer. **SC.912.L.16.14** Describe the cell cycle, including the process of mitosis. Explain the role of mitosis in the formation of new cells and its importance in maintaining chromosome number during asexual reproduction. **SC.912.L.16.16** Describe the process of meiosis, including independent assortment and crossing over. Explain how reduction division results in the formation of haploid gametes or spores.
Benchmark Clarifications	The student will differentiate the processes of mitosis and meiosis. The student will describe the role of mitosis in asexual reproduction, and/or the role of meiosis in sexual reproduction, including how these processes may contribute to or limit genetic variation. The student will relate the development of cancer (uncontrolled growth) to mutations that affect the proteins that regulate the cell cycle. The student will describe specific events occurring in each of the stages of the cell cycle and/or phases of mitosis, including cytokinesis. The student will explain how mitosis forms new cells and its role in maintaining chromosome number during asexual reproduction. The student will explain the role of mitosis in growth, repair, and regeneration within a multicellular organism. The student will describe the process of meiosis, including independent assortment and crossing over. The student will explain how meiosis results in the formation of haploid gametes or spores.

Assessment Limits

Items will focus on the relationship between mutations and uncontrolled cell growth, rather than a specific mutation that may result in uncontrolled cell growth.

Items referring to mutation will focus on the general concepts of uncontrolled cell growth and not require knowledge of specific cancers or diseases resulting from that growth.

Items will not assess the specific proteins associated with regulating the cell cycle.

Items may address the presence and location of centrioles but will not require knowledge of the function of centrioles.

Items addressing mitosis or meiosis are limited to identification of phases, structures, and major events of each phase.

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 of SC.7.L.16.3.

Sample Item 16 SC.912.L.16.17

Mitosis and meiosis are processes involved in cellular reproduction. Which of the following is a characteristic of mitosis rather than meiosis?

A. two cycles of cell division
B. replication of cellular genetic material
★**C.** daughter cells that are identical to the parent cell
D. four daughter cells that are produced from each parent cell

Benchmark SC.912.L.17.5

Reporting Category	Organisms, Populations, and Ecosystems
Standard	**Standard 17** Interdependence
Benchmark	**SC.912.L.17.5 Analyze how population size is determined by births, deaths, immigration, emigration, and limiting factors (biotic and abiotic) that determine carrying capacity. (Also assesses SC.912.L.17.2, SC.912.L.17.4, SC.912.L.17.8, and SC.912.N.1.4.)**
Also Assesses	**SC.912.L.17.2** Explain the general distribution of life in aquatic systems as a function of chemistry, geography, light, depth, salinity, and temperature. **SC.912.L.17.4** Describe changes in ecosystems resulting from seasonal variations, climate change, and succession. **SC.912.L.17.8** Recognize the consequences of the losses of biodiversity due to catastrophic events, climate changes, human activity, and the introduction of invasive, nonnative species. **SC.912.N.1.4** Identify sources of information, and assess their reliability according to the strict standards of scientific investigation.
Benchmark Clarifications	The student will use data and information about population dynamics, abiotic factors, and/or biotic factors to explain and/or analyze a change in carrying capacity and its effect on population size in an ecosystem. The student will explain that the distribution of different types of organisms in aquatic ecosystems is influenced by chemistry, geography, light, depth, salinity, and/or temperature. The student will describe the potential changes to an ecosystem resulting from seasonal changes, climate changes, and/or succession. The student will identify positive and/or negative consequences that result from a reduction in biodiversity. The student will assess the reliability of sources of information according to scientific standards.
Assessment Limits	Items referring to chemical factors in aquatic ecosystems are limited to pH, oxygen, carbon dioxide, nitrogen, phosphorous, and salinity. Items referring to geography in aquatic ecosystems are limited to water depth, latitude, temperature, underwater topography, and proximity to land. Items will not require the identification of oceanic zones.

Assessment Limits	Items must focus on changes to the ecosystem and not only on how a single population changes/responds to seasonal changes, climate changes, and/or succession. Items referring to reduction in biodiversity may include examples of catastrophic events, climate changes, human activities, and the introduction of invasive and nonnative species, but they will not assess specific knowledge of these. Items referring to reduction in biodiversity will focus on the consequence and not require knowledge of the specific event that led to the reduction. Items addressing climate change are limited to biodiversity, population dynamics, and ecosystem contexts. Items addressing sources of information and reliability of information are limited to population dynamics, distribution of life in aquatic ecosystems, changes in and effects on ecosystems, and biodiversity.
Stimulus Attributes	None specified
Response Attribute	Responses in items referring to sources of information should be specific to the context of the item instead of generic statements.
Prior Knowledge	Items may require the student to apply science knowledge described in the NGSSS from lower grades. This benchmark requires prerequisite knowledge of SC.7.L.15.2, SC.7.L.15.3, SC.7.L.17.3, SC.6.E.7.7, SC.7.E.6.6, SC.8.N.4.1, and SC.8.N.4.2.

Sample Item 17 SC.912.L.17.5

The number of pythons found throughout Everglades National Park has increased in recent years. These snakes can grow to be very large and are not native to Florida. Wildlife biologists have initiated attempts to capture and remove these pythons. Which statement **best** explains the biologists' reason for removing these pythons from the Everglades?

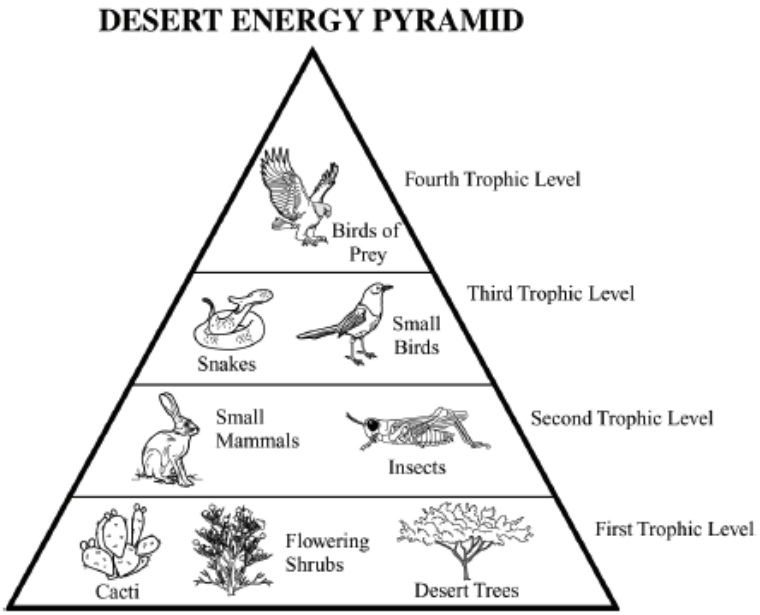
A. The pythons could upset the territorial boundaries of native organisms.
B. The pythons could adapt to overcome diseases common to native snakes.
★**C.** The pythons could prey on native organisms and cause native populations to decline.
D. The pythons could begin to interbreed with native snakes and produce a more successful species.

Benchmark SC.912.L.17.9

Reporting Category	Organisms, Populations, and Ecosystems
Standard	**Standard 17** Interdependence
Benchmark	**SC.912.L.17.9 Use a food web to identify and distinguish producers, consumers, and decomposers. Explain the pathway of energy transfer through trophic levels and the reduction of available energy at successive trophic levels. (Also assesses SC.912.E.7.1.)**
Also Assesses	**SC.912.E.7.1** Analyze the movement of matter and energy through the different biogeochemical cycles, including water and carbon.
Benchmark Clarifications	The student will describe the energy pathways through the different trophic levels of a food web or energy pyramid. The student will analyze the movement of matter through different biogeochemical cycles and/or the interaction of matter and energy within a biogeochemical cycle.
Assessment Limits	Items addressing food webs will require application of the knowledge of roles of organisms in a food web to describe energy pathways rather than the identification of producers, consumers (primary, secondary, tertiary), and decomposers in isolation. Items referring to organisms in food webs are limited to the effect of changes in energy within different trophic levels. Items will not require knowledge of specific organisms or their feeding habits. Items assessing biogeochemical cycles are limited to the water cycle and the carbon cycle. Items referring to the biogeochemical cycles may address but will not assess photosynthesis and cellular respiration in isolation.
Stimulus Attribute	Scenarios will express energy in joules (J).
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 of SC.7.L.17.1, SC.7.L.17.2, SC.8.L.18.3, SC.8.L.18.4, SC.6.E.7.4, SC.7.P.11.2, SC.7.P.11.3, and SC.8.P.9.1.

Sample Item 18 SC.912.L.17.9

A team of ecologists studied feeding patterns within a desert community. The energy pyramid shown below depicts the feeding patterns the ecologists observed.



Which of the following **best** explains the difference in the amount of available energy in the trophic levels of the desert ecosystem?

A. There is less energy available in the organisms in the first trophic level because their tissues are less dense than those at higher trophic levels.

B. There is more energy available in the second trophic level because less energy is needed for hunting compared to the higher trophic levels.

★**C**. There is less available energy in the fourth trophic level because of the loss of energy through metabolism in each of the lower trophic levels.

D. There is more available energy in the organisms in the fourth trophic level because they have greater muscle mass for storing energy than organisms in lower trophic levels have.

Benchmark SC.912.L.17.20

Reporting Category	Organisms, Populations, and Ecosystems
Standard	**Standard 17** Interdependence
Benchmark	**SC.912.L.17.20 Predict the impact of individuals on environmental systems, and examine how human lifestyles affect sustainability. (Also assesses SC.912.L.17.11, SC.912.L.17.13, SC.912.N.1.3.)**
Also Assesses	**SC.912.L.17.11** Evaluate the costs and benefits of renewable and nonrenewable resources, such as water, energy, fossil fuels, wildlife, and forests. **SC.912.L.17.13** Discuss the need for adequate monitoring of environmental parameters when making policy decisions. **SC.912.N.1.3** Recognize that the strength or usefulness of a scientific claim is evaluated through scientific argumentation, which depends on critical and logical thinking, and the active consideration of alternative scientific explanations to explain the data presented.
Benchmark Clarifications	The student will predict how the actions of humans may affect environmental systems and/or affect sustainability. The student will evaluate possible environmental effects resulting from the use of renewable and/or nonrenewable resources. The student will identify ways in which a scientific claim is evaluated (e.g., through scientific argumentation, critical and logical thinking, and/or consideration of alternative explanations).
Assessment Limits	Items will not require specific knowledge of the following: energy technologies, environmental regulations, pollution prevention technologies or devices, or other mechanisms used to prevent pollution. Items referring to renewable and nonrenewable resources will focus on the positive and negative effects on the environment of using those resources and not on identifying examples of renewable and nonrenewable resources. Items referring to monitoring of environmental parameters will focus on why monitoring is needed and not on how the monitoring is done. Items assessing a scientific claim are limited to effects on the environment and renewable and nonrenewable resources.
Stimulus Attributes	None specified

Response Attribute Responses in items referring to science claims should be specific to the context of the item instead of generic statements.

Prior Knowledge Items may require the student to apply science knowledge described in the NGSSS from lower grades. This benchmark requires prerequisite knowledge of SC.7.L.17.3, SC.7.E.6.6, SC.6.N.2.2, SC.7.N.1.7, SC.7.N.2.1, SC.8.N.4.1, and SC.8.N.4.2.

Sample Item 19 SC.912.L.17.20

Salt water is an abundant resource but is unusable for irrigation and drinking. As demands on freshwater sources increase, the use of desalination processes to remove salt from ocean water is increasing. A concern of desalinating water is the large amounts of recovered salts that are returned to the ocean. Which of the following describes the most likely impact of desalination on the surrounding ocean environment?

A. Methane gas would pollute the ocean environment as shoreline organisms begin to die and decay.

★**B.** Alteration in ocean salt levels would cause loss of species and unbalanced populations in marine food webs.

C. Nonrenewable resources in the ocean environment would become depleted and upset the ecosystem's balance.

D. Increased levels of salts and minerals in the ocean would result in overpopulation of marine bivalves due to strengthened shells.

Benchmark SC.912.L.18.1

Reporting Category	Molecular and Cellular Biology
Standard	**Standard 18** Matter and Energy Transformations
Benchmark	**SC.912.L.18.1 Describe the basic molecular structures and primary functions of the four major categories of biological macromolecules. (Also assesses SC.912.L.18.11.)**
Also Assesses	**SC.912.L.18.11** Explain the role of enzymes as catalysts that lower the activation energy of biochemical reactions. Identify factors, such as pH and temperature, and their effect on enzyme activity.
Benchmark Clarifications	The student will identify and/or describe the basic molecular structure of carbohydrates, lipids, proteins, and/or nucleic acids. The student will describe the primary functions of carbohydrates, lipids, proteins, and/or nucleic acids in organisms. The student will explain how enzymes speed up the rate of a biochemical reaction by lowering the reaction's activation energy. The student will identify and/or describe the effect of environmental factors on enzyme activity.
Assessment Limits	Items will not refer to intermolecular forces found in the four types of macromolecules. Items will not assess hydrolysis and dehydration synthesis. Items referring to the role of enzymes as catalysts will use a biological context and not require knowledge of specific enzymes. Items referring to the factors that affect enzyme activity are limited to concentration, pH, and temperature. Items will not require knowledge of how a specific enzyme reacts at a certain pH or temperature. Items will not assess the enzyme-substrate complex.
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 of SC.6.L.14.3 and SC.8.P.8.5.

Sample Item 20 SC.912.L.18.11

As food travels through the digestive system, it is exposed to a variety of pH levels. The stomach has a pH of 2 due to the presence of hydrochloric acid (HCl), and the small intestine has a pH ranging from 7 to 9. HCl converts pepsinogen into pepsin, an enzyme that digests proteins in the stomach. Which of the following **most likely** happens to pepsin as it enters the small intestine?

★ **A.** It becomes inactive.
B. It begins to replicate.
C. Its shape changes to engulf large proteins.
D. Its activity increases to digest more proteins.

Benchmark SC.912.L.18.9

Reporting Category	Molecular and Cellular Biology
Standard	**Standard 18** Matter and Energy Transformations
Benchmark	**SC.912.L.18.9 Explain the interrelated nature of photosynthesis and cellular respiration. (Also assesses SC.912.L.18.7, SC.912.L.18.8, and SC.912.L.18.10.)**
Also Assesses	**SC.912.L.18.7** Identify the reactants, products, and basic functions of photosynthesis. **SC.912.L.18.8** Identify the reactants, products, and basic functions of aerobic and anaerobic cellular respiration. **SC.912.L.18.10** Connect the role of adenosine triphosphate (ATP) to energy transfers within a cell.
Benchmark Clarifications	The student will explain how the products of photosynthesis are used as reactants for cellular respiration and vice versa. The student will explain how photosynthesis stores energy in organic compounds and cellular respiration releases energy from organic compounds. The student will identify the reactants, products, and/or the basic functions of photosynthesis. The student will identify the reactants, products, and/or the basic functions of aerobic and anaerobic cellular respiration. The student will connect the role of adenosine triphosphate (ATP) to energy transfers within the cell.
Assessment Limits	Items will not require the memorization of the stages, specific events, or intermediate molecules produced during these processes. Items will not require the balancing of equations. Items will not assess plant structures.
Stimulus Attributes	Scenarios may include chemical equations. Scenarios referring to adenosine triphosphate should use the abbreviation ATP rather than the words adenosine triphosphate.
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 of SC.6.L.14.4, SC.8.L.18.1, SC.8.L.18.2, SC.7.P.11.2, and SC.7.P.11.3.

Sample Item 21 SC.912.L.18.8

To determine if cells are actively carrying out cellular respiration, scientists design an investigation that measures the amount of various compounds in a closed system over a certain period of time. Which of the following indicates that the cells are actively respiring?

A. a decrease in the water content
B. an increase in the release of oxygen
★**C.** an increase in the concentration of ATP
D. a decrease in the amount of carbon dioxide

Benchmark SC.912.L.18.12

Reporting Category	Molecular and Cellular Biology
Standard	**Standard 18** Matter and Energy Transformations
Benchmark	**SC.912.L.18.12 Discuss the special properties of water that contribute to Earth's suitability as an environment for life: cohesive behavior, ability to moderate temperature, expansion upon freezing, and versatility as a solvent.**
Benchmark Clarifications	The student will explain the properties of water at a conceptual level. The student will explain how the properties of water make it essential for life on Earth.
Assessment Limits	Items referring to the properties of water are limited to hydrogen bonding, polarity, cohesive behavior, ability to moderate temperature, expansion upon freezing, and versatility as a solvent. Items may address adhesion but will not assess adhesion.
Stimulus Attribute	Scenarios must have a biological 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 of SC.6.E.7.4 and SC.8.P.8.5.

Sample Item 22 SC.912.L.18.12

Water is essential for life. Its special properties make water the single most important molecule in plant life. Which of the following properties of water enables it to move from the roots to the leaves of plants?

A. Water expands as it freezes.
B. Water is an excellent solvent.
★ **C.** Water exhibits cohesive behavior.
D. Water is able to moderate temperatures.

Appendix A: Directions for Item Review and Biology 1 End-of-Course Assessment 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 Biology 1 EOC Assessment 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 assessment limits described in the *Biology 1 EOC Assessment Test Item Specifications*?
3. Are the context and language of the test item appropriate for the Biology 1 course according to the course description?
4. What is the cognitive complexity of the test item? Is the item best categorized as low complexity (**L**), moderate complexity (**M**), or high complexity (**H**)?
5. Is the item clearly worded and dependent on the context (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 clang? (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)	**RR** (Revise and Resubmit)
AM (Accept with Metadata Change)	**R** (Reject)
AR (Accept as Revised)	

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

Biology 1 EOC Item Rating Form

NGSSS Science & Social Studies Assessments

Signature_____ Date_____	Students in my (classroom, school, district) [circle one] are given the opportunity to learn the Biology 1 material that these items test, except as noted in my comments.

Sequence	Florida ID	Measures Benchmark	Adheres to Assessment Limits	Is Course Appropriate	Has Appropriate Cognitive Complexity (L, M, H)	Is Clearly Written and Free of Clang	Has Appropriate Content Focus	Has Only One Correct Answer	Has Appropriate MC Options	Is Scientifically Accurate	Overall Rating A, AM, AR, RR, R	Additional Comments

Appendix A: Directions for Context-Dependent Set Item Review and Biology 1 End-of-Course Assessment 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 Biology 1 EOC Assessment 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 appropriate in content and language for Biology 1?
2. Is the main context free of clang, 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)	**RR** (Revise and Resubmit)
AM (Accept with Metadata Change)	**R** (Reject)
AR (Accept as Revised)	

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 assessment limits described in the *Biology 1 End-of-Course Test Item Specifications*?
7. Is the item clearly worded and dependent on or directly related to the main context?
8. Are the context and language of the test item appropriate for Biology 1 according to the course description?
9. What is the cognitive complexity of the test item? Is the item best categorized as low complexity (**L**), moderate complexity (**M**), or high complexity (**H**)?
10. Is the answer free of clang? (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)	**RR** (Revise and Resubmit)
AM (Accept with Metadata Change)	**R** (Reject)
AR (Accept as Revised)	

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

Biology 1 EOC Item Rating Form

NGSSS Science & Social Studies Assessments

Signature_____ Date_____	Students in my (classroom, school, district) [circle one] are given the opportunity to learn the Biology 1 material that these items test, except as noted in my comments.

Context-Dependent Set: Main Context

Sequence	Passage	Is Grade Appropriate	Is Clearly Written and Free of Clang	Is Scientifically Accurate	Overall Rating A, AM, AR, RR, R	Additional Comments

Context-Dependent Set: Items

Sequence	Florida ID	Measures Benchmark	Adheres to Assessment Limits	Is Dependent or Related	Is Course Appropriate	Has Appropriate Cognitive Complexity (L, M, H)	Is Clearly Written and Free of Clang	Has Appropriate Content Focus	Has Only One Correct Answer	Has Appropriate MC Options	Is Scientifically Accurate	Overall Rating A, AM, AR, RR, R	Additional Comments

Appendix B: Science Content Assessed by Biology 1 End-of-Course Assessment

Body of Knowledge Nature of Science
Standard 1 The Practice of Science
SC.912.N.1.1 Define a problem based on a specific body of knowledge, for example: biology, chemistry, physics, and Earth/space science, and do the following: 1. pose questions about the natural world; 2. conduct systematic observations; 3. examine books and other sources of information to see what is already known; 4. review what is known in light of empirical evidence; 5. plan investigations; 6. use tools to gather, analyze, and interpret data (this includes the use of measurement in metric and other systems, and also the generation and interpretation of graphical representations of data, including data tables and graphs); 7. pose answers, explanations, or descriptions of events; 8. generate explanations that explicate or describe natural phenomena (inferences); 9. use appropriate evidence and reasoning to justify these explanations to others; 10. communicate results of scientific investigations; and 11. evaluate the merits of the explanations produced by others. Also assesses SC.912.N.1.4, SC.912.N.1.6, SC.912.L.14.4. **AA**
SC.912.N.1.3 Recognize that the strength or usefulness of a scientific claim is evaluated through scientific argumentation, which depends on critical and logical thinking, and the active consideration of alternative scientific explanations to explain the data presented. Assessed as SC.912.L.14.1, SC.912.L.15.1, SC.912.L.15.6, SC.912.L.15.8, SC.912.L.15.13, and/or SC.912.L.17.20.
SC.912.N.1.4 Identify sources of information, and assess their reliability according to the strict standards of scientific investigation. Assessed as SC.912.N.1.1, SC.912.L.15.1, SC.912.L.15.8, and/or SC.912.L.17.5.
SC.912.N.1.6 Describe how scientific inferences are drawn from scientific observations, and provide examples from the content being studied. Assessed as SC.912.N.1.1, SC.912.L.15.1, and/or SC.912.L.15.6.

AA = annually assessed benchmark

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

Appendix B: Science Content Assessed by Biology 1 End-of-Course Assessment

Body of Knowledge	Nature of Science
Standard 2	**The Characteristics of Scientific Knowledge**
SC.912.N.2.1 Identify what is science, what clearly is not science, and what superficially resembles science (but fails to meet the criteria for science). Assessed as SC.912.L.14.1, SC.912.L.15.1, and/or SC.912.L.15.8.	
SC.912.N.2.2 Identify which questions can be answered through science and which questions are outside the boundaries of scientific investigation, such as questions addressed by other ways of knowing, such as art, philosophy, and religion. Not Assessed.	
Body of Knowledge	**Nature of Science**
Standard 3	**The Role of Theories, Laws, Hypotheses, and Models**
SC.912.N.3.1 Explain that a scientific theory is the culmination of many scientific investigations drawing together all the current evidence concerning a substantial range of phenomena; thus, a scientific theory represents the most powerful explanation scientists have to offer. Assessed as SC.912.L.14.1 and/or SC.912.L.15.1.	
SC.912.N.3.4 Recognize that theories do not become laws, nor do laws become theories; theories are well-supported explanations, and laws are well-supported descriptions. Assessed as SC.912.L.14.1 and/or SC.912.L.15.1.	
Body of Knowledge	**Earth and Space Science**
Standard 7	**Earth Systems and Patterns**
SC.912.E.7.1 Analyze the movement of matter and energy through the different biogeochemical cycles, including water and carbon. Assessed as SC.912.L.17.9.	

AA = annually assessed benchmark

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

Appendix B: Science Content Assessed by Biology 1 End-of-Course Assessment

Body of Knowledge Life Science
Standard 14 Organization and Development of Living Organisms
SC.912.L.14.1 Describe the scientific theory of cells (cell theory), and relate the history of its discovery to the process of science. Also assesses SC.912.N.1.3, SC.912.N.2.1, SC.912.N.3.1, and SC.912.N.3.4. **AA**
SC.912.L.14.2 Relate structure to function for the components of plant and animal cells. Explain the role of cell membranes as a highly selective barrier (passive and active transport). Assessed as SC.912.L.14.3.
SC.912.L.14.3 Compare and contrast the general structures of plant and animal cells. Compare and contrast the general structures of prokaryotic and eukaryotic cells. Also assesses SC.912.L.14.2. **AA**
SC.912.L.14.4 Compare and contrast structure and function of various types of microscopes. Assessed as SC.912.N.1.1.
SC.912.L.14.6 Explain the significance of genetic factors, environmental factors, and pathogenic agents to health from the perspectives of both individual and public health. Assessed as SC.912.L.14.52.
SC.912.L.14.7 Relate the structure of each of the major plant organs and tissues to physiological processes. **AA**

AA = annually assessed benchmark

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

Appendix B: Science Content Assessed by Biology 1 End-of-Course Assessment

Body of Knowledge Life Science
Standard 14 Organization and Development of Living Organisms
SC.912.L.14.26 Identify the major parts of the brain on diagrams or models. **AA**
SC.912.L.14.36 Describe the factors affecting blood flow through the cardiovascular system. **AA**
SC.912.L.14.52 Explain the basic functions of the human immune system, including specific and nonspecific immune response, vaccines, and antibiotics. Also assesses SC.912.L.14.6. **AA**
Body of Knowledge Life Science
Standard 15 Diversity and Evolution of Living Organisms
SC.912.L.15.1 Explain how the scientific theory of evolution is supported by the fossil record, comparative anatomy, comparative embryology, biogeography, molecular biology, and observed evolutionary change. Also assesses SC.912.L.15.10, SC.912.N.1.3, SC.912.N.1.4, SC.912.N.1.6, SC.912.N.2.1, SC.912.N.3.1, and SC.912.N.3.4 **AA**
SC.912.L.15.4 Describe how and why organisms are hierarchically classified and based on evolutionary relationships. Assessed as SC.912.L.15.6.
SC.912.L.15.5 Explain the reasons for changes in how organisms are classified. Assessed as SC.912.L.15.6.

AA = annually assessed benchmark

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

Appendix B: Science Content Assessed by Biology 1 End-of-Course Assessment

Body of Knowledge Life Science
Standard 15 Diversity and Evolution of Living Organisms
SC.912.L.15.6 Discuss distinguishing characteristics of the domains and kingdoms of living organisms. Also Assesses SC.912.L.15.4, SC.912.L.15.5, SC.912.N.1.3, and SC.912.N.1.6. **AA**
SC.912.L.15.8 Describe the scientific explanations of the origin of life on Earth. Also assesses SC.912.N.1.3, SC.912.N.1.4, and SC.912.N.2.1. **AA**
SC.912.L.15.10 Identify basic trends in hominid evolution from early ancestors six million years ago to modern humans, including brain size, jaw size, language, and manufacture of tools. Assessed as SC.912.L.15.1.
SC.912.L.15.13 Describe the conditions required for natural selection, including: overproduction of offspring, inherited variation, and the struggle to survive, which result in differential reproductive success. Also assesses SC.912.L.15.14, SC.912.L.15.15, and SC.912.N.1.3. **AA**
SC.912.L.15.14 Discuss mechanisms of evolutionary change other than natural selection such as genetic drift and gene flow. Assessed as SC.912.L.15.13.
SC.912.L.15.15 Describe how mutation and genetic recombination increase genetic variation. Assessed as SC.912.L.15.13.

AA = annually assessed benchmark

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

Appendix B: Science Content Assessed by Biology 1 End-of-Course Assessment

Body of Knowledge Life Science
Standard 16 Heredity and Reproduction
SC.912.L.16.1 Use Mendel's laws of segregation and independent assortment to analyze patterns of inheritance. Also assesses SC.912.L.16.2. **AA**
SC.912.L.16.2 Discuss observed inheritance patterns caused by various modes of inheritance, including dominant, recessive, codominant, sex-linked, polygenic, and multiple alleles. Assessed as SC.912.L.16.1.
SC.912.L.16.3 Describe the basic process of DNA replication and how it relates to the transmission and conservation of the genetic information. Also assesses SC.912.L.16.4, SC.912.L.16.5, and SC.912.L.16.9. **AA**
SC.912.L.16.4 Explain how mutations in the DNA sequence may or may not result in phenotypic change. Explain how mutations in gametes may result in phenotypic changes in offspring. Assessed as SC.912.L.16.3.
SC.912.L.16.5 Explain the basic processes of transcription and translation and how they result in the expression of genes. Assessed as SC.912.L.16.3.
SC.912.L.16.8 Explain the relationship between mutation, cell cycle, and uncontrolled cell growth potentially resulting in cancer. Assessed as SC.912.L.16.17.

AA = annually assessed benchmark

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

Appendix B: Science Content Assessed by Biology 1 End-of-Course Assessment

Body of Knowledge Life Science
Standard 16 Heredity and Reproduction
SC.912.L.16.9 Explain how and why the genetic code is universal and is common to almost all organisms. Assessed as SC.912.L.16.3.
SC.912.L.16.10 Evaluate the impact of biotechnology on the individual, society, and the environment, including medical and ethical issues. **AA**
SC.912.L.16.13 Describe the basic anatomy and physiology of the human reproductive system. Describe the process of human development from fertilization to birth and major changes that occur in each trimester of pregnancy. **AA**
SC.912.L.16.14 Describe the cell cycle, including the process of mitosis. Explain the role of mitosis in the formation of new cells and its importance in maintaining chromosome number during asexual reproduction. Assessed as SC.912.L.16.17.
SC.912.L.16.16 Describe the process of meiosis, including independent assortment and crossing over. Explain how reduction division results in the formation of haploid gametes or spores. Assessed as SC.912.L.16.17.
SC.912.L.16.17 Compare and contrast mitosis and meiosis and relate to the processes of sexual and asexual reproduction and their consequences for genetic variation. Also assesses SC.912.L.16. 8, SC.912.L.16.14, and SC.912.L.16.16. **AA**

AA = annually assessed benchmark

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

Appendix B: Science Content Assessed by Biology 1 End-of-Course Assessment

Body of Knowledge Life Science
Standard 17 Interdependence
SC.912.L.17.2 Explain the general distribution of life in aquatic systems as a function of chemistry, geography, light, depth, salinity, and temperature. Assessed as SC.912.L.17.5.
SC.912.L.17.4 Describe changes in ecosystems resulting from seasonal variations, climate change, and succession. Assessed as SC.912.L.17.5.
SC.912.L.17.5 Analyze how population size is determined by births, deaths, immigration, emigration, and limiting factors (biotic and abiotic) that determine carrying capacity. Also assesses SC.912.L.17.2, SC.912.L.17.4, SC.912.L.17.8, and SC.912.N.1.4. **AA**
SC.912.L.17.8 Recognize the consequences of the losses of biodiversity due to catastrophic events, climate changes, human activity, and the introduction of invasive, nonnative species. Assessed as SC.912.L.17.5.
SC.912.L.17.9 Use a food web to identify and distinguish producers, consumers, and decomposers. Explain the pathway of energy transfer through trophic levels and the reduction of available energy at successive trophic levels. Also assesses SC.912.E.7.1. **AA**
SC.912.L.17.11 Evaluate the costs and benefits of renewable and nonrenewable resources, such as water, energy, fossil fuels, wildlife, and forests. Assessed as SC.912.L.17.20.

AA = annually assessed benchmark

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

Appendix B: Science Content Assessed by Biology 1 End-of-Course Assessment

Body of Knowledge Life Science
Standard 17 Interdependence
SC.912.L.17.13 Discuss the need for adequate monitoring of environmental parameters when making policy decisions. Assessed as SC.912.L.17.20.
SC.912.L.17.20 Predict the impact of individuals on environmental systems, and examine how human lifestyles affect sustainability. Also assesses SC.912.L.17.11, SC.912.L.17.13, SC.912.N.1.3. **AA**
Body of Knowledge Life Science
Standard 18 Matter and Energy Transformations
SC.912.L.18.1 Describe the basic molecular structures and primary functions of the four major categories of biological macromolecules. Also assesses SC.912.L.18.11. **AA**
SC.912.L.18.7 Identify the reactants, products, and basic functions of photosynthesis. Assessed as SC.912.L.18.9.
SC.912.L.18.8 Identify the reactants, products, and basic functions of aerobic and anaerobic cellular respiration. Assessed as SC.912.L.18.9.
SC.912.L.18.9 Explain the interrelated nature of photosynthesis and cellular respiration. Also assesses SC.912.L.18.7, SC.912.L.18.8, and SC.912.L.18.10. **AA**

AA = annually assessed benchmark

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

Appendix B: Science Content Assessed by Biology 1 End-of-Course Assessment

Body of Knowledge Life Science
Standard 18 Matter and Energy Transformations
SC.912.L.18.10 Connect the role of adenosine triphosphate (ATP) to energy transfers within a cell. Assessed as SC.912.L.18.9.
SC.912.L.18.11 Explain the role of enzymes as catalysts that lower the activation energy of biochemical reactions. Identify factors, such as pH and temperature, and their effect on enzyme activity. Assessed as SC.912.L.18.1.
SC.912.L.18.12 Discuss the special properties of water that contribute to Earth's suitability as an environment for life: cohesive behavior, ability to moderate temperature, expansion upon freezing, and versatility as a solvent. **AA**

AA = annually assessed benchmark

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

Appendix C: Biology 1 End-of-Course Assessment Item Writer Glossary

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 course. The terms and definitions in this glossary are specific to the Florida NGSSS in science for Biology 1 and the content assessed on the Biology 1 EOC Assessment. Knowledge of the terms in the glossaries for grade 5 and grade 8 is assumed.

Abiotic—An environmental factor not associated with or derived from living organisms.

Adenosine triphosphate (ATP)—An organic compound that is composed of adenosine and three phosphate groups. It serves as a source of energy for many metabolic processes. ATP releases energy when it is broken down into ADP and phosphate by hydrolysis during cell metabolism.

Aerobic—Occurring in the presence of oxygen or requiring oxygen to live. In aerobic respiration, which is the process used by cells of most organisms, the production of energy from glucose metabolism requires the presence of oxygen.

Anaerobic—Occurring in the absence of oxygen or not requiring oxygen to live. Anaerobic bacteria produce energy from food molecules without the presence of oxygen.

Anatomy—The scientific study of the shape and structure of organisms and their parts.

Aquatic—In or on the water.

Biotic—Factors in an environment relating to, caused by, or produced by living organisms.

Catalyst—A substance that speeds up or slows down the rate of a reaction without being consumed or altered.

Codominant—Relating to two alleles of a gene pair in a heterozygote that are both fully expressed.

Dominance—Tendency of certain (dominant) alleles to mask the expression of their corresponding (recessive) alleles.

Enzyme—Any numerous proteins that are produced in living cells and that accelerate or catalyze chemical reactions.

Gamete—A reproductive cell having haploid number of chromosomes, especially in mature sperm or egg, capable of fusing with the gamete of the opposite sex to produce a fertilized egg.

Appendix C: Biology 1 End-of-Course Assessment Item Writer Glossary

Haploid—Having a single set of each chromosome in a cell or cell nucleus. In most animals, only the gametes (reproductive cells) are haploid.

Hominid—A group of primates of the family Hominidae, which includes modern humans.

Joule—A unit of work equal to the amount of energy required to lift an object weighing one Newton a distance of one meter.

Mutation—A change in genetic sequence.

Offspring—The progeny or descendants of an animal or plant considered as a group.

Organic molecule—A compound containing carbon atoms and covalent bonds between carbon and hydrogen atoms.

Physiology—The scientific study of an organism's vital functions, including growth, development, reproduction, the absorption and processing of nutrients, the synthesis and distribution of proteins and other organic molecules, and the functioning of different tissues, organs, and other anatomic structures.

Polygenic—Any group of nonallelic genes that collectively control the inheritance of a quantitative character or modify the expression of a qualitative character.

Recessive—An allele for a trait that will be masked unless the organism is homozygous for this trait.

Replication—In molecular biology, the process by which genetic material is copied in cells.

Semipermeable membrane—A membrane that allows specific molecules or ions through by diffusion.

Vaccine—A preparation of a weakened or killed pathogen, such as a bacterium or virus, or of a portion of the pathogen's structure, that stimulates immune cells to recognize and attack the pathogen, especially through antibody production.

Appendix D: Reporting Categories for Statewide Science Assessments and Biology 1 End-of-Course Assessment

Reporting Categories

The following tables represent the content reporting categories for the Statewide Science Assessments and Biology 1 End-of-Course Assessment, along with the approximate percentage of raw-score points that will be derived from each content category.

Statewide Science Assessments				
Grade	**Nature of Science**	**Earth and Space Science**	**Physical Science**	**Life Science**
5	17%	29%	29%	25%
8	19%	27%	27%	27%

Biology 1 End-of-Course Assessment	
Molecular and Cellular Biology	35%
Classification, Heredity, and Evolution	25%
Organisms, Populations, and Ecosystems	40%

Appendix E: Statewide Science Assessments and Biology 1 End-of-Course Assessment Test Design Summary

Item Types and Numbers

This table provides an approximate range for the number of items on each test. These ranges include both the operational and field-test items. All items are multiple choice (MC).

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

Duration of Tests

The table below displays the number of minutes allowed for regular test takers for Statewide Science Assessments and Biology 1 End-of-Course Assessment.

Assessment	Duration (in minutes)
5	160
8	160
Biology 1	160

Appendix F: Periodic Table of the Elements Statewide Science Assessment Grade 8 and Biology 1 End-of-Course Assessment

The Periodic Table of the Elements for use with the Statewide Science Assessment Grade 8 and the Biology 1 EOC Assessment is available online at the Florida Statewide Assessments Program Portal at https://fsassessments.org/.

Appendix G: Revisions

Page(s)	Revision	Date
Cover	Replaced logo	August 2021
1	Revised Introduction section	August 2021
2	Added to the Overall Considerations section	August 2021
3	Revised an Item Contexts (Scenarios) entry	August 2021
5	Revised Item Style and Format General Guidelines entries	August 2021
7	Revised a Context-Dependent Item Sets entry	August 2021
8	Revised Sample CD set	August 2021
9	Revised Sample CD set	August 2021
10	Revised Guidelines for Item Writers	August 2021
11	Revised Item Difficulty entries	August 2021
20	Revised a term	August 2021
40	Revised Benchmark Clarifications	August 2021
41	Added a Benchmark Clarification	August 2021
41	Revised a Stimulus Attribute	August 2021
43	Revised a Benchmark Clarification	August 2021
43	Revised an Assessment Limit	August 2021
45	Revised Benchmark Clarifications	August 2021
45	Revised an Assessment Limit	August 2021
46	Revised a Sample Item	August 2021
48	Revised a Sample Item	August 2021
50	Replaced a Sample Item	August 2021
52	Revised a Benchmark Clarification	August 2021
53	Replaced a Sample Item	August 2021
55	Revised a Benchmark Clarification	August 2021
56	Revised an Assessment Limit	August 2021
57	Revised a Sample Item	August 2021
58	Revised an Assessment Limit	August 2021
61	Revised a Sample Item	August 2021
64	Revised a Stimulus Attribute	August 2021
65	Revised a Benchmark Clarification	August 2021
66	Revised a Sample Item	August 2021
68	Revised an Assessment Limit	August 2021
69	Revised a Sample Item	August 2021
70	Added a Benchmark Clarification	August 2021
71	Revised an Assessment Limit	August 2021

Page(s)	Revision	Date
71	Revised a Sample Item	August 2021
72	Revised a Benchmark Clarification	August 2021
72	Revised an Assessment Limit	August 2021
73	Revised an Assessment Limit	August 2021
73	Revised a Sample Item	August 2021
74	Revised a Benchmark Clarification	August 2021
75	Revised a Sample Item	August 2021
76	Revised a Benchmark Clarification	August 2021
76	Revised an Assessment Limit	August 2021
78	Revised an Assessment Limit	August 2021
80	Revised a Benchmark Clarification	August 2021
81	Replaced a Sample Item	August 2021
82	Revised a Benchmark Clarification	August 2021
A-2	Revised column headers	August 2021
A-5	Revised column headers	August 2021
C-2	Added glossary terms/definitions	August 2021
F-1	Replaced table with link	August 2021

The Florida Department of Education and its test contractors currently employ strategies to protect the environment in the production and destruction of Statewide Science Assessment and Biology 1 EOC Assessment materials. The Department encourages schools and districts to recycle nonsecure Statewide Science Assessment and Biology 1 EOC Assessment interpretive publications after use.

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