OKLAHOMA SCHOOL TESTING PROGRAM
OKLAHOMA CORE CURRICULUM TESTS

TEST AND ITEM SPECIFICATIONS

Science
Grade 8

OKLAHOMA
STATE DEPARTMENT of EDUCATION
JANET BARRESI
STATE SUPERINTENDENT of PUBLIC INSTRUCTION

2012-2013 Edition

Oklahoma State Department of Education
Oklahoma City, Oklahoma

Revised
March 2013

OKLAHOMA CORE CURRICULUM TESTS

TEST AND ITEM SPECIFICATIONS

Table of Contents

Purpose 1

Test Structure, Format, and Scoring 2

Test Alignment with *OK C³* 2

Test Blueprint 3

Depth of Knowledge Assessed by Test Items 5

Universal Test Design Considerations 7

Testing Schedules 7

Multiple-Choice Item Guidelines 9

Stimulus Materials 9

General Considerations 10

Vocabulary 11

Overview of Item Specifications 12

Sample Test Items by Standard 16

Science Formulas for OCCT and OMAAP Grade 8 17

Purpose

The purpose of the Grade 8 Science Test is to measure Oklahoma students' level of proficiency. On this test, students are required to respond to a variety of items linked to the eighth-grade science process and content standards and objectives identified in the *Oklahoma College, Career, and Citizen Ready (C^3) Standards.* All science test forms will assess the identified standards and objectives listed below. The following standards and objectives are intended to summarize the knowledge as identified in *Oklahoma C^3 Standards (OK C^3).*

***OK C^3* Process Standards and Objectives**
Observe and Measure • Qualitative/quantitative observations/ changes (P1.1) • SI (metric) units/appropriate tools (P1.2 and P1.3)
Classify • Classification system (P2.1) • Properties ordered (P2.2)
Experiment • Experimental design (P3.2) • Identification of variables (P3.3) • Hazards/safety practices (P3.4)
Interpret and Communicate • Data tables/line/bar/trend and circle graphs (P4.2) • Explanations/predictions (P4.3)

***OK C^3* Content Standards and Objectives**
Properties and Chemical Changes in Matter • Chemical reactions (C1.1) • Conservation of matter (C1.2)
Motion and Forces • Motion of an object (C2.1) • Object subjected to a force (C2.2)
Diversity and Adaptations of Organisms • Classification (C3.1) • Internal and external structures (C3.2)
Structure and Forces of Earth and the Solar System • Landforms result from constructive and destructive forces (C4.1) • Rock cycle (C4.2) • Global weather patterns (C4.3)
Earth's History • Catastrophic events (C5.1) • Fossil evidence (C5.2)

Copyright © 2013 by the Oklahoma State Department of Education

Developed and published under contract with the Oklahoma State Department of Education by CTB/McGraw-Hill LLC, 20 Ryan Ranch Road, Monterey, California 93940-5703. Copyright © 2013 by the Oklahoma State Department of Education. Only State of Oklahoma educators and citizens may copy, download and/or print the document, located online at www.ok.gov/sde/test-support-teachers-and-administrators. Any other use or reproduction of this document, in whole or in part, requires written permission of the Oklahoma State Department of Education and the publisher.

Test Structure, Format, and Scoring

The Oklahoma Core Curriculum Tests consist of multiple-choice items. Each multiple-choice item is scored as correct or incorrect. The student's raw score is converted to a scaled score using the number correct method. Of the total items, 10 items are field-test items and do not contribute to the student's scaled score.

Content Assessment	Total Items	Total Operational Items	Total Field Test Items
Science	55	45	10

Test Alignment with OK C^3

Criteria for Aligning the Test with the *OK* C^3 Standards and Objectives
1. Categorical Concurrence The test is constructed so that there are at least six items measuring each *OK* C^3 standard. The number of items is based on estimating the number of items that could produce a reasonably reliable estimate of a student's mastery of the content measured.
2. Depth of Knowledge Consistency The test is constructed using items from a variety of Depth of Knowledge levels that are consistent with the processes students need in order to demonstrate proficiency for each *OK* C^3 objective.
3. Range of Knowledge Correspondence The test is constructed so that at least 75% of the objectives for an *OK* C^3 standard have at least one corresponding assessment item.
4. Balance of Representation The test is constructed according to the Test Blueprint which reflects the degree of representation given on the test to each *OK* C^3 standard and/or objective in terms of the percent of total test items measuring each standard and the number of test items measuring each standard and/or objective. The test construction shall yield a balance of representation with an index of 0.7 or higher of assessed objectives related to a standard.
5. Source of Challenge Each test item is constructed in such a way that the major cognitive demand comes directly from the targeted *OK* C^3 objective or concept being assessed, not from specialized knowledge or cultural background of the test taker.

Copyright © 2013 by the Oklahoma State Department of Education

Test Blueprint

The Test Blueprint reflects the degree to which each *Oklahoma C³* standard and objective is represented on the test. The overall distribution of operational items in a test form is intended to look as follows:

OK C³ **Process Standards & Objectives**	**Ideal Number of Items for Alignment to *OK C³****	**Ideal Percentage of Items ****
Observe and Measure	**8-11**	**18-24%**
Qualitative/quantitative observations/changes (P1.1)	4-6	
SI (metrics) units/appropriate tools (P1.2 and P1.3)	4-5	
Classify	**7-9**	**16-20%**
Classification system (P2.1)	4-6	
Properties ordered (P2.2)	3-5	
Experiment	**15-17**	**33-38%**
Experimental design (P3.2)	6-7	
Identify variables (P3.3)	6-7	
Hazards/practice safety (P3.6)	3-4	
Interpret and Communicate	**12-14**	**27-31%**
Data tables/line/bar/trend and circle graphs (P4.2)	6-7	
Explanations/prediction (P4.3)	6-7	
Total Test	***45***	***100%***

* A minimum of 4 items is required to report results for an objective, and a minimum of 6 items is required to report a standard. While the actual numbers of items on the test may not match the blueprint exactly, each future test will move toward closer alignment with the ideal blueprint.

** Percentages are approximations and may result in a sum other than 100 due to rounding.

Copyright © 2013 by the Oklahoma State Department of Education

OK C³ **Content Standards & Objectives**	**Ideal Number of Items for Alignment to *OK C³***	**Ideal Percentage of Items ****
Properties and Chemical Changes in Matter	**8**	**19%**
Chemical reactions (1.1)	4	
Conservation of matter (1.2)	4	
Motion and Forces	**8**	**19%**
Motion of an object (2.1)	4	
Object subjected to a force (2.2)	4	
Diversity and Adaptations of Organisms	**7**	**17%**
Classification (3.1)	3	
Internal and external structures (3.2)	4	
Structures/Forces of the Earth/Solar System	**11**	**27%**
Landforms result from constructive and destructive forces (4.1)	4	
Rock cycle (4.2)	3-4	
Global Weather Patterns (4.3)	3-4	
Earth's History	**7-8**	**18%**
Catastrophic events (5.1)	3-4	
Fossil evidence (5.2)	3-4	
Total Test	***41-42****	***100%***

* Safety items are not included within the content blueprint

** The ideal percentages are based on the total number of items on a test that are matched to the content standards and do not include items added for safety.

Copyright © 2013 by the Oklahoma State Department of Education

Depth of Knowledge Assessed by Test Items

The Oklahoma Core Curriculum Tests will, as closely as possible, reflect the following "Depth of Knowledge" distribution of items.

Grade 8	
Depth of Knowledge	**Percent of Items**
Level 1—Recall and Reproduction	10-15%
Level 2—Skills and Concepts	60-65%
Level 3—Strategic Thinking	20-30%

Level 1 (Recall and Reproduction) is the recall of information such as a fact, definition, term, or a simple procedure, as well as performing a simple science process or procedure. Level 1 requires students to demonstrate a rote response, use a well-known formula, follow a set procedure (like a recipe), or perform a clearly defined series of steps. A "simple" procedure is well defined and typically involves only one step. Verbs such as "identify," "recall," "recognize," "use," "calculate," and "measure" generally represent cognitive work at the recall and reproduction level. Simple word problems that can be directly translated into and solved by a formula are considered Level 1. Verbs such as "describe" and "explain" could be classified at different DOK levels, depending on the complexity of what is to be described and explained.

A student answering a Level 1 item either knows the answer or does not; that is, the answer does not need to be "figured out" or "solved." In other words, if the knowledge necessary to answer an item automatically provides the answer to the item, the item is at Level 1. If the knowledge necessary to answer the items does not automatically provide the answer, the item is at least at Level 2.

Some examples that represent, but do not constitute all Level 1 performances are:

- Recall or recognize a fact, term, or property
- Represent in words or diagrams a scientific concept or relationship
- Provide or recognize a standard, scientific representation for simple phenomena
- Perform a routine procedure, such as measuring length

Copyright © 2013 by the Oklahoma State Department of Education

Level 2 (Skills and Concepts) includes the engagement of some mental processing beyond recalling or reproducing a response. The content knowledge or process involved is more complex than in Level 1. Items require students to make some decisions as to how to approach the question or problem. Keywords that generally distinguish a Level 2 item include "classify," "organize," "estimate," "make observations," "collect and display data," and "compare data." These actions imply more than one step. For example, to compare data requires first identifying characteristics of the objects or phenomenon, and then grouping or ordering the objects. Level 2 activities include: making observations and collecting data; classifying, organizing, and comparing data; and organizing and displaying data in tables, graphs, and charts.

Some action verbs, such as "explain," "describe," or interpret" could be classified at different DOK levels, depending on the complexity of the action. For example, interpreting information from a simple graph, which requires reading information from the graph, is a Level 2. An item that requires interpretation from a complex graph, such as making decisions regarding features of the graph that need to be considered and how information from the graph can be aggregated, is at a Level 3.

Some examples that represent, but do not constitute all of Level 2 performances are:

- Specify and explain the relationship between facts, terms, properties, or variables
- Describe and explain examples and non-examples of science concepts
- Select a procedure according to specified criteria and perform it
- Formulate a routine problem given data and conditions
- Organize, represent, and interpret data

Level 3 (Strategic and Extended Thinking) requires reasoning, planning, using evidence, and a higher level of thinking than the previous two levels. The cognitive demands of Level 3 are complex and abstract. The complexity does not result only from the fact that there could be multiple answers, a possibility for both Levels 1 and 2, but because the multi-step task requires more demanding reasoning. In most instances, requiring students to explain their thinking is at Level 3; requiring a very simple explanation or a word or two should be at Level 2. An activity that has more than one possible answer and requires students to justify the response they give would most likely be Level 3. Experimental designs in Level 3 typically involve more than one dependent variable. Other Level 3 activities include: drawing conclusions from observations; citing evidence and developing a logical argument for concepts; explaining phenomena in terms of concepts; and using concepts to solve non-routine problems.

Some examples that represent, but do not constitute all of Level 3 performances are:

- Identify research questions and design investigations for a scientific problem
- Solve non-routine problems
- Develop a scientific model for a complex situation
- Form conclusions from experimental data

Note—The descriptions are adapted from *Review Background Information and Instructions, Standards and Assessment Alignment Analysis, CCSSO TILSA Alignment Study*, May 21-24, 2001, Version 2.0.

For an extended description of each Depth of Knowledge level, see the student assessment Web site at <http://sde.state.ok.us>.

Copyright © 2013 by the Oklahoma State Department of Education

Universal Test Design Considerations

Universal design, as applied to assessments, is a concept that allows the widest possible range of students to participate in assessments and may even reduce the need for accommodations and alternative assessments by expanding access to the tests themselves. In the Oklahoma Core Curriculum Tests, modifications have been made to some items that simplify and clarify instructions and that provide maximum readability, comprehensibility, and legibility. This includes such things as reduction of language load in content areas other than Reading, increased font size, fewer items per page, and boxed items to assist visual focus. In Science tests, the vocabulary level will be below the grade being tested except for content words. Grade 8 will be two grade levels below. These modifications are evident in the sample items included in this document.

Testing Schedules

The Grade 8 Science Test is meant to be administered in a separate session. Students may be given additional time if needed, but the additional time is to be given as an extension of the same science testing period.

Grade 8 Science	
Test Session	
	Approximately:
Distributing books, reading directions	15 minutes
Administering the Test	60-80 minutes
Total:	75-95 minutes

Copyright © 2013 by the Oklahoma State Department of Education

Multiple-Choice Item Guidelines

- All item stems clearly indicate what is expected in an item to help students focus on selecting a response.
- Each multiple-choice item has a stem (question, statement, or incomplete statement, and/or graphic component) and four answer (or completion) options, only one of which is correct.
- Multiple-choice item stems present a complete problem so that students know what to do before looking at the answer choices; students should not need to read all answer choices before knowing what is expected.
- Art incorporated within an item must be functional and assist students in determining the correct response.

In summary, test items assess whether students: understand relevant concepts and procedures; communicate their understandings effectively in content specific terms; approach problems; and develop viable solutions.

Stimulus Materials

Stimulus materials are the passages, graphs, models, figures, etc., that students must read and examine in order to respond to items. The following characteristics are necessary for stimulus materials:

1. When students are given information, data, or an experimental setup to evaluate, they should know the research question and the purpose of the research.

2. Tables, graphs, reading passages, and illustrations provide sufficient information for assessment of multiple standards.

3. Stimulus materials for a set of items may be a combination of multiple stimuli.

4. Information in stimulus materials is representative of concepts and principles described in *Oklahoma* C^3.

5. For conceptual items, stimulus materials are necessary but not conceptually sufficient for student response.

6. There is a balance of graphic and textual stimulus materials within a test form. At least 50% of the items have appropriate pictorial and graphical representations. Graphs, tables, or figures are clearly associated with their intended items. Graphics appear either on the same page as the stimulus or on the facing page.

7. The stimuli avoid subject matter that might prompt emotional distress on the part of the students.

8. Permission to use stimuli from copyrighted material is obtained as necessary by the testing vendor.

Copyright © 2013 by the Oklahoma State Department of Education

General Considerations

It is necessary to create test items that are reliable, fair, and targeted to the *Oklahoma C*^{3}standards listed on the following pages. There are some general considerations and procedures for effective item development. These considerations include, but are not limited to, the following:

1. Each test form contains items assessing standards and objectives listed in the Test Blueprint for the specific grade and content area. In the *Oklahoma College, Career, and Citizen Ready* document, asterisks have been used to identify standards and objectives that must be assessed by the local school district.

2. Test items that assess each standard are not limited to one particular type of response format. Each item begins with a stem that asks a question or poses a clear problem. Stems may include incomplete sentences in order to reduce unnecessary repetition of text.

3. Test items attempt to focus on content that is authentic and that grade-level students can relate to and understand.

4. Test items are worded precisely and clearly. The more focused an item is, the more reliable and fair it will be, and the more likely all students will understand what is required of them.

5. All items are reviewed to eliminate language that is biased or is otherwise likely to disadvantage a particular group of students. That is, items do not display unfair representations of gender, race, ethnicity, disability, culture, or religion; nor do items contain elements that are offensive to any such groups.

6. All multiple-choice items, including the correct response and distractors, are similar in length and syntax. Students should not be able to rule out an incorrect answer or identify a correct response solely because it looks or sounds different from the other answer choices. Distractors are created so that students reason their way to the correct answer rather than simply identify incorrect responses because of a distractor's obviously inappropriate nature. Distractors should always be plausible (but incorrect) in the context of the item stem. Correct responses are reasonably distributed among A's, B's, C's, and D's. The distractors adopt the language and sense of the material in the selection. Test items focus on reading skills and comprehension strategies, avoiding measurement of the students' feelings or values.

7. Items deal with issues and details that are of consequence in the stimulus and central to students' understanding and interpretation of the stimulus.

8. To the greatest extent possible, no item or answer choice clues the correct answer to any other item. No item stem or answer choice provides clues to any other item's correct answer, nor is the same fact of the passage assessed more than once, including the same vocabulary or technical term.

9. Test items are tied closely and particularly to the stimuli from which they derive, so that the impact of outside (prior) knowledge, while never wholly avoidable, is minimized.

10. The responses "Both of the above," "All of the above," "None of the above," and "Neither of the above" are not used.

Copyright © 2013 by the Oklahoma State Department of Education

11. Most stems are positively worded—avoiding the use of the word not. If a negative is required, the format is "All of the following . . . except."

12. The material presented is balanced, culturally diverse, well written, and interesting to students. The stimuli and items are presented fairly in order to gain a true picture of students' skills.

13. Across all forms, a balance of gender and active/passive roles by gender is maintained.

14. No resource materials or calculators may be used by students during the test.

15. Science: gridlines required on a graph only when a specific point on a graph is needed.

16. Note of explanation: i.e. (*id est*—that is) only such items mentioned may be assessed. e.g. (*exempli gratia*—for example, for instance) items related to the content may be assessed.

Vocabulary

No single source is available to determine the reading level of various words. Therefore, the appropriateness and difficulty of a word is determined in various ways. Vocabulary words are checked in the following: *EDL Core Vocabularies in Reading, Mathematics, Science, and Social Studies*; *Basic Reading Vocabularies*; the *Living Word*; or other reliable readability sources. In addition to using the aforementioned printed resources to assist in creating vocabulary items, each vocabulary item must be approved by Oklahoma's Content Review Committee. The committee members, comprised of Oklahoma educators from across the state, review proposed vocabulary items for grade-level appropriateness. The Grade 8 Science Test will have a vocabulary level two grade levels below, except for science content words.

All items developed using these specifications are reviewed by Oklahoma educators and approved by the Oklahoma State Department of Education. The distribution of newly developed items is based on content and process alignment, difficulty, cognitive ability, percentage of art/graphics, and grade-level appropriateness as determined by an annual Item Development Plan approved by the Oklahoma State Department of Education.

Copyright © 2013 by the Oklahoma State Department of Education

Overview of Item Specifications

For each *Oklahoma C*^{3}standard, item specifications are organized under the following headings:

- Process Standard and Process Objective or Content Standard and Content Objective
- Item Specifications
  a. Emphasis
  b. Stimulus Attributes
  c. Format
  d. Assessment Limits
  e. Content Objectives May Include
  f. Distractor Domain May Include
  g. Sample Test Item

The headings "Process Standard" and "Process Objective" or "Content Standard" and "Content Objective" state the standard and objective being measured as found in the eighth-grade science section of the *Oklahoma College, Career, and Citizen Ready* document.

The heading "Item Specifications" highlights important points about item development and provides examples to facilitate understanding. All items will measure one process objective and one content objective, with the exception of items for process objective 3.6 which measures only safety knowledge and skills.

Note about the Item Specifications and Sample Test Items:

With the exception of content limits, the item specifications give suggestions of what might be included but do not provide an exhaustive list of what can be included. The sample test items are not intended to be definitive in nature or construction—the stimuli and the test items may differ from one test form to another, as may their presentations.

Copyright © 2013 by the Oklahoma State Department of Education

COLLEGE, CAREER AND CITIZEN READY

SCIENCE PROCESSES AND INQUIRY

Grade 8

Asterisks (*) have been used to identify standards and objectives that must be assessed by the local school district. All other skills may be assessed by the Oklahoma School Testing Program (OSTP).

Process Standard 1: Observe and Measure—Observing is the first action taken by the learner to acquire new information about an object, organism, or event. Opportunities for observation are developed through the use of a variety of scientific tools. Measurement allows observations to be quantified. The student will accomplish these objectives to meet this process standard.

1. Identify qualitative and/or quantitative changes given conditions (e.g., temperature, mass, volume, time, position, length) before, during, and after an event.
2. Use appropriate tools (e.g., metric ruler, graduated cylinder, thermometer, balances, spring scales, stopwatches, computers, handheld data collection devices) to measure objects, organisms, and/or events.
3. Use appropriate International System of Units (SI) (i.e., grams, meters, liters, degrees Celsius, and seconds) and SI prefixes (i.e., milli-, centi-, and kilo-) when measuring objects, organisms, and/or events.

Process Standard 2: Classify—Classifying establishes order. Objects, organisms, and events are classified based on similarities, differences, and interrelationships. The student will accomplish these objectives to meet this process standard.

1. Using observable properties, place an object, organism, and/or event into a classification system (e.g., dichotomous keys, periodic table, biological hierarchy).
2. Identify properties by which a set of objects, organisms, or events could be ordered.

Process Standard 3: Experiment Design—Understanding experimental design requires that students recognize the components of a valid experiment. The student will accomplish these objectives to meet this process standard.

*1. Ask questions about the world and design investigations that lead to scientific inquiry. Identify testable questions based on prior knowledge, background research, or observations.
2. Evaluate the design of a scientific investigation.
3. Identify variables and/or controls in an experimental setup: independent variable and *dependent variable.*

**4. Identify a testable hypothesis for an experiment.*

Copyright © 2013 by the Oklahoma State Department of Education

*5. Follow a multistep procedure when carrying out experiments, taking measurements, or performing technical tasks.

6. Recognize potential hazards and practice safety procedures in all science activities.

Process Standard 4: Interpret and Communicate—Interpreting is the process of recognizing patterns in collected data by making inferences, predictions, or conclusions. Communicating is the process of describing, recording, and reporting experimental procedures and results to others. Communication may be oral, written, or mathematical and includes organizing ideas, using appropriate vocabulary, graphs, other visual representations, and mathematical equations. The student will accomplish these objectives to meet this process standard.

*1. Report and record both quantitative/qualitative data in an appropriate method when given an experimental procedure or data.

2. Interpret data tables, line, bar, trend, and/or circle graphs.

3. Evaluate data to develop reasonable explanations, and/or predictions.

*4. Determine if results of investigations support or do not support hypotheses.

*5. Communicate scientific processes, procedures, and conclusions (e.g, model, poster, diagram, journal entry, lab report, scientific paper, oral presentation, and digital presentation).

Process Standard 5: Inquiry—Inquiry can be defined as the skills necessary to carry out the process of scientific thinking. In order for inquiry to occur, students must have the opportunity to make observations, pose questions, formulate testable hypotheses, carry out experiments, and make conclusions based on evidence. The student will accomplish these objectives to meet this process standard.

*1. Ask questions that can be answered through scientific investigation.

*2. Design and conduct experiments utilizing scientific processes.

*3. Use the engineering design process to address a problem or need (e.g., identify a need, conduct background research, prepare preliminary designs, build and test a prototype, test and revise design, communicate results).

*4. Understand the value of technology and use technology to gather data and analyze results of investigations (e.g., probes, hand-held digital devices, digital cameras, software, computers, calculators, digital balances, GPS).

*5. Develop a logical relationship between evidence and explanation to form and communicate a valid conclusion, and suggest alternative explanation.

Copyright © 2013 by the Oklahoma State Department of Education

PHYSICAL SCIENCE

Grade 8

Standard 1: Properties and Chemical Changes in Matter—Physical characteristics of objects can be described using shape, size, and mass. The materials from which objects are made can be described using color, texture, and hardness. These properties can be used to distinguish and separate one substance from another. The student will engage in investigations that integrate the process standards and lead to the discovery of the following objectives:

1. Substances react chemically with other substances to form new substances with different characteristics (e.g., oxidation, combustion, acid/base reactions).
2. Matter has physical properties that can be measured (i.e., mass, volume, temperature, color, texture, density, and hardness) and chemical properties. In chemical reactions and physical changes, matter is conserved (e.g., compare and contrast physical and chemical changes).

Standard 2: Motions and Forces—The motion of an object can be described by its position, direction of motion, and speed as prescribed by Newton's Laws of Motion. The student will engage in investigations that integrate the process standards and lead to the discovery of the following objectives:

1. The motion of an object can be measured. The position of an object, its speed and direction can be represented on a graph.
2. An object that is not being subjected to a net force will continue to move at a constant velocity (i.e., inertia, balanced and unbalanced forces).

LIFE SCIENCE

Grade 8

Standard 3: Diversity and Adaptations of Organisms—Millions of species of animals, plants, and microorganisms are alive today. Although different species might look dissimilar, the unity among organisms becomes apparent from an analysis of internal and external structures. Adaptation involves the selection of naturally occurring variations in populations. The student will engage in investigations that integrate the process standards and lead to the discovery of the following objectives:

1. By classifying organisms, biologists consider details of internal and external structure to infer the degree of relatedness among organisms (i.e., kingdom, phylum, class, order, family, genus, species).
2. Organisms have a great variety of internal and external structures that enable them to survive in a specific habitat (e.g., echolocation, seed dispersal).

Copyright © 2013 by the Oklahoma State Department of Education

EARTH/SPACE SCIENCE

Grade 8

Standard 4: Structures and Forces of the Earth and Solar System—The earth is mostly rock, three-fourths of its surface is covered by a relatively thin layer of water, and the entire planet is surrounded by a relatively thin blanket of air, and is able to support life. The student will engage in investigations that integrate the process standards and lead to the discovery of the following objectives:

1. Landforms result from constructive forces such as crustal deformation, volcanic eruption, and deposition of sediment and destructive forces such as weathering and erosion.
2. The formation, weathering, sedimentation, and reformation of rock constitute a continuing "rock cycle" in which the total amount of material stays the same as its form changes.
3. Atmospheric and ocean circulation patterns affect weather on a global scale (e.g., El Niño, La Niña, Gulf Stream).

Standard 5: Earth's History—The Earth's history involves periodic changes in the structures of the earth over time. The student will engage in investigations that integrate the process standards and lead to the discovery of the following objectives:

1. Earth's history has been punctuated by occasional catastrophic events (e.g., the impact of asteroids or comets, enormous volcanic eruptions, periods of continental glaciation, and the rise and fall of sea level).
2. Fossils provide important evidence of how life and environmental conditions have changed (e.g., Law of Superposition, index fossil, geologic time period, extinction).

Copyright © 2013 by the Oklahoma State Department of Education

Sample Test Items by Standard

Process Standard:

Standard 1: Observe and Measure—Observing is the first action taken by the learner to acquire new information about an object, organism, or event. Opportunities for observation are developed through the use of a variety of scientific tools. Measurement allows observations to be quantified. The student will accomplish the objective to meet this process standard.

Process Objective:

1. Identify qualitative and/or quantitative changes given conditions (e.g., temperature, mass, volume, time, position, length) before, during, and after an event.

Item Specifications:

Emphasis:

- Recognize and determine the qualitative and/or quantitative changes that occur before, during, and after an event.

Stimulus Attributes:

- Test items may include illustrations, graphs (including single-line, double-line, line-of-best-fit; and stacked and multiple bar graphs), data tables, and chemical equations.

Format: Assessable content includes the following:

- Analyze an event in which quantitative changes have occurred and identify a numeric value at some point during the event.
- Identify the greatest, least, hottest, coldest, more, less, increase, decrease, etc., value in a set of data.
- Identify and explain qualitative changes occurring in an event.
- Items include grade-appropriate events in which students identify a change that occurs over time or determine the cause of a change.
- Analyze or identify quantitative changes using common formulas (p. 17).

Assessment Limits: Non-assessable content includes the following:

- Identify a change that occurs over time or determine the cause of a change for grade-appropriate events.
- Identify which data (qualitative or quantitative) would be most important to collect to test a hypothesis.
- Identify observations or measurements which are precise, accurate, and reliable.
- Test items are limited to qualitative and/or quantitative changes before, during, or after an event.
- Distinguish an observation from inference.
- Test items may not use significant digits or use exponents for calculations.

Content Objectives May Include:

- Items may be written to assess any of the content objectives.

Distractor Domain May Include:

- Incorrect answer choices may include plausible, but inaccurate, changes or causes.

Copyright © 2013 by the Oklahoma State Department of Education

Science Formulas for OCCT and OMAAP Grade 8

Note: The student may need to recall the formula as it may or may not appear as part of the item.

1. Cellular respiration

$$\mathbf{C_6H_{12}O_6 + 6\ O_2 \longrightarrow 6\ CO_2 + 6\ H_2O}$$

2. Photosynthesis

$$\mathbf{6\ CO_2 + 6\ H_2O + \text{Light energy} \longrightarrow C_6H_{12}O_6 + 6\ O_2}$$

3. Density

$$\mathbf{\text{Density} = \frac{\text{Mass (g)}}{\text{Volume (cm}^3\text{)}} \quad \text{or} \quad D = m/v \quad \text{or} \quad D = g/cm^3}$$

4. Speed

$$\mathbf{\text{Speed} = \frac{\text{Distance (m)}}{\text{Time (s)}} \quad \text{or} \quad s = d/t \quad \text{or} \quad s = m/s}$$

5. Force

$$\mathbf{\text{Force} = \text{Mass (kg)} \times \text{Acceleration (m/s}^2\text{)} \quad \text{or} \quad F = ma \quad \text{or} \quad F = kg/m/s^2)}$$

6. Volume

$$\mathbf{\text{Volume (cm}^3\text{)} = \frac{\text{Mass (g)}}{\text{Density (g/ cm}^3\text{)}} \quad \text{or} \quad 1\ cm^3 = 1\ mL \quad \text{or} \quad V = L \times W \times H}$$

7. Velocity

$$\mathbf{\text{Velocity} = \frac{\text{Distance (m)}}{\text{Time (s)}} \quad \text{or} \quad V = \frac{D\ (m)}{t\ (s)}}$$

Copyright © 2013 by the Oklahoma State Department of Education

Sample Test Item:
Process Objective: 1.1
Content Objective: 1.2
Depth of Knowledge: 2
Correct Response: C

Unknown substances are mixed in four beakers, and a thermometer is placed in each beaker. The thermometers are checked every minute for five minutes, and the temperatures are recorded in the table.

Temperatures in Beakers Over Time

Time (minutes)	Beaker A (°C)	Beaker B (°C)	Beaker C (°C)	Beaker D (°C)
0	20	20	20	20
1	21	19	21	20
2	22	18	22	20
3	20	18	23	20
4	20	17	24	20
5	20	16	25	20

After five minutes, in which beaker did the greatest change in temperature occur?

A Beaker A

B Beaker B

C Beaker C

D Beaker D

Copyright © 2013 by the Oklahoma State Department of Education

Sample Test Item:
Process Objective: 1.1
Content Objective: 1.2
Depth of Knowledge: 2
Correct Response: B

A student heated 20 grams of liquid hydrogen peroxide until it changed to liquid water and oxygen gas.

Which of these best describes the total mass of water and oxygen that was produced?

A more than 20 grams because heat was added

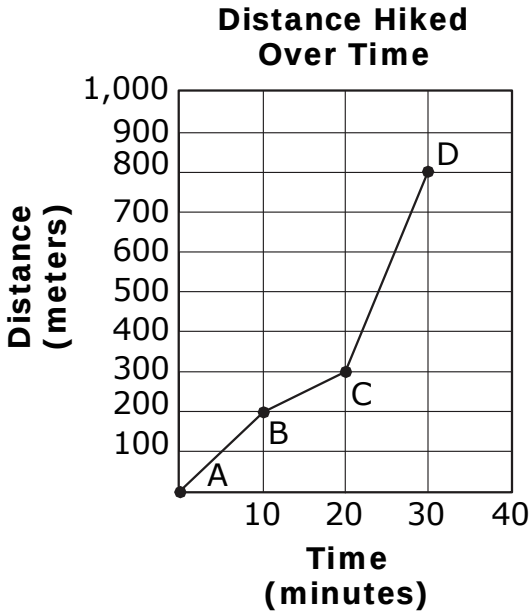
B 20 grams because no matter was added or removed

C less than 20 grams because oxygen gas is very light

D more than 20 grams because there are two new substances

Copyright © 2013 by the Oklahoma State Department of Education

Sample Test Item:
Process Objective: 1.1
Content Objective: 2.1
Depth of Knowledge: 3
Correct Response: B



What is the speed of the person from point C to point D?

A 15 $\frac{\text{meters}}{\text{minute}}$

B 50 $\frac{\text{meters}}{\text{minute}}$

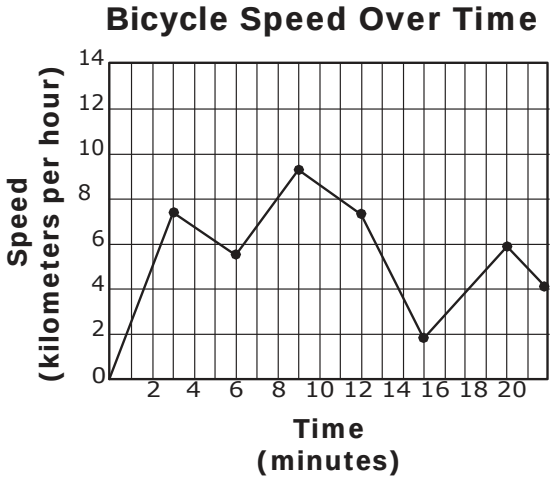
C 400 $\frac{\text{meters}}{\text{minute}}$

D 550 $\frac{\text{meters}}{\text{minute}}$

Copyright © 2013 by the Oklahoma State Department of Education

Sample Test Item:
Process Objective: 1.1
Content Objective: 2.1
Depth of Knowledge: 3
Correct Response: C

The graph below shows the speed of a person riding a bicycle.



The person was most likely traveling up the steepest hill between

A 2 to 4 minutes.

B 6 to 8 minutes.

C 12 to 14 minutes.

D 16 to 18 minutes.

Copyright © 2013 by the Oklahoma State Department of Education

Process Standard:

Standard 1: Observe and Measure—Observing is the first action taken by the learner to acquire new information about an object, organism, or event. Opportunities for observation are developed through the use of a variety of scientific tools. Measurement allows observations to be quantified. The student will accomplish the objective to meet this process standard.

Process Objective:

2. Use appropriate tools (e.g., metric ruler, graduated cylinder, thermometer, balances, spring scales, stopwatches, computers, handheld data collection devices) when measuring objects, organisms, and/or events.

Item Specifications:

Emphasis:

- Recognize and select appropriate scientific tools for measuring objects, organisms, and/or events.

Stimulus Attributes:

- Test items may include illustrations, descriptions, graphs, and/or data tables.
- Tools may include: beaker, flask, test tube, rubber stopper, stirring rod, overflow container, Bunsen burner, balance, spring scale, metric ruler, Celsius thermometer, stopwatch, anemometer, hot plate, GPS, and seismograph.

Format: Assessable content includes the following:

- Identify appropriate tools used when measuring objects, organisms, and/or events.
- Use tools to make quantitative measurements.
- Make basic calculations needed when measuring between SI units (e.g., speed, velocity, acceleration, 1,000 mL=1L, 1mL of water=1g) using common formulas (p. 17).
- Identify correct method for measuring and/or using measurement tools.

Assessment Limits: Non-assessable content includes the following:

- Test items are limited to selecting the appropriate tools commonly used in eighth-grade science classrooms for measuring an object, organism, and/or event.
- Items referencing units other than SI units will not be used.
- Items referencing units or prefixes other than SI units will not be used.
- Items with derived units other than those in P1.3, C2.1, C2.2, and C4.3 will not be used.
- Items requiring English to metric conversions.

Content Objectives May Include:

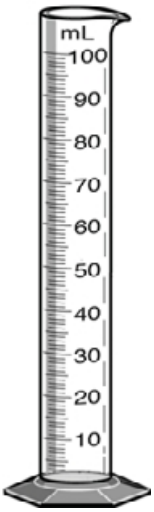
- Items may be written to assess any of the content objectives.

Distractor Domain May Include:

- Inappropriate tools for measurement
- Inappropriate measurements for specific tools

Copyright © 2013 by the Oklahoma State Department of Education

Sample Test Item:
Process Objective: 1.2
Content Objective: 1.2
Depth of Knowledge: 1
Correct Response: C



This tool is used to measure

A time.

B mass.

C volume.

D temperature.

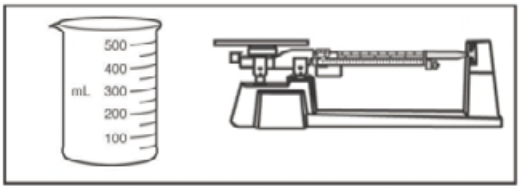
Copyright © 2013 by the Oklahoma State Department of Education

Sample Test Item:
Process Objective: 1.2
Content Objective: 3.1
Depth of Knowledge: 1
Correct Response: C

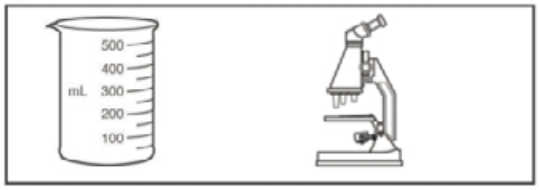
Students classified leaves by their lengths and the patterns of their veins.

Which pair of tools was most likely used for this activity?

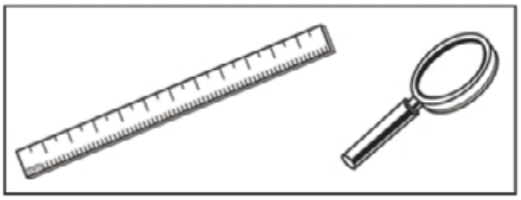
A



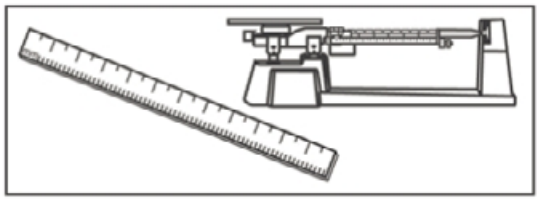
B



C



D



Copyright © 2013 by the Oklahoma State Department of Education

Sample Test Item:
Process Objective: 1.2
Content Objective: 1.2
Depth of Knowledge: 2
Correct Response: A

Use the following information to calculate the volume of an irregularly shaped rock specimen:

1. Place 250 mL of water in a graduated cylinder.
2. Place the rock specimen in the graduated cylinder.
3. The water level in the graduated cylinder then rises to a level of 318 mL.

The volume of the rock specimen is

A 68 mL.

B 250 mL.

C 318 mL.

D 568 mL.

Copyright © 2013 by the Oklahoma State Department of Education

Process Standard:

Standard 1: Observe and Measure—Observing is the first action taken by the learner to acquire new information about an object, organism, or event. Opportunities for observation are developed through the use of a variety of scientific tools. Measurement allows observations to be quantified. The student will accomplish the objective to meet this process standard.

Process Objective:

3. Use appropriate International System of Units (SI) (i.e., grams, meters, liters, degrees Celsius, and seconds), and SI prefixes (i.e., milli-, centi-, and kilo-) when measuring objects, organisms, and/or events.

Item Specifications:

Emphasis:

- Recognize and select appropriate SI units when investigating objects, organisms, and/or events.

Stimulus Attributes:

- Test items may include illustrations, descriptions, graphs, and data tables.

Format: Assessable content includes the following:

- Identify appropriate SI units for measurement.
- Identify appropriate SI prefixes.
- Make basic calculations needed when measuring with appropriate SI units or making conversions between SI units.
- Identify appropriate derived units for acceleration, velocity, and speed.
- Utilize common science formulas (p. 17) to determine the appropriate SI units.

Assessment Limits: Non-assessable content includes the following:

- Test items are limited to the SI units and prefixes listed in the objective above.
- Conversions between English standard units and SI units will not be required. English units can be referenced when necessary (e.g., candlepower, BTU, inches of Hg).
- Students will identify derived units for acceleration, velocity, and speed.

Content Objectives May Include:

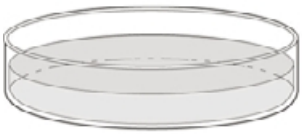
- Items may be written to assess any of the content objectives.

Distractor Domain May Include:

- Incorrect use of SI unit
- Incorrect SI measurement

Copyright © 2013 by the Oklahoma State Department of Education

Sample Test Item:
Process Objective: 1.3
Content Objective: 1.2
Depth of Knowledge: 1
Correct Response: A



The most appropriate scientific unit for measuring the volume of the liquid in this container is

A milliliters.

B milligrams.

C millimeters.

D milliseconds.

Copyright © 2013 by the Oklahoma State Department of Education

Sample Test Item:
Process Objective: 1.3
Content Objective: 1.2
Depth of Knowledge: 2
Correct Response: C

A student was given a chemical equation and a data table.

$$Ca(OH)_2 + 2HCl \rightarrow CaCl_2 + 2H_2O$$

Chemical Reaction Data

Total Mass	$Ca(OH)_2$	2HCl	$CaCl_2$	$2H_2O$
Initial	74	73	0	0
Final	0	0	111	?

Which calculation should the student use to find the final mass of H_2O?

A (111 – 73) grams

B (111 – 73) liters

C (74 + 73 – 111) grams

D (74 + 73 – 111) liters

Copyright © 2013 by the Oklahoma State Department of Education

Sample Test Item:
Process Objective: 1.3
Content Objective: 3.2
Depth of Knowledge: 2
Correct Response: D

During an investigation, a scientist needs to measure the internal and external parts that help a polar bear survive in cold environments.

Which polar bear parts and measurements are most appropriate for this investigation?

A

Part that Helps a Polar Bear Survive	Measurement
tail	length of tail in kilometers
claws	mass of claws in grams

B

Part that Helps a Polar Bear Survive	Measurement
tail	length of tail in centimeters
claws	mass of claws in milliliters

C

Part that Helps a Polar Bear Survive	Measurement
fur	length of fur in centimeters
blubber	mass of blubber in milliliters

D

Part that Helps a Polar Bear Survive	Measurement
fur	length of fur in centimeters
blubber	mass of blubber in grams

Copyright © 2013 by the Oklahoma State Department of Education

Process Standard:

Standard 2: Classify—Classifying establishes order. Objects, organisms, and events are classified based on similarities, differences, and interrelationships. The student will accomplish the objective to meet this process standard.

Process Objective:

1. Using observable properties, place an object, organism, and/or event into a classification system (e.g., dichotomous keys, periodic table, biological hierarchy).

Item Specifications:

Emphasis:

- Apply classification skills based on observations. Place objects, organisms, and/or events into a classification system based on their properties.

Stimulus Attributes:

- Test items may include illustrations, data tables, graphs (e.g., single-line, double-line, and multiple-lines), flowcharts, and classification keys including dichotomous keys.
- Items include classification of science-related objects, organisms, or events. Test items should not include cladograms or phylogenetic trees.

Format: Assessable content includes the following:

- Use a dichotomous key to place objects, organisms, and/or events into a classification system.
- Identify similar and/or different characteristics used to classify objects, organisms, and/or events into a classification system.
- Use a periodic table to obtain grade level appropriate chemical information.

Assessment Limits: Non-assessable content includes the following:

- Classification is limited to using observable properties to place objects, organisms, and/or events in a classification system.
- Test items are limited to assessing observable characteristics that are present in graphics or text descriptions.

Content Objectives May Include:

- Items may be written to assess any of the content objectives.

Distractor Domain May Include:

- Plausible, but inaccurate, classification schemes

Copyright © 2013 by the Oklahoma State Department of Education

Sample Test Item:
Process Objective: 2.1
Content Objective: 4.2
Depth of Knowledge: 3
Correct Response: A

Chemistry of Four Minerals

Mineral	Chemical Formula
Quartz	SiO_2
Zircon	$ZrSiO_2$
Talc	$Mg_3Si_4O_{10}(OH)_2$
Orthoclase	$KAlSi_3O_8$

All these minerals belong to the same group.

Which group do these minerals belong to, and which element is contained in each mineral?

A silicates because each mineral contains a combination of silicon and oxygen

B silicates because each mineral contains oxygen

C oxides because each mineral contains oxygen

D oxides because each mineral contains oxygen and a metal

Copyright © 2013 by the Oklahoma State Department of Education

Sample Test Item:
Process Objective: 2.1
Content Objective: 3.1
Depth of Knowledge: 2
Correct Response: D

Botanists identify violets by their flowers and leaves. A common blue violet is shown.

Which plant is most likely another type of violet?

A

B

C

D

Copyright © 2013 by the Oklahoma State Department of Education

Sample Test Item:
Process Objective: 2.1
Content Objective: 4.1
Depth of Knowledge: 3
Correct Response: C

Landforms Key

1a. Formed primarily due to wind..... go to 2

1b. Not formed primarily due to wind..... go to 3

2a. Formed by deposition ..... Landform R

2b. Formed by erosion ..... Landform T

3a. Caused by deposition after a short-term increase in river flow ..... Landform V

3b. Not caused by deposition after a short-term increase in river flow ..... go to 4

4a. Formed by dropping sediments as river water enters a slower flowing body of water..... Landform X

4b. Formed as rocks are changed by the movement of water, sand, and pebbles ..... Landform Z

According to the key, which landform best represents a delta?

A Landform T

B Landform V

C Landform X

D Landform Z

Copyright © 2013 by the Oklahoma State Department of Education

Process Standard:

Standard 2: Classify—Classifying establishes order. Objects, organisms, and events are classified based on similarities, differences, and interrelationships. The student will accomplish the objective to meet this process standard.

Process Objective:

2. Identify properties by which a set of objects, organisms, or events could be ordered.

Item Specifications:

Emphasis:

- Use a given property or properties to order a set of objects, organisms, and/or events.

Stimulus Attributes:

- Test items may include illustrations, graphs, and data tables.
- Test items may include a set of misordered objects, organisms, or events that students must reorder into the correct sequence.
- Items include grade-appropriate objects, organisms, or events displaying similar scientific properties.

Format: Assessable content includes the following:

- Identify properties by which a set of objects, organisms, and/or events are ordered.
- Order a set of objects, organisms, and/or events.
- Student may need to determine the property by which the objects, organisms, or events are ordered.

Assessment Limits: Non-assessable content includes the following:

- Information outside the contextual level of grade 8 will not be assessed.
- The number of properties is limited to no more than 6 per item.

Content Objectives May Include:

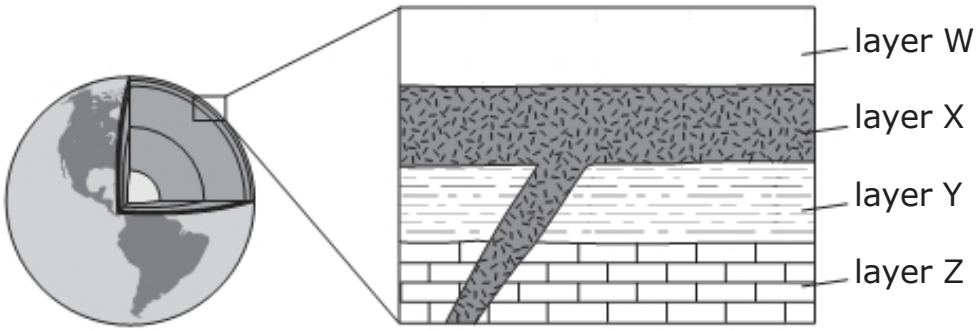
- Items may be written to assess any of the content objectives.

Distractor Domain May Include:

- Properties that are not similar
- Irrelevant properties

Copyright © 2013 by the Oklahoma State Department of Education

Sample Test Item:
Process Objective: 2.2
Content Objective: 5.1
Depth of Knowledge: 2
Correct Response: D



Based on the cross-section drawing, which two layers most likely formed before a volcanic eruption?

A layers W and X

B layers X and Z

C layers Y and X

D layers Z and Y

Copyright © 2013 by the Oklahoma State Department of Education

Sample Test Item:
Process Objective: 2.2
Content Objective: 1.2
Depth of Knowledge: 2
Correct Response: B

The chart shows whether different objects will scratch rocks.

Hardness

Scratch Test Results				
Rock	**Scratched by Fingernail (2.2)**	**Scratched by Penny (3.0)**	**Scratches Glass (5.5)**	**Scratched by Quartz (7.0)**
W	no	yes	no	yes
X	no	no	no	no
Y	no	no	yes	yes
Z	yes	yes	no	yes

Which list shows these rocks in order from hardest to softest?

A X, W, Y, Z
B X, Y, W, Z
C Z, Y, W, X
D Z, W, Y, X

Copyright © 2013 by the Oklahoma State Department of Education

Sample Test Item:
Process Objective: 2.2
Content Objective: 3.1
Depth of Knowledge: 3
Correct Response: C

A student collected a leaf while walking to school. The student decided to use a dichotomous key to identify the leaf.

A Key to the Leaves of Some Trees in Oklahoma

1. a. Leaves are scale and awe-like ..... Eastern Red Cedar
   b. Leaves are broad ..... go to 2
2. a. Compound leaves divided into 7 leaflets..... White Ash
   b. Simple leaves ..... go to 3
3. a. Lobed, rounded leaves with 7 to 9 lobes .....White Oak
   b. Leaves have jagged, toothed edges ..... go to 4
4. a. Long, slender leaves on branches that droop down ..... Weeping Willow
   b. Leaves at the widest part are more than 5 cm ..... go to 5
5. a. Leaves have an oval shape ..... American Beech
   b. Leaves have a toothed and lobed shape ..... Sugar Maple

Which set of properties should the student observe to identify the leaf using the dichotomous key?

A leaf size, leaf shape, and leaf color

B leaf veins, leaf size, and branch shape

C leaf shape, leaf arrangement, and leaf edges

D leaf arrangement, leaf edges, and bark texture

Copyright © 2013 by the Oklahoma State Department of Education

Process Standard:

Standard 3: Experimental Design—Understanding experimental design requires that students recognize the components of a valid experiment. The student will accomplish the objective to meet this process standard.

Process Objective:

2. Evaluate the design of a scientific investigation.

Item Specifications:

Emphasis:

- Sequence steps in logical progression and determine which steps are not needed or are missing; identify correct and incorrect scientific procedures; or identify the purpose of an experiment.

Stimulus Attributes:

- Test items include a scenario of an experimental design and may include illustrations, graphs, and/or data tables.

Format: Assessable content includes the following:

- Determine the correct order for the steps of an experiment.
- Identify errors in experimental design.
- Identify appropriate graphical representations of data.
- Identify necessary and/or unnecessary steps in an experiment.
- Identify a testable hypothesis.
- Identify appropriate conclusion of an experiment.
- Identify parts of an experiment that must be controlled (constants or controlled variables).

Assessment Limits: Non-assessable content includes the following:

- Test items are limited to reordering steps of a scientific investigation that are listed in an incorrect order; identifying steps of a scientific investigation that are unnecessary or steps that are missing; or evaluating experimental designs.

Content Objectives May Include:

- Items may be written to assess any of the content objectives.

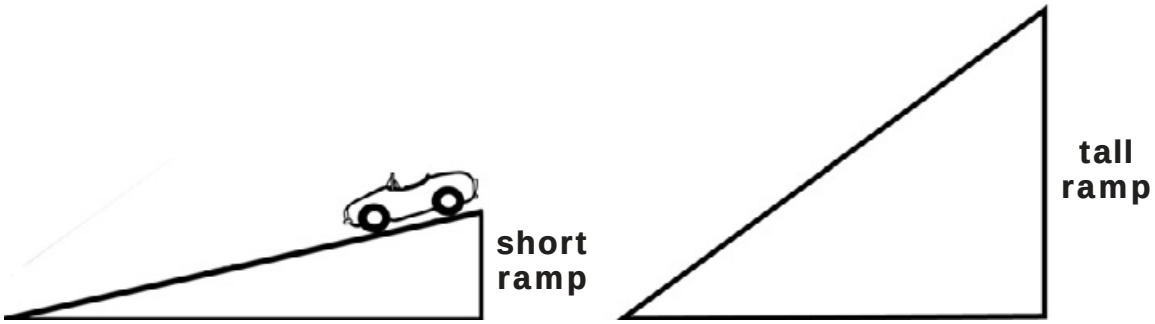
Distractor Domain May Include:

- Steps listed in an incorrect order
- Steps not needed in an experiment
- Unnecessary steps for an experiment
- Inappropriate experiment procedures
- Incorrect purpose for experiment
- Incorrect conclusion of an experiment

Copyright © 2013 by the Oklahoma State Department of Education

Sample Test Item:
Process Objective: 3.2
Content Objective: 2.2
Depth of Knowledge: 2
Correct Response: B

Students were given some materials to determine the effect of ramp height on the total distance a toy car travels.



The students performed four steps during their experiment:

1. Put the car at the top of the short ramp.
2. Let the car go until it stops.
3. Measure the distance the car traveled.
4. Record the distance in a chart.

Which step should be completed next?

A Identify which ramp will make the car go farther.

B Place the car at the top of the tall ramp.

C Put a new surface on the short ramp.

D Change the wheels on the car.

Copyright © 2013 by the Oklahoma State Department of Education

Sample Test Item:
Process Objective: 3.2
Content Objective: 1.2
Depth of Knowledge: 2
Correct Response: D

A student wants to determine if a solid substance is an acid or a base. In what order should the student complete the following steps?

W. Test with blue litmus paper.
X. Dissolve the substance in water.
Y. Look at any changes in the color of the litmus paper.
Z. Grind some of the substance to make a powder.

A W, Z, X, Y
B X, W, Y, Z
C Y, X, W, Z
D Z, X, W, Y

Copyright © 2013 by the Oklahoma State Department of Education

Sample Test Item:
Process Objective: 3.2
Content Objective: 3.2
Depth of Knowledge: 3
Correct Response: B

Students conducted an experiment that compared the effects of different sounds on the growth of bean plants. The students planted bean seeds of the same type and size in three containers with the same type of soil. The students placed the containers in the locations described in a chart.

Bean Plant Locations and Sounds

Container	Location and Sounds
X	bedroom with 4 hours of music per day
Y	living room with 4 hours of television per day
Z	empty room with no sound

The students gave each plant the same amount of water at the same time each day. After two weeks, they observed that the plant in the living room was the largest and had the most leaves. The students concluded that bean plants grow the fastest when exposed to television sounds.

Which statement describes the greatest error the students made in this experimental design?

A Students did not control for the variables of soil type or amount of water.

B Students did not control other variables that might affect plant growth.

C Students did not use enough different types of music.

D Students did not plant the beans from seeds.

Copyright © 2013 by the Oklahoma State Department of Education

Process Standard:

Standard 3: Experimental Design—Understanding experimental design requires that students recognize the components of a valid experiment. The student will accomplish the objective to meet this process standard.

Process Objective:

3. Identify variables and/or controls in an experimental setup: independent variable and dependent variable.

Item Specifications:

Emphasis:

- Identify the most appropriate variables and controls in an experimental design (i.e., independent variable, dependent variable, control and constant variables).

Stimulus Attributes:

- Test items include a scenario of an experimental design and may include illustrations, graphs, and data tables.
- Test items present an experimental setup or the results of an experiment.
- Students are asked to identify either the control, independent, or dependent variable.
- Items emphasize student-designed, classroom-conducted investigations.

Format: Assessable content includes the following:

- Identify the independent variable for an experiment.
- Identify the dependent variable for an experiment.
- Identify the control for an experiment.
- Identify parts of an experiment that must be controlled (constants or controlled variables).
- Identify the most appropriate independent variable, dependent variable, control or constant variable for use within a given controlled experiment.

Assessment Limits: Non-assessable content includes the following:

- Designs involving multiple independent or dependent variables.
- Information outside the contextual level of grade 8 Science will not be used.

Content Objectives May Include:

- Items may be written to assess any of the content objectives.

Distractor Domain May Include:

- Irrelevant variables
- Wrong type of variable

Copyright © 2013 by the Oklahoma State Department of Education

Sample Test Item:
Process Objective: 3.3
Content Objective: 3.2
Depth of Knowledge: 2
Correct Response: C

An experiment is performed on one species of ants. One group is placed in a cool and damp environment and the other group is placed into a warm and damp environment. All other conditions are kept the same. The ants are observed for four weeks.

What is the independent variable and what should the students be observing?

A environmental temperature; type of food eaten

B environmental moisture; size of the ants

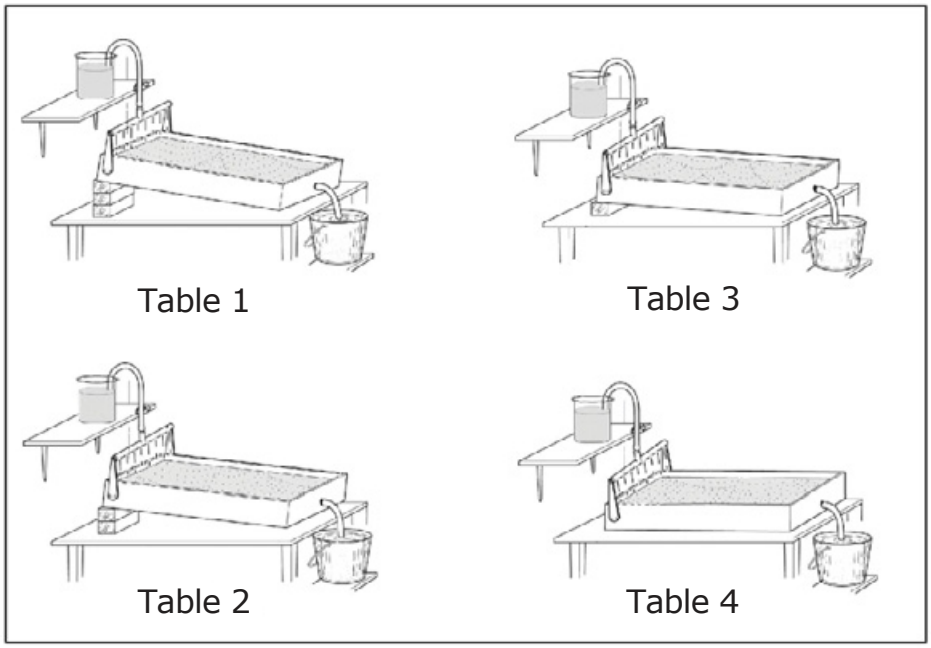
C environmental temperature; number of ants

D environmental moisture; type of food eaten

Copyright © 2013 by the Oklahoma State Department of Education

Sample Test Item:
Process Objective: 3.3
Content Objective: 4.1
Depth of Knowledge: 2
Correct Response: B

Students performed an experiment to test the effects of the slope of a stream table on the amount of sand eroded.



Procedure

1. Make 4 identical stream tables, with the same amount of sand.
2. Angle each stream table as shown in the pictures.
3. Add 1 liter of water from the same height onto each stream table.
4. Collect water and sand eroded from the table into the buckets.
5. Separate the water and the sand.
6. Measure the mass of the sand eroded from each table.
7. Record results.

What is the independent variable in this experiment?

A amount of sand eroded

B angle of the stream tables

C volume of water collected in the buckets

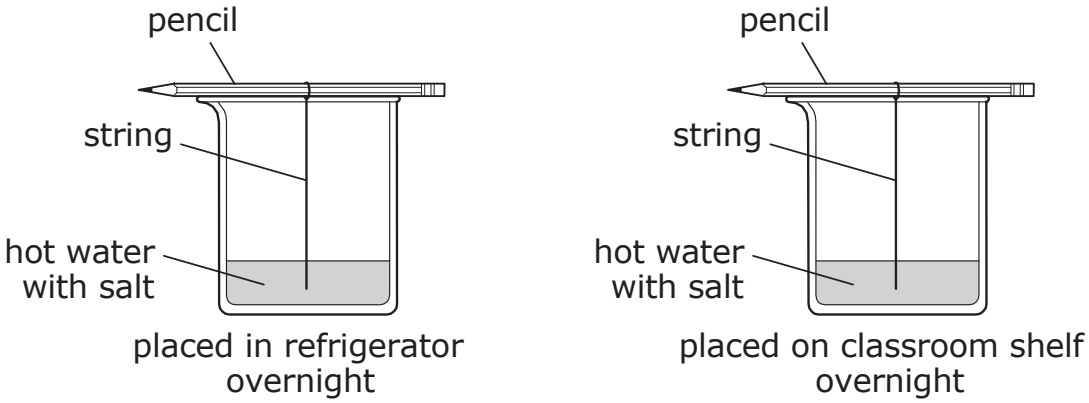
D volume of water added to the stream tables

Copyright © 2013 by the Oklahoma State Department of Education

Sample Test Item:
Process Objective: 3.3
Content Objective: 4.2
Depth of Knowledge: 3
Correct Response: A

Students are investigating how rocks can be formed. They use the setup shown to test if the size of crystals that will form on a string are affected by temperature.

Rock Investigation Setup



Which chart <u>best</u> describes the investigation?

A

Rock Type Investigated	Independent Variable
igneous	temperature

B

Rock Type Investigated	Independent Variable
igneous	size of crystal

C

Rock Type Investigated	Independent Variable
metamorphic	temperature

D

Rock Type Investigated	Independent Variable
metamorphic	size of crystal

Copyright © 2013 by the Oklahoma State Department of Education

Process Standard:

Standard 3: Experimental Design—Understanding experimental design requires that students recognize the components of a valid experiment. The student will accomplish the objective to meet this process standard.

Process Objective:

6. Recognize potential hazards and practice safety procedures in all science activities.

Item Specifications:

Emphasis:

- Identify potential hazards in science activities.
- Be aware of unsafe practices and appropriate procedures in science-related activities conducted in the laboratory or field setting.

Stimulus Attributes:

- Test items may include illustrations and/or text descriptions.
- Items may include grade appropriate situations or problems reflecting potential dangers related to science activities.

Format: Assessable content includes the following:

- Identify potential hazards in science activities.
- Identify appropriate safety equipment for science activities.
- Identify appropriate safety procedures in science activities.

Assessment Limits: Non-assessable content includes the following:

- Test items are limited to hazards and safety practices in science activities.
- Items may ask students to select the appropriate safety practice to follow in various situations.

Content Objectives may include:

- Content is nonspecific, as items relate to lab safety only.

Distractor Domain May Include:

- Wrong hazard
- Not a safety concern
- Wrong safety procedure
- Not a safety procedure

Copyright © 2013 by the Oklahoma State Department of Education

Sample Test Item:
Process Objective: 3.6
Depth of Knowledge: 1
Correct Response: A

Which action can be a hazard while working in the science laboratory?

A working alone
B following directions
C wearing safety goggles
D knowing how to use equipment

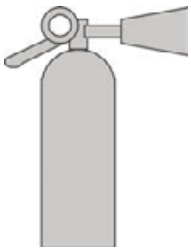
Sample Test Item:
Process Objective: 3.6
Depth of Knowledge: 1
Correct Response: A

Which is the <u>best</u> action to take for a fire in a lab trash-can?

A use a fire extinguisher
B throw flour onto the fire
C open windows and leave the room
D watch the fire to see if it spreads

Copyright © 2013 by the Oklahoma State Department of Education

Sample Test Item:
Process Objective: 3.6
Depth of Knowledge: 1
Correct Response: D



The safety equipment shown is used in events involving

A a broken glass.

B chemical spills.

C physical injuries.

D a laboratory fire.

Copyright © 2013 by the Oklahoma State Department of Education

Process Standard:

Standard 4: Interpret and Communicate—Interpreting is the process of recognizing patterns in collected data by making inferences, predictions, or conclusions. Communicating is the process of describing, recording, and reporting experimental procedures and results to others. Communication may be oral, written, or mathematical and includes organizing ideas, using appropriate vocabulary, graphs, other visual representations, and mathematical equations. The student will accomplish the objective to meet this process standard.

Process Objective:

2. Interpret data tables, line, bar, trend and/or circle graphs.

Item Specifications:

Emphasis:

- Analyze information given in a data table, line, bar, trend, or circle graph.

Stimulus Attributes:

- Test items may include data tables, line (e.g., single-line, double-line, multiple-lines, and line-of-best-fit), bar, trend, and/or circle graphs for students to interpret.

Format: Assessable content includes the following:

- Recognize trends in data.
- Analyze graphical representations of data to determine missing data values.
- Interpret graphical representations of data.

Assessment Limits: Non-assessable content includes the following:

- Test items are limited to the interpretation of data tables, line, bar, trend, and/or circle graphs.

Content Objectives:

- Items may be written to assess any of the content objectives.

Distractor Domain May Include:

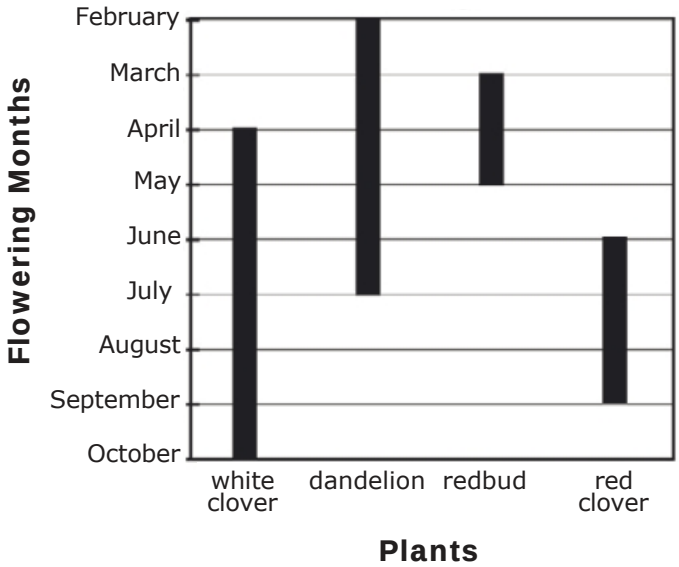
- Quantitative errors due to incorrect interpretations of graphs
- Qualitative errors due to incorrect interpretations of graphs

Copyright © 2013 by the Oklahoma State Department of Education

Sample Test Item:
Process Objective: 4.2
Content Objective: 3.2
Depth of Knowledge: 2
Correct Response: C

A student is using the graph shown to complete a data table. The graph shows the months of flowering for some plants.

Months of Flowering for Some Plants



Months of Flowering for Some Plants

Plant	Flowering Begins	Number of Flowering Months
white clover	April	6
dandelion	February	?
redbud	March	2
red clover	June	3

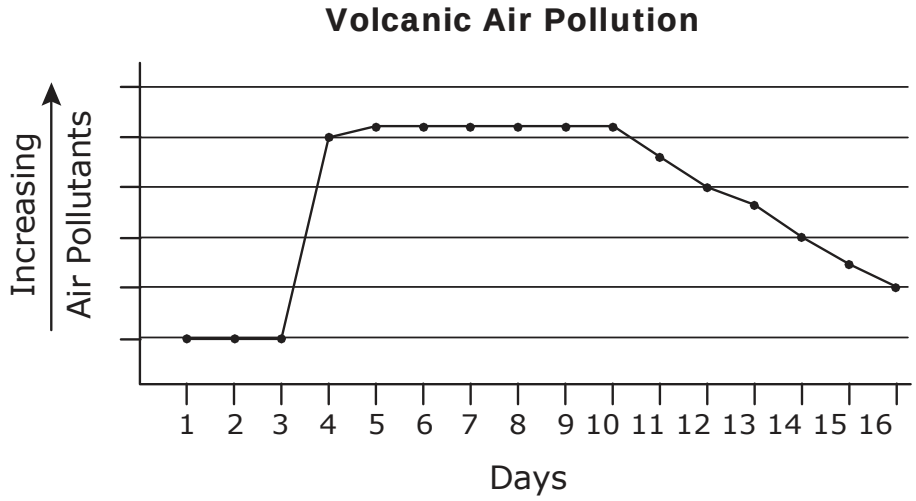
Which number <u>best</u> completes the data table?

A 3
B 4
C 5
D 6

Copyright © 2013 by the Oklahoma State Department of Education

Sample Test Item:
Process Objective: 4.2
Content Objective: 4.1
Depth of Knowledge: 2
Correct Response: A

Scientists collected and displayed pollution data before, during, and after a volcanic eruption.



When did the eruption most likely occur?

A between days 3 and 4

B between days 5 and 6

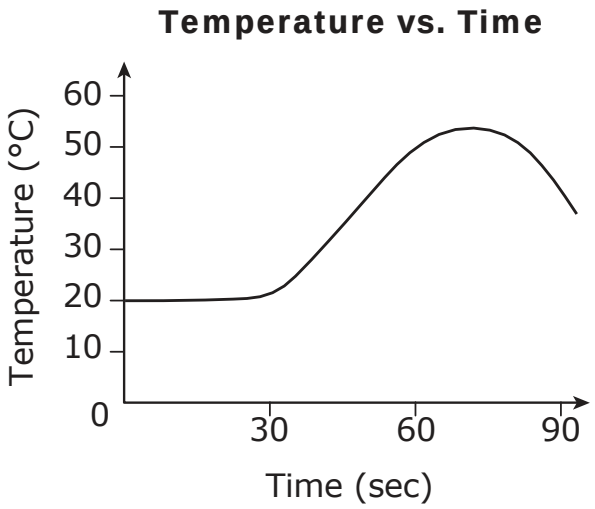
C between days 10 and 11

D between days 14 and 15

Copyright © 2013 by the Oklahoma State Department of Education

Sample Test Item:
Process Objective: 4.2
Content Objective: 1.1
Depth of Knowledge: 3
Correct Response: D

A liquid with a known temperature was poured into a container. After 30 seconds, a second liquid with the same temperature was added to the container. The change in temperature was recorded and displayed in a graph.



Which statement describes what most likely happened after the two liquids were combined?

A Each liquid stayed the same.

B Each liquid changed into a solid.

C The two liquids created a new element.

D The two liquids formed a new substance.

Copyright © 2013 by the Oklahoma State Department of Education

Process Standard:

Standard 4: Interpret and Communicate—Interpreting is the process of recognizing patterns in collected data by making inferences, predictions, or conclusions. Communicating is the process of describing, recording, and reporting experimental procedures and results to others. Communication may be oral, written, or mathematical and includes organizing ideas, using appropriate vocabulary, graphs, other visual representations, and mathematical equations. The student will accomplish the objective to meet this process standard.

Process Objective:

3. Evaluate data to develop reasonable explanations, and/or predictions.

Item Specifications:

Emphasis:

- Find patterns in data and describe them; draw conclusions or make predictions based on interpretation of data provided.

Stimulus Attributes:

- Test items may include data tables (including parts of the periodic table), graphs, or text descriptions.
- Items include data arranged in a format that is grade-appropriate and lends itself to description.
- A variety of data table types may be used including portions of the periodic table (atomic number, average atomic mass, atomic name and/or symbol).

Format: Assessable content includes the following:

- Use patterns and trends in data to make predictions.
- Evaluate data to develop scientific explanations and conclusions.
- Distinguish observation from inference.

Assessment Limits: Non-assessable content includes the following:

- Test items are limited to predictions, conclusions, or explanations based on data.
- Some periodic chart information will not be assessed as it is not grade 8 level appropriate (e.g., atomic structure, family name, valence number, periodic groups, trends, state of matter element is found in nature).

Content Objectives May Include:

- Items may be written to assess any of the content objectives.

Distractor Domain May Include:

- Numbers, events, organisms, or objects that do not fit a pattern
- Incorrect conclusions, predictions, or explanations
- Incorrect patterns

Copyright © 2013 by the Oklahoma State Department of Education

Sample Test Item:
Process Objective: 4.3
Content Objective: 1.2
Depth of Knowledge: 2
Correct Response: C

A student stirs 2 grams of salt into a cup of water. The student then separates the salt from the water by evaporation. In this experiment, the mass of salt separated from the water would be the same as the initial mass because

A a chemical change occurred.

B salt does not dissolve in water.

C salt does not evaporate with water.

D some of the salt evaporates with the water.

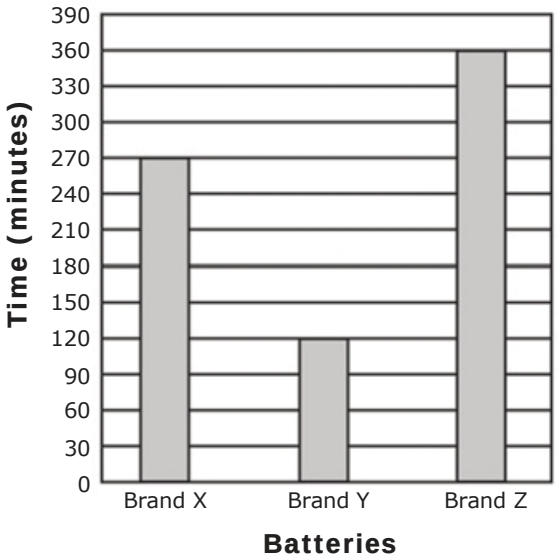
Copyright © 2013 by the Oklahoma State Department of Education

Sample Test Item:
Process Objective: 4.3
Content Objective: 1.2
Depth of Knowledge: 2
Correct Response: B

Students tested three brands of batteries to determine how much time each battery will keep a flashlight lit. They followed the directions and displayed the data in a bar graph.

- **place two brand X batteries in a flashlight**
- **turn flashlight on and measure the time the light shined**
- **repeat with battery brands Y and Z using the same flashlight**

Battery Experiment Results



Which conclusion best explains the results?

A Brand Z batteries lasted twice as long as Brand X batteries.

B Brand Z batteries lasted three times longer than Brand Y batteries.

C The light was twice as bright with Brand X batteries than with Brand Y batteries.

D The light shined three times farther with Brand Z batteries than with Brand Y batteries.

Copyright © 2013 by the Oklahoma State Department of Education

Sample Test Item:
Process Objective: 4.3
Content Objective: 1.2
Depth of Knowledge: 3
Correct Response: B

Characteristics of Seven Objects

Object	Mass (g)	Volume (cm^3)	Sinks or Floats in Water
red ball	30.0	40.0	floats
bottle	4.0	9.0	floats
paper clip	1.0	0.4	sinks
wooden block	12.8	16.0	floats
magnet	2.2	0.2	sinks
ruler	14.0	12.0	sinks
pink eraser	6.0	4.5	sinks

Water mass = 20 g
Water volume = 20 cm^3

Which conclusion is <u>best</u> supported by the data?

A Metal objects are more likely to float in water.
B An object floats in water if its mass is less than its volume.
C The color of an object determines if it will sink or float in water.
D The shape of an object determines if it will sink or float in water.

Copyright © 2013 by the Oklahoma State Department of Education

Content Standard:

Standard 1: Properties and Chemical Changes in Matter—Physical characteristics of objects can be described using shape, size, and mass. The materials from which objects are made can be described using color, texture, and hardness. These properties can be used to distinguish and separate one substance from another. The student will engage in investigations that integrate the process standards and lead to the discovery of the following objective:

Content Objective:

1. Substances react chemically with other substances to form new substances with different characteristics (e.g., oxidation, combustion, acid/base reactions).

Item Specifications:

Emphasis:

- When a chemical reaction occurs between two or more substances, the products from the reaction have different characteristics than the reactants.
- Evidence of a chemical reaction include temperature change, gas production, change in color, production of light or sound, and/or the formation of a solid (precipitate).

Stimulus Attributes:

- Test items may include grade-appropriate text, illustrations, data tables, graphs, graphic organizers, and/or descriptions.
- Unfamiliar chemical reactions will be described with a chemical equation, diagram, picture, or text.
- Chemical reactions will be presented as balanced equations and a maximum of two reactants and two products.

Format: Assessable content includes the following:

- Identify whether a chemical reaction occurs based on the qualitative and/or quantitative properties before and after the chemical reaction (e.g., temperature change, gas production, change in color, production of light or sound, or formation of a solid).
- Identify the appropriate SI units and/or tools used to measure the properties of reactants and products in chemical reactions.
- Identify the differences in properties between reactants and products in a chemical reaction.
- Predict if a chemical reaction will occur based on the provided data.
- Evaluate the design of an experiment to investigate chemical reactions. (i.e. testable hypothesis, control, variables, procedure, results, and conclusion).
- Interpret data tables, graphs, and models of a chemical reaction and its properties.
- Identify properties of acids and bases.
- Differentiate between the reactants and products of a chemical reaction/equation (e.g., cellular respiration, photosynthesis).
- Photosynthesis requires light, carbon dioxide (CO_2), water (H_2O) and occurs in the presence of chlorophyll, which produces oxygen (O_2) and glucose ($C_6H_{12}O_6$). Full equation: $6\ CO_2 + 6\ H_2O +$ Light energy $\longrightarrow C_6H_{12}O_6 + 6\ O_2$.
- Respiration requires glucose ($C_6H_{12}O_6$), and oxygen (O_2) which produces carbon dioxide (CO_2), water (H_2O), and releases energy (ATP). Full equation: $C_6H_{12}O_6 + 6\ O_2 \longrightarrow 6\ CO_2 + 6\ H_2O$.

Copyright © 2013 by the Oklahoma State Department of Education

Assessment Limits: Non-assessable content includes the following:

- Items are limited to grade-level appropriate chemical reactions and product characteristics e.g., vinegar and baking soda, rusting metals, burning, heat releasing, heat absorbing, gas producing, color changing, and solid forming).
- Identifying or classifying types of chemical reactions (e.g., combustion, synthesis, decomposition, single replacement, double replacement).
- Types of chemical bonds between the atoms during a chemical reaction.
- Balancing the equation, organic compounds, or specifics of the carbon cycle, how CO_2 is used to make glucose, the Krebs cycle, or information related to photosynthesis and respiration outside of the grade 8 level.

Process Objectives May Include:

- Items may be written to any of the process objectives except for 3.6.

Distractor Domain May Include:

- Incorrect identification of a chemical reaction based on properties of the products
- Incorrect identification of SI units and/or tools to measure and identify products, reactants, and chemical changes
- Incorrect prediction of a chemical reaction occurring based on provided data
- Incorrect evaluation of the scientific experiment
- Incorrect interpretation of data tables, graphs, and/or models
- Incorrect interpretation/explanation of chemical properties

Copyright © 2013 by the Oklahoma State Department of Education

Sample Test Item:
Content Objective: 1.1
Process Objective: 4.3
Depth of Knowledge: 1
Correct Response: B

A student stirs a powder into a liquid. This procedure results in bubbling, the release of heat, and the formation of a solid.

Based on these observations, the student can conclude that the procedure causes the formation of

A a new element.

B a new substance.

C a new energy source.

D a new physical mixture.

Copyright © 2013 by the Oklahoma State Department of Education

Sample Test Item:
Content Objective: 1.1
Process Objective: 1.1
Depth of Knowledge: 2
Correct Response: B

Experimental Observations

	Observations
1	Soft, yellow metal did not show change in color or physical characteristics.
2	Reddish metal formed a thin, black layer that could be scraped away to show the reddish metal underneath.
3	Soft, silvery solid turned to a bright, silvery liquid. A
4	red liquid formed into a red gas.

Which observation is the best evidence that a chemical change formed a new compound?

A Observation 1

B Observation 2

C Observation 3

D Observation 4

Copyright © 2013 by the Oklahoma State Department of Education

Sample Test Item:
Content Objective: 1.1
Process Objective: 3.3
Depth of Knowledge: 3
Correct Response: A

Students design an investigation to determine if temperature affects the rate of a chemical reaction.

Which statement includes the best set of reactants and the dependent variable for the investigation?

A

Set of Reactants	Dependent Variable
• baking soda • vinegar at three different temperatures	time it takes each product to form

B

Set of Reactants	Dependent Variable
• baking soda • vinegar	temperature of each product

C

Set of Reactants	Dependent Variable
• salt • vinegar at three different temperatures	temperature of each salt solution

D

Set of Reactants	Dependent Variable
• salt • water	time it takes the salt to dissolve

Copyright © 2013 by the Oklahoma State Department of Education

Content Standard:

Standard 1: Properties and Chemical Changes in Matter—Physical characteristics of objects can be described using shape, size, and mass. The materials from which objects are made can be described using color, texture, and hardness. These properties can be used to distinguish and separate one substance from another. The student will engage in investigations that integrate the process standards and lead to the discovery of the following objective:

Content Objective:

2. Matter has physical properties that can be measured (i.e., mass, volume, temperature, color, texture, density, and hardness) and chemical properties. In chemical reactions and physical changes, matter is conserved (e.g., compare and contrast physical and chemical changes).

Item Specifications:

Emphasis:

- All substances have physical properties.
- Physical properties can be described or measured.
- These properties can be used to identify, organize, and classify substances.
- Changes in matter can be classified as chemical or physical.
- In a physical change, the identity of the original substance does not change.
- In a chemical change, the original substance is combined with other substances or broken into its component parts, making new substances with new properties.
- For both chemical and physical changes the total amount of matter remains the same (i.e., matter is conserved).

Stimulus Attributes:

- Test items may include grade-appropriate text, illustrations, data tables, graphs, and/or graphic organizers.
- Test items will include descriptions and/or data related to materials that are likely to be unfamiliar to students at this grade.

Format: Assessable content includes the following:

- Identify physical properties of matter (i.e., mass, volume, temperature, color, texture, density, and hardness) and chemical properties of matter (i.e., ability to burn, ability to react with a given substance to produce a new substance).
- Identify appropriate tools and/or SI units to measure physical properties of matter.
- Determine measures of physical properties or changes in properties when given appropriate information (e.g., determine density of irregular-shaped and regular-shaped objects; identify correct reading of a thermometer, metric balance, graduated cylinder, and metric ruler).
- Recognize that mass is conserved during chemical reactions and physical changes.
- Analyze given information about a physical change to determine which properties of a substance do not change (e.g., density, boiling point, melting point, and freezing point) and which change (e.g., size, shape).
- Identify common physical and chemical changes (e.g., heat melting ice, sugar dissolving in water, wood being cut, leaves changing color, digestion, cooking, and metals rusting).
- Compare and contrast materials based on physical properties (i.e., mass, volume, temperature, color, texture, density, and hardness).

Copyright © 2013 by the Oklahoma State Department of Education

- Compare and contrast chemical reactions and physical changes (e.g., phase changes, solids dissolving, substances changing shape, rate of gas production, and/or temperature changes).
- Classify common materials based on their physical properties (i.e., mass, volume, temperature, color, texture, density, and hardness).
- Classify chemical and physical changes based on given chemical and physical properties (e.g., phase changes, solids dissolving, substances changing shape, rate of gas production, and/or temperature changes).
- Predict the type of change that has occurred based on the physical properties of the given product(s).
- Evaluate the design of an experiment to investigate physical and/or chemical properties and physical and/or chemical changes (e.g., comparing the mass of the reactants to the mass of the products in a chemical reaction).
- Interpret data tables, graphs, and/or models of matter and their characteristic properties before and after physical and/or chemical changes.
- Compare and contrast the chemical make-up of minerals (i.e., silicates, carbonates, and/or oxides).
- Students may be given the formulas (p. 17) to calculate the density, mass, and/or volume for an object.

Assessment Limits: Non-assessable content includes the following:

- Test items are limited to grade-level appropriate physical properties including mass, volume, temperature, color, texture, density, and hardness.

Process Objectives May Include:

- Items may be written to assess any of the process objectives except for 3.6.

Distractor Domain May Include:

- Incorrect identification of physical properties, chemical reaction, and/or physical change
- Incorrect identification of SI units and/or tools to measure and identify physical properties of matter, the starting material and ending material of a chemical reaction or physical change
- Incorrect comparison of the physical properties of chemical reactions and physical changes
- Incorrect classification of chemical reactions and physical changes
- Incorrect prediction of change based on provided data
- Incorrect evaluation of the scientific experiment
- Incorrect interpretation of data tables, graphs, and/or models

Copyright © 2013 by the Oklahoma State Department of Education

Sample Test Item:
Content Objective: 1.2
Process Objective: 1.3
Depth of Knowledge: 2
Correct Response: A

Which statement best explains what happens during a chemical reaction?

A The total mass of the products, measured in grams, is the same as the total mass of the reactants.

B The total mass of the substances in the reaction, measured in grams, either increases or decreases.

C The total mass of the products, measured in liters, is the same as the total mass of the reactants.

D The total mass of the substances in the reaction, measured in liters, either increases or decreases.

Copyright © 2013 by the Oklahoma State Department of Education

Sample Test Item:
Content Objective: 1.2
Process Objective: 2.2
Depth of Knowledge: 2
Correct Response: C

Some Properties of Metal Objects

Metal Object	Melting Point (°C)	Color	Density (g/mL)	Reacts with Acid
aluminum	659	silvery gray	2.7	yes
zinc	419	dull gray	7.1	yes
iron	1,530	reddish brown	7.9	yes
copper	1,083	shiny orange	8.9	yes
lead	327	dull gray	11.3	yes

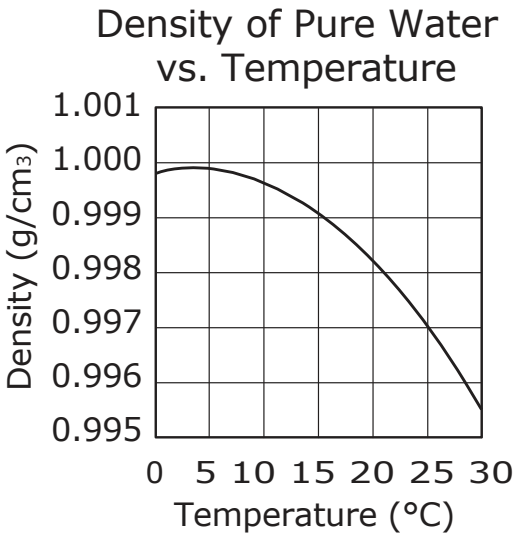
These metal objects are ordered by which physical property?

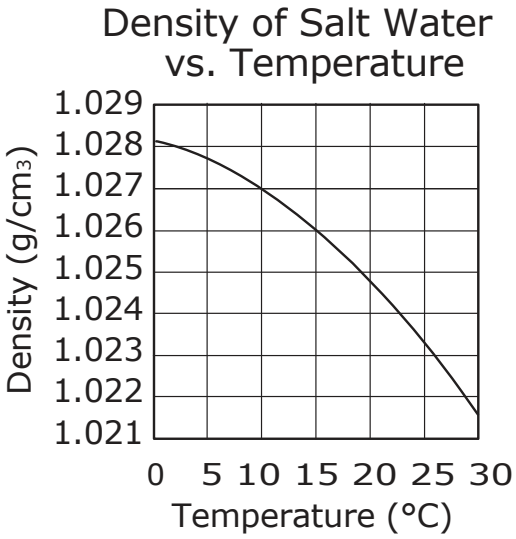
A Melting Point
B Color
C Density
D Reacts with Acid

Copyright © 2013 by the Oklahoma State Department of Education

Sample Test Item:
Content Objective: 1.2
Process Objective: 1.1
Depth of Knowledge: 3
Correct Response: B

A scientist measured the densities of pure water and salt water at different temperatures and presented two graphs.





Which conclusion can be <u>correctly</u> made about the dissolved salts based on the graphs?

A Dissolved salts make water less dense over the 30 °C range.

B Dissolved salts make water more dense over the 30 °C range.

C Dissolved salts make water more dense from 0 °C to 4 °C and less dense above 4 °C.

D Dissolved salts make water less dense from 0 °C to 4 °C and more dense above 4 °C.

Copyright © 2013 by the Oklahoma State Department of Education

Content Standard:

Standard 2: Motions and Forces—The motion of an object can be described by its position, direction of motion, and speed as prescribed by Newton's Laws of Motion. The student will engage in investigations that integrate the process standards and lead to the discovery of the following objective:

Content Objective:

1. The motion of an object can be measured. The position of an object, its speed and direction can be represented on a graph.

Item Specifications:

Emphasis:

- The motion of an object is the change in position as time changes.
- This motion can be measured and investigated using scientific tools.
- The data from an investigation can be represented using a graph, data table, and/or text and can be used to make predictions.

Stimulus Attributes:

- Test items may include grade-level appropriate text, illustrations, data tables, graphs, and/or graphic organizers.
- Students may be given the formulas (p. 17) to calculate the speed, distance, and/or time for an object.

Format: Assessable content includes the following:

- Identify the position, distance, or time for an object traveling at a constant, increasing, or decreasing speed before, during, and after an event using descriptions, pictures, and/or data.
- Identify appropriate SI units and/or tools to determine the time, distance, and/or speed of an object.
- Determine appropriate measures of motion from given information.
- Analyze the differences and similarities between moving objects based on descriptions, pictures, or data about their positions and/or speeds.
- Predict distance or time traveled by an object based on text descriptions, pictures, and/or data about the motion of an object.
- Evaluate an experiment (including: testable hypothesis, control, variables, procedure, results, and conclusion) designed to investigate the motion of an object.
- Interpret data tables and/or models of the motion of an object.
- Analyze distance vs. time, speed vs. time, and/or position vs. time graphs.
- Items may include the calculation of the speed of an object, distance, or time based on provided data, interpretation of graphs, and/or analyzing motion investigations

Assessment Limits: Non-assessable content includes the following:

- Test items are limited to the motion of speed described as a change in distance or position as time changes.
- Items are limited to qualitative comparisons of rates of speed (e.g., slowing down, speeding up), rather than calculations of acceleration.

Process Objectives May Include:

- Items may be written to assess any of the process objectives except for 3.6.

Copyright © 2013 by the Oklahoma State Department of Education

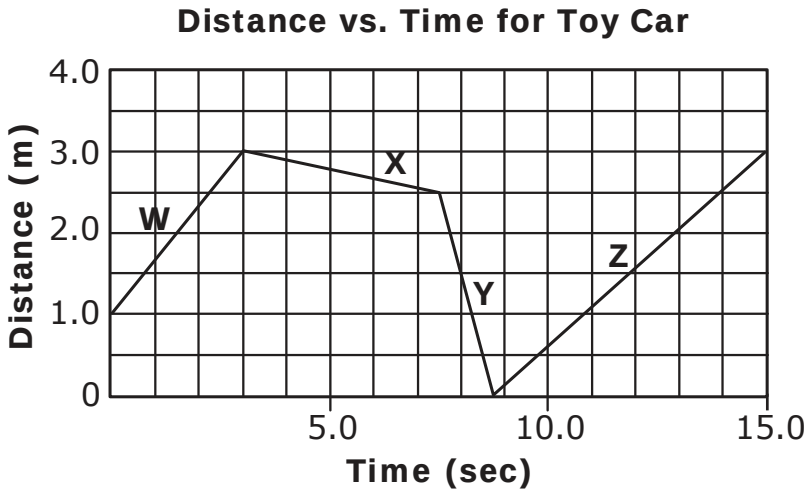
Distractor Domain May Include:

- Incorrect identification of the change in position, time, or speed of an object
- Incorrect identification of SI units and/or tools to measure and identify the distance traveled, length of time, or speed of an object
- Incorrect comparison of the motion of an object
- Incorrect prediction of speed, distance, or time an object travels based on data
- Incorrect evaluation of the scientific experiment
- Incorrect interpretation or analysis of data tables, graphs, and/or models

Copyright © 2013 by the Oklahoma State Department of Education

Sample Test Item:
Content Objective: 2.1
Process Objective: 2.2
Depth of Knowledge: 2
Correct Response: A

The graph shows the speed of a toy car over time, with distance intervals labeled W, X, Y, and Z.



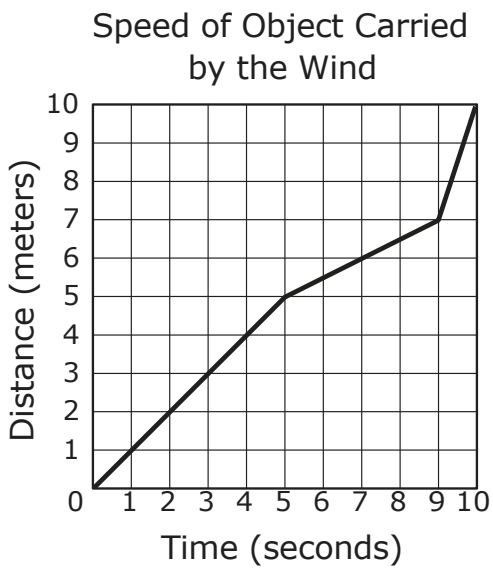
Which list shows the intervals in order from shortest to longest distance traveled by the car?

A X, W, Y, Z
B Y, Z, W, X
C X, Y, W, Z
D W, Y, Z, X

Copyright © 2013 by the Oklahoma State Department of Education

Sample Test Item:
Content Objective: 2.1
Process Objective: 2.1
Depth of Knowledge: 3
Correct Response: B

Students are studying wind speed classification. They determine the speed of an object carried by the wind across a field and graph their data.



Wind Classification

Wind Speed (meters/second)	Wind Description
less than 0.89	light wind
0.89-2.2	gentle-moderate
2.3-2.97	fresh wind
2.98-4.75	strong wind
4.76-6.83	gale
6.84-9.1	whole gale
greater than 9.1	hurricane

Using the graph and wind classification chart, which is the <u>best</u> classification for the average wind speed for the 10-second interval shown in the graph?

A light wind

B gentle-moderate

C strong wind

D gale

Copyright © 2013 by the Oklahoma State Department of Education

Sample Test Item:
Content Objective: 2.1
Process Objective: 4.3
Depth of Knowledge: 3
Correct Response: D

The data table shows the average braking distances of a bicycle moving at different speeds on three surfaces.

Bicycle Data

Bicycle Speed (kilometers per hour)	**8**	**12**	**16**	**20**
Surface	**Average Braking Distances (meters)**			
dry concrete	0.74	1.66	2.96	4.62
wet concrete	1.13	2.55	4.53	7.08
sand on concrete	0.98	2.21	3.93	6.14

Which conclusion is <u>best</u> supported by the data in the table?

A Water has no effect on braking distances.

B Braking distances decrease as the bicycle speeds increase.

C Sand causes a decrease in friction, reducing braking distances.

D Braking distances increase as the speeds of the bicycle increase.

Copyright © 2013 by the Oklahoma State Department of Education

Content Standard:

Standard 2: Motions and Forces—The motion of an object can be described by its position, direction of motion, and speed as prescribed by Newton's Laws of Motion. The student will engage in investigations that integrate the process standards and lead to the discovery of the following objective:

Content Objective:

2. An object that is not being subjected to a net force will continue to move at a constant velocity (i.e., inertia, balanced and unbalanced forces).

Item Specifications:

Emphasis:

- A force is a push or pull that has a magnitude and direction.
- When two or more forces are acting on an object, they are classified as either balanced or unbalanced forces.
- Unbalanced forces occur when two forces act in the same direction and they reinforce each other or when two unequal forces act in different directions.
- If the opposite forces are equal, they will cancel each other and are called balanced forces.
- An object that is subjected to unbalanced forces will have a change in velocity (speed and/or direction), and an object that is being subjected to a balanced set of forces will continue to travel in a straight line and at a constant speed or remain at rest.

Stimulus Attributes:

- Test items may include grade-level appropriate text, illustrations, data tables, graphs, and/or graphic organizers.
- Test items are limited to grade-level appropriate forces (e.g., a push or pull, gravity, and friction). Centripetal forces will not be assessed.

Format: Assessable content includes the following:

- Identify balanced and/or unbalanced forces acting on an object.
- Identify appropriate use of tools and SI units to measure the magnitude and direction of a force.
- Calculate the net force exerted on an object.
- Compare and contrast differences and similarities of balanced and unbalanced forces (e.g., compare objects in motion and determine the types of forces acting on these objects).
- Classify forces acting on an object using the net movement of the object.
- Predict the change in velocity resulting from balanced or unbalanced forces.
- Analyze the effect of balanced and unbalanced forces on the velocity of an object.
- Evaluate the design of an experiment to investigate the forces, motion, or velocity, including: testable hypothesis, control, variables, procedure, results, and conclusion.
- Interpret models, graphs, and/or data tables demonstrating the effect of multiple forces and how the resulting force will be dependent on the magnitude and direction of each contributing force.
- Recognize that both a zero velocity and an unchanging velocity equals a constant velocity.
- A change in velocity will include acceleration (a change in speed) and/or a change in direction.
- Students may be given the formulas (p. 17) to calculate the velocity and acceleration of an object.

Assessment Limits: Non-assessable content includes the following:

- Calculations will only include forces in the same direction or opposite directions. Items will not include vector components.

Copyright © 2013 by the Oklahoma State Department of Education

Process Objectives May Include:

- Items may be written to assess any of the process objectives except for 3.6.

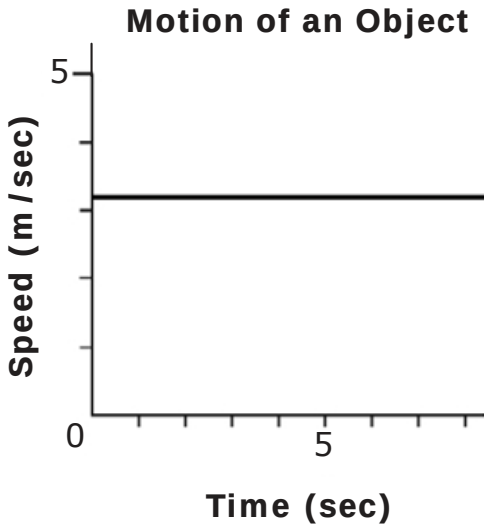
Distractor Domain May Include:

- Incorrect identification of a change in the net force before, during, and after an event.
- Incorrect identification of SI units and/or tools to measure and identify forces.
- Incorrect calculation of the net force on an object.
- Incorrect comparison of the forces.
- Incorrect classification of the types of forces.
- Incorrect prediction of the motion of an object due to balanced or unbalanced forces.
- Incorrect evaluation of the scientific experiment.
- Incorrect interpretation of data tables, graphs, graphic organizers, and/or models.

Copyright © 2013 by the Oklahoma State Department of Education

Sample Test Item:
Content Objective: 2.2
Process Objective: 4.2
Depth of Knowledge: 2
Correct Response: B

The motion of an object was measured and graphed during a lab activity.



Which statement best describes the forces acting on the object?

A Two opposite forces are unequal.

B The total of all forces equals zero.

C The forward forces change at a constant rate.

D The horizontal force is greater than the vertical force.

Copyright © 2013 by the Oklahoma State Department of Education

Sample Test Item:
Content Objective: 2.2
Process Objective: 4.3
Depth of Knowledge: 2
Correct Response: B

Students investigated the motion of an object. They pushed the object across four surfaces using the same total force for each trial. The information collected by the students is displayed in a data table.

Investigational Data

Type of Surface	Distance Traveled (meters)
polished wooden floor	16
ice	36
paved parking lot	6
sand	1

What caused the object to travel the farthest on the ice?

A The ice reduced the forward motion on the object.
B The ice exerted the least friction on the object.
C The ice reduced the force of gravity on the object.
D The ice exerted the least upward force on the object.

Copyright © 2013 by the Oklahoma State Department of Education

Sample Test Item:
Content Objective: 2.2
Process Objective: 3.3
Depth of Knowledge: 3
Correct Response: C

Four students are investigating how different forces acting on the same object will affect the speed of the object. Each student puts the object in motion using a different initial force.

Which student best measures and describes the dependent variable?

A Student 1 measures the mass of the object and determines that the object with the least mass has balanced forces.

B Student 2 measures the mass of the object and determines that the object with the most mass has balanced forces.

C Student 3 measures the speed of the object and determines that the object with a decreasing speed has unbalanced forces.

D Student 4 measures the speed of the object and determines that the object with a constant speed has unbalanced forces.

Copyright © 2013 by the Oklahoma State Department of Education

Content Standard:

Standard 3: Diversity and Adaptations of Organisms—Millions of species of animals, plants, and microorganisms are alive today. Although different species might look dissimilar, the unity among organisms becomes apparent from an analysis of internal and external structures. Adaptation involves the selection of naturally occurring variations in populations. The student will engage in investigations that integrate the process standards and lead to the discovery of the following objective:

Content Objective:

1. By classifying organisms, biologists consider details of internal and external structure to infer the degree of relatedness among organisms (i.e., kingdom, phylum, class, order, family, genus, species).

Item Specifications:

Emphasis:

- There are different levels of organization within individuals and groups of organisms.
- Biologists are able to classify organisms into different groups based on their internal and/or external structures.

Stimulus Attributes:

- Test items may include grade-level appropriate text, illustrations, data tables, graphs, concept maps, bubble maps or Venn diagrams.
- Organisms likely to be unknown to students will be described and/or pictured.
- Items may include body covering, number of legs, body shape, body temperature regulation, life cycle, reproduction, acquisition of energy (e.g., producer or consumer), roots, stems, leaves, breathing structures, level of complexity (unicellular vs. multi-cellular, cells, tissues, organs, organ systems).
- Unfamiliar organisms and structures will be described with text, diagrams, or pictures.

Format: Assessable content includes the following:

- Identify the structure(s) common to a given group of organisms for classification purposes.
- Identify the appropriate SI units and/or tools that are used to classify organisms by measuring internal and/or external structures using common formulas (p. 17).
- Compare and contrast the similarities and differences of given organisms (e.g., multi-cellular vs. single cell; two organisms of the same species, but different characteristics).
- Classify organisms based on their internal and/or external structures (e.g., reproduction, body coverings, body appendages [e.g., limbs, fins, tentacles, antennae], type of body skeleton, plant characteristics).
- Evaluate the design of an experiment (including: testable hypothesis, control, variables, procedure, results, and conclusion) that includes the classification of organisms based on their internal or external structures (e.g., an investigation to determine body temperature regulation, ability to use the energy from the Sun to produce food).
- Interpret data tables, graphs, and/or models to classify individual or groups of organisms.
- Use a dichotomous key to discern the relatedness among organisms.
- Compare and contrast divisions of a biological classification system.

Assessment Limits: Non-Assessable content includes the following:

- Test items are limited to internal or external structures that are grade-level appropriate.

Copyright © 2013 by the Oklahoma State Department of Education

Process Objectives May Include:

- Items may be written to assess any of the process objectives except for 3.6.

Distractor Domain May Include:

- Incorrect identification of structure used for classification
- Incorrect identification of SI units and/or tools for classification
- Incorrect comparison of differences and/or similarities
- Incorrect classification of organism
- Incorrect prediction of classification group
- Incorrect evaluation of the scientific experiment
- Incorrect interpretation of data tables, graphs, and/or models

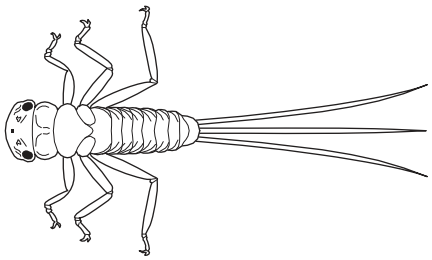
Copyright © 2013 by the Oklahoma State Department of Education

Sample Test Item:
Content Objective: 3.1
Process Objective: 2.1
Depth of Knowledge: 2
Correct Response: B

The data table shows some identifying characteristics for four different organisms.

Organism	Has Wings	Number of Legs	Average Length
1	No	8	less than 1 cm
2	No	6	3 cm to 6 cm
3	No	9	less than 20 cm
4	Yes	6	6 cm to 10 cm

A student collects an organism. The student determines that the length of the organism is 4.5 cm. The student also drew a picture of the organism.



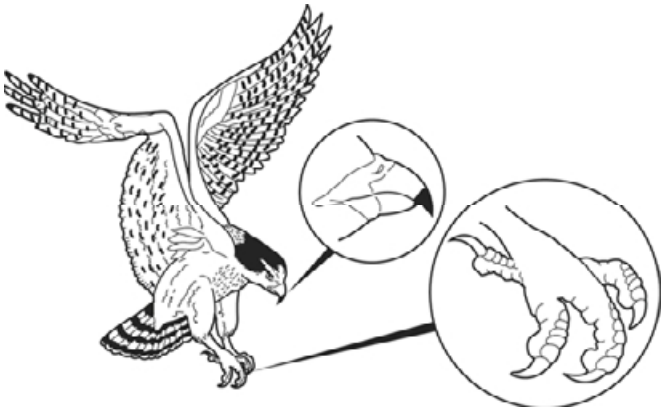
Which organism did the student most likely collect?

A Organism 1
B Organism 2
C Organism 3
D Organism 4

Copyright © 2013 by the Oklahoma State Department of Education

Sample Test Item:
Content Objective: 3.1
Process Objective: 2.1
Depth of Knowledge: 2
Correct Response: C

Students want to identify a bird they observed on a field trip.



Bird Identification Key

Step	Characteristic	Identification
1a	bird has webbed feet	go to 2
1b	bird does not have webbed feet	go to 3
2a	bird has a wide, flat beak	mallard duck
2b	bird has a scoop-shaped bill	pelican
3a	bird's foot has 3 toes in front, 1 toe in back	go to 4
3b	bird's foot has 2 toes in front, 2 toes in back	woodpecker
4a	bird has a long, pointed beak for spearing	heron
4b	bird has a hooked beak for tearing	goshawk

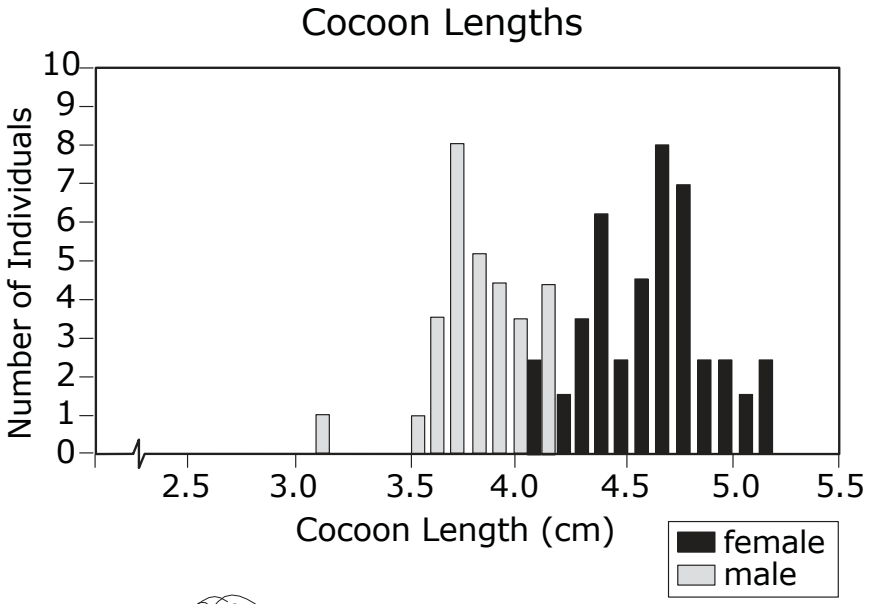
According to the identification key, which bird did the students observe on their field trip?

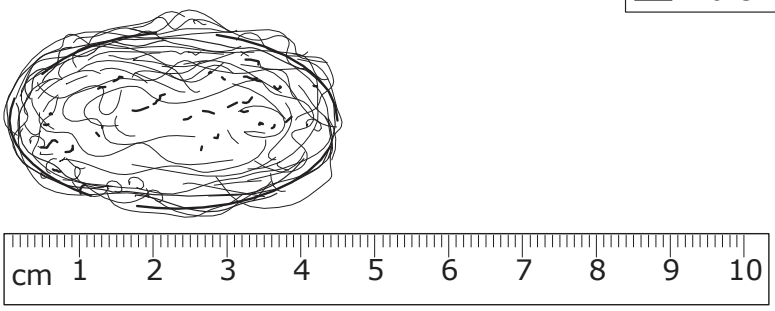
A heron
B pelican
C goshawk
D woodpecker

Copyright © 2013 by the Oklahoma State Department of Education

Sample Test Item:
Content Objective: 3.1
Process Objective: 4.3
Depth of Knowledge: 2
Correct Response: D

Use the data in the graph and the actual size drawing of a silkworm cocoon to make a prediction about the caterpillar that spun the cocoon.





The caterpillar that spun this cocoon was <u>most likely</u>

A male, because there are more males than females.

B male, because the cocoon is about 4.5 cm in length.

C female, because there are more females than males.

D female, because the cocoon is about 4.5 cm in length.

Copyright © 2013 by the Oklahoma State Department of Education

Content Standard:

Standard 3: Diversity and Adaptations of Organisms—Millions of species of animals, plants, and microorganisms are alive today. Although different species might look dissimilar, the unity among organisms becomes apparent from an analysis of internal and external structures. Adaptation involves the selection of naturally occurring variations in populations. The student will engage in investigations that integrate the process standards and lead to the discovery of the following objective:

Content Objective:

2. Organisms have a great variety of internal and external structures that enable them to survive in a specific habitat (e.g., echolocation, seed dispersal).

Item Specifications:

Emphasis:

- There is variability among organisms in both their structures and physiology. Some variations allow for organisms to increase their chances of reproducing and surviving in specific habitats.

Stimulus Attributes:

- Test items may include grade-level appropriate text, illustrations, data tables, graphs, and/or graphic organizers. Unfamiliar habitats will be described and/or pictured.

Format: Assessable content includes the following:

- Identify the structures that enable organisms to survive in specific habitats.
- Identify variations in given organisms.
- Identify appropriate SI units and/or tools that can be used to identify and measure the specialized structures that increase the survival chances of an organism in a specific habitat.
- Compare and contrast the structures that enable organisms to survive in specific habitats (e.g., limb shape and structure, beak shape, fur thickness, ability to use the Sun's energy).
- Classify organisms based on their adaptations that increase their ability to survive in specific habitats (e.g., arctic mammals with similar body coverings increase their ability to blend into the environment).
- Predict the ability of an organism to survive based on given internal and/or external structures.
- Analyze adaptations of different organisms and how they increase the survival of the organism in specific habitats.
- Examine the relationship between organisms within an environment that allows them to increase their chances for survival in specific habitats (e.g., symbiotic relationships that are positive or neutral for one or more species, mutualism and commensalism).
- Evaluate the design of an experiment to investigate the specialized internal and external structures and physiology of an individual or group of organisms that enhance the chance of survival, including: testable hypothesis, control, variables, procedure, results, and conclusion.
- Interpret data tables, graphs, and/or models of internal and external structures and physiology of organisms that are responsible for the increased chance of survival in specific habitats.
- Compare and contrast plant and animal reproductive adaptations, specialized adaptations to locate prey or escape predators (e.g., echolocation, heat-sensing, camouflage, mimicry), specialized adaptations for movement (e.g., type, shape, and number of limbs), type of body temperature regulation (warm or cold blooded).

Copyright © 2013 by the Oklahoma State Department of Education

Assessment Limits: Non-assessable content includes the following:

- Test items are limited to grade-level appropriate structures.
- Students will not be asked to simply recall the specific definition of the following terms: mimicry, symbiosis, mutualism, and commensalism.

Process Objectives May Include:

- Items may be written to assess any of the process objectives except for 3.6.

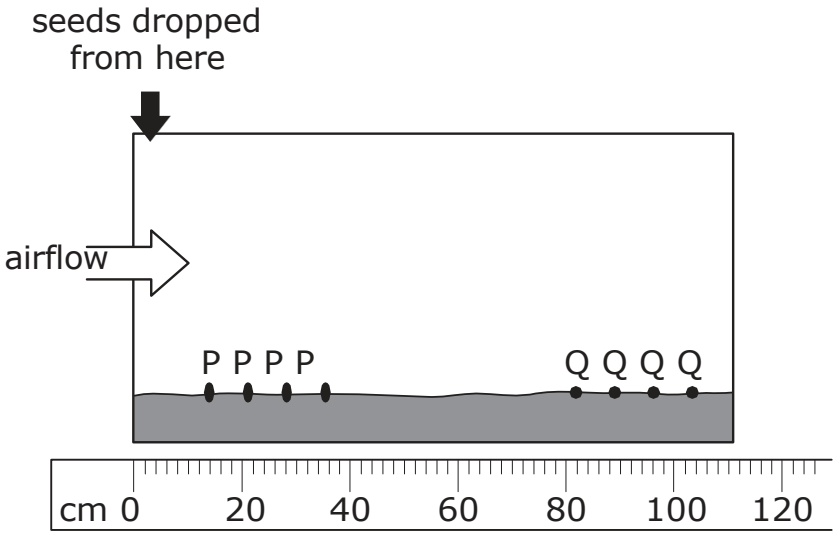
Distractor Domain May Include:

- Incorrect identification of a structure that helps an organism survive in a specific habitat
- Incorrect identification of SI units and/or tools to measure structure
- Incorrect comparison of internal and external structures
- Incorrect prediction of a structure or the chance of surviving or an organism in the specific habitat
- Incorrect analysis of an adaptation and the role it plays in survival
- Incorrect analysis of a relationship between organisms
- Incorrect evaluation of a scientific experiment
- Incorrect interpretation of data tables, graphs, and/or models

Copyright © 2013 by the Oklahoma State Department of Education

Sample Test Item:
Content Objective: 3.2
Process Objective: 4.3
Depth of Knowledge: 2
Correct Response: D

In an investigation, two seed types are labeled P and Q. The seeds were all dropped from the same location. A fan provided a steady airflow. The final positions of the seeds after they were dropped were measured and a picture was drawn of the results.



Which conclusion is best supported by the investigation?

A The rapidly moving air moved type P seeds farther because the seeds are better adapted for reproduction.

B The rapidly moving air moved type Q seeds farther because the seeds are better adapted for reproduction.

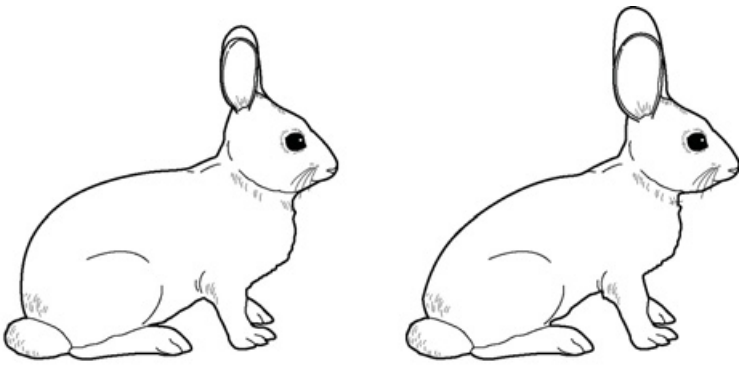
C The rapidly moving air moved type P seeds farther because the seeds are better adapted for wind dispersal.

D The rapidly moving air moved type Q seeds farther because the seeds are better adapted for wind dispersal.

Copyright © 2013 by the Oklahoma State Department of Education

Sample Test Item:
Content Objective: 3.2
Process Objective: 1.2
Depth of Knowledge: 3
Correct Response: D

The eastern cottontail rabbit and the desert cottontail rabbit are commonly found in different environments in Oklahoma. Four scientists measure and compare the rabbits.



Eastern Cottontail Rabbit **Desert Cottontail Rabbit**

Results for the Cottontail Comparison

Scientist	Tool	Result	Conclusion
1	balance	desert cottontail rabbit has less mass	desert cottontail rabbit will need more food than the eastern cottontail rabbit
2	ruler	desert cottontail rabbit has longer and wider ears	ears provide more shade for the desert cottontail rabbit
3	balance	desert cottontail rabbit has less mass	desert cottontail rabbit can blend more easily into its surroundings
4	ruler	desert cottontail rabbit has longer and wider ears	desert cottontail rabbit is able to release more heat into the environment

Which scientist provides the <u>best</u> evidence for why the desert cottontail rabbit can survive in locations with limited available water and high air temperatures?

A Scientist 1

B Scientist 2

C Scientist 3

D Scientist 4

Copyright © 2013 by the Oklahoma State Department of Education

Sample Test Item:
Content Objective: 3.2
Process Objective: 3.3
Depth of Knowledge: 3
Correct Response: B

Students studied the results of an investigation about the effects of heat on the ability of three pine tree species to reproduce.

Effects of Heat on Three Pine Tree Species

Temperature (°C)	Pine Tree Species		
	W	X	Z
20	-	+	-
30	-	+	-
40	-	+	-
50	+	+	-
60	+	-	+
70	+	-	+

Key
- \- unable to reproduce
+ able to reproduce

Student Responses

Student	Independent Variable	Conclusion
1	Temperature	Pine tree species W and Z are likely to survive long droughts.
2	Temperature	Pine tree species W and Z are likely to produce seedlings after a forest fire.
3	Ability to Reproduce	Pine tree species W and Z are likely to survive long droughts.
4	Ability to Reproduce	Pine tree species W and Z are likely to produce seedlings after a forest fire.

Which student correctly identified the independent variable and made a correct conclusion for this investigation?

A Student 1
B Student 2
C Student 3
D Student 4

Copyright © 2013 by the Oklahoma State Department of Education

Content Standard:

Standard 4: Structures and Forces of the Earth and Solar System—The earth is mostly rock, three-fourths of its surface is covered by a relatively thin layer of water, and the entire planet is surrounded by a relatively thin blanket of air, and is able to support life. The student will engage in investigations that integrate the process standards and lead to the discovery of the following objective:

Content Objective:

1. Landforms result from constructive forces such as crustal deformation, volcanic eruption, and deposition of sediment and destructive forces such as weathering and erosion.

Item Specifications:

Emphasis:

- The surface of Earth is constantly changing.
- The forces that change the surface of Earth can be classified as constructive or destructive.
- Weathering, erosion, earthquakes, volcanic eruptions, mountain building, and tectonic plate movement are examples of forces that change the surface of Earth.

Stimulus Attributes:

- Test items may include grade-level appropriate text, illustrations, data tables, graphs, and/or graphic organizers.
- Unfamiliar landforms will be described with text, diagrams, or pictures.

Format: Assessable content includes the following:

- Identify the changes in landforms due to a constructive or destructive event.
- Identify or sequence the changes in a landscape due to constructive or destructive events.
- Identify appropriate SI units and/or tools that can be used to identify and measure a landform or the forces that cause a landform.
- Compare and contrast different types of landforms and/or the forces that cause them.
- Classify landforms by the forces that created them.
- Predict the resulting landform from a given constructive or destructive force or event.
- Predict the force needed to construct or destruct a landform (e.g., weathering or erosion of a riverbank or mountain, glacial movement, volcanic eruption, folding of rock layers, tectonic plate movement including earthquakes, uplifting/convergence, divergence, subduction).
- Draw conclusions from data on the forces that create and destroy landforms and/or the resulting impact on the environment and/or landscape from these forces.
- Evaluate the design of an experiment to investigate constructive or destructive forces and their effects on different landforms (including: testable hypothesis, control, variables, procedure, results, and conclusion).
- Interpret data tables, graphs, and/or models to identify, compare, and contrast the forces that construct or destruct different landforms.

Assessment Limits: Non-assessable content includes the following:

- Items are limited to grade-level appropriate landforms including volcanoes, mountains, valleys, rivers, lakes, islands, mesas, caves, canyons, plateaus, deltas, and dunes.
- Items are limited to grade-level appropriate forces including: weathering, erosion, volcanic eruption, crustal deformation (e.g., mountain building, rifting, faulting, subduction), glacial movement, and deposition of sediments

Copyright © 2013 by the Oklahoma State Department of Education

Process Objectives May Include:

- Items may be written to assess any of the process objectives except for 3.6.

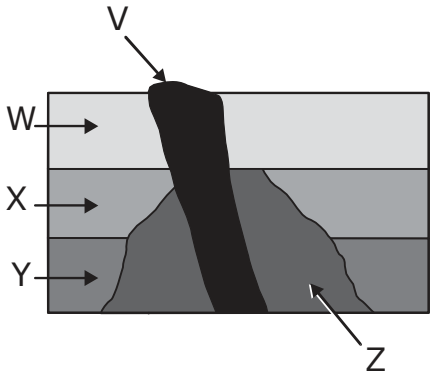
Distractor Domain May Include:

- Incorrect identification of a force and resulting landform
- Incorrect identification of SI units and/or tools to measure the force and landform
- Incorrect comparison of landforms and/or forces
- Incorrect classification of landforms and/or forces
- Incorrect prediction of force that creates or destroys a landform
- Incorrect analysis of the constructive or destructive forces and their resulting impacts
- Incorrect evaluation of a scientific experiment
- Incorrect interpretation of data tables, graphs, and/or models

Copyright © 2013 by the Oklahoma State Department of Education

Sample Test Item:
Content Objective: 4.1
Process Objective: 2.1
Depth of Knowledge: 2
Correct Response: D

Cross-Section of Rock Layers



Cross-Section of Rock Data

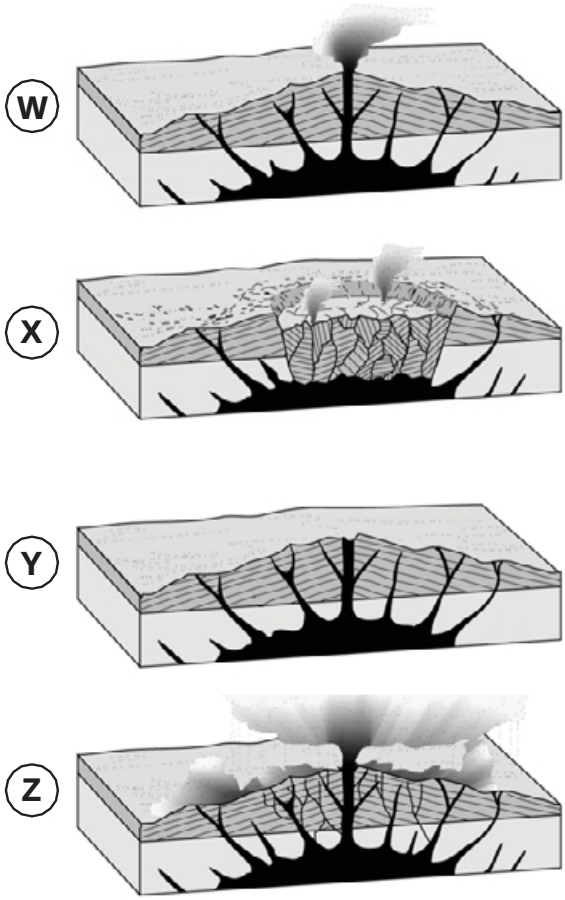
Locations	Age (millions of years)
W	80
X	130
Y	165
V	75
Z	105

Which locations are most likely made of hardened magma?

A Locations W and V
B Locations W and Y
C Locations X and Y
D Locations V and Z

Copyright © 2013 by the Oklahoma State Department of Education

Sample Test Item:
Content Objective: 4.1
Process Objective: 2.2
Depth of Knowledge: 2
Correct Response: C



Which list best orders the events that formed a volcanic crater?

A Y, X, Z, W
B X, W, Y, Z
C Y, W, Z, X
D X, Z, Y, W

Copyright © 2013 by the Oklahoma State Department of Education

Sample Test Item:
Content Objective: 4.1
Process Objective: 3.2
Depth of Knowledge: 3
Correct Response: D

A group of students performed an investigation.

- **students placed a box on its side on top of a table**
- **students placed a tray covered with a layer of fine sand inside the box**
- **students measured a distance of 10 cm from the edge of the tray outward and marked this location with an X**
- **students took turns exhaling air in the same direction across the sand from location X**
- **students recorded their observations**

Students identified a real-life use for the experimental results, as well as a problem with this experimental setup.

Student's Response

Student	Real-Life Use of Experimental Results	Problem with the Experimental Setup
1	to predict the rate of sediment deposition	The temperature of the air exhaled by the students may be different.
2	to model coastline and beach erosion	The particles of sand may vary in shape.
3	to predict movement of volcanic ash	The sides of the box limit the flow of air across the sand-covered tray.
4	to model the effects of wind	The students may have exhaled air with variable forces.

Which student correctly identified the real-life use and the problem?

A Student 1

B Student 2

C Student 3

D Student 4

Copyright © 2013 by the Oklahoma State Department of Education

Content Standard:

Standard 4: Structures and Forces of the Earth and Solar System—The earth is mostly rock, three-fourths of its surface is covered by a relatively thin layer of water, and the entire planet is surrounded by a relatively thin blanket of air, and is able to support life. The student will engage in investigations that integrate the process standards and lead to the discovery of the following objective:

Content Objective:

2. The formation, weathering, sedimentation, and reformation of rock constitute a continuing "rock cycle" in which the total amount of material stays the same as its form changes.

Item Specifications:

Emphasis:

- The rock cycle is a continuous process in which the total amount of material does not change within Earth's system.
- The transformation of a rock to a different rock type will depend on the environmental forces acting on it.
- When heat and pressure are applied to a rock, the rock can be transformed into a metamorphic rock.
- A rock that has melted and then cooled below or above Earth's surface is classified as an igneous rock (intrusive or extrusive).
- When sediments resulting from weathering and erosion are compacted and cemented together, they form sedimentary rock.

Stimulus Attributes:

- Test items may include grade-level appropriate text, illustrations, data tables, graphs, and/or graphic organizers.

Format: Assessable content includes the following:

- Identify the rock type based on the changes before, during, and/or after an event.
- Identify characteristics of minerals and or their basic mineral groups (i.e., carbonates, silicates, oxides).
- Identify appropriate SI units and/or tools that can be used to identify and measure the different rock types.
- Compare or contrast different rock types and/or how they are made during the rock cycle.
- Classify rocks as intrusive igneous, extrusive igneous, sedimentary, or metamorphic.
- Predict the type of rock that will result from a given process.
- Identify the process needed to transform a given rock type into another rock type.
- Evaluate the design of an experiment to investigate different rock types and how they are formed (including: testable hypothesis, control, variables, procedure, results, and conclusion).
- Interpret data tables, graphs, and/or models to identify, compare, and contrast the different rock types and the processes within the rock cycle.

Assessment Limits: Non-assessable content includes the following:

- Test items will be limited to three basic rock types: sedimentary, metamorphic, and igneous (intrusive igneous and extrusive igneous).

Process Objectives May Include:

- Items may be written to assess any of the process objectives except for 3.6.

Copyright © 2013 by the Oklahoma State Department of Education

Distractor Domain May Include:

- Incorrect identification of a rock type or processes in the rock cycle
- Incorrect identification of SI units and/or tools to measure and identify a rock type
- Incorrect comparison of rock types and the processes in the rock cycle
- Incorrect classification of rock types and the processes in the rock cycle
- Incorrect prediction of rock type or process that transforms rock
- Incorrect evaluation of a scientific experiment
- Incorrect interpretation of data tables, graphs, and/or models

Copyright © 2013 by the Oklahoma State Department of Education

Sample Test Item:
Content Objective: 4.2
Process Objective: 1.3
Depth of Knowledge: 1
Correct Response: A

Part of the Rock Cycle

basalt → marble → sandstone

Which measurement would give evidence that something stays the same throughout this part of the rock cycle?

A the masses in grams of the basalt and sandstone

B the masses in meters of the basalt and sandstone

C the volumes in milliliters of the basalt and marble

D the volumes in kilometers of the basalt and marble

Copyright © 2013 by the Oklahoma State Department of Education

Sample Test Item:
Content Objective: 4.2
Process Objective: 1.3
Depth of Knowledge: 2
Correct Response: A

Students collect two sedimentary rock samples of sandstone. The students rub the two rocks together and observe that pieces of sand break off from the rocks.

Sedimentary Rock Activity

Student	Measurement	Unit	Results
1	mass	gram	total mass of sand and sandstone rocks remains the same
2	volume	gram	total volume of sand and sandstone rocks remains the same
3	mass	gram	total mass of sand and sandstone rocks increases
4	volume	gram	total volume of sand and sandstone rocks increases

Based on the rock cycle, which student made a correct measurement and best described the results of this activity?

A Student 1
B Student 2
C Student 3
D Student 4

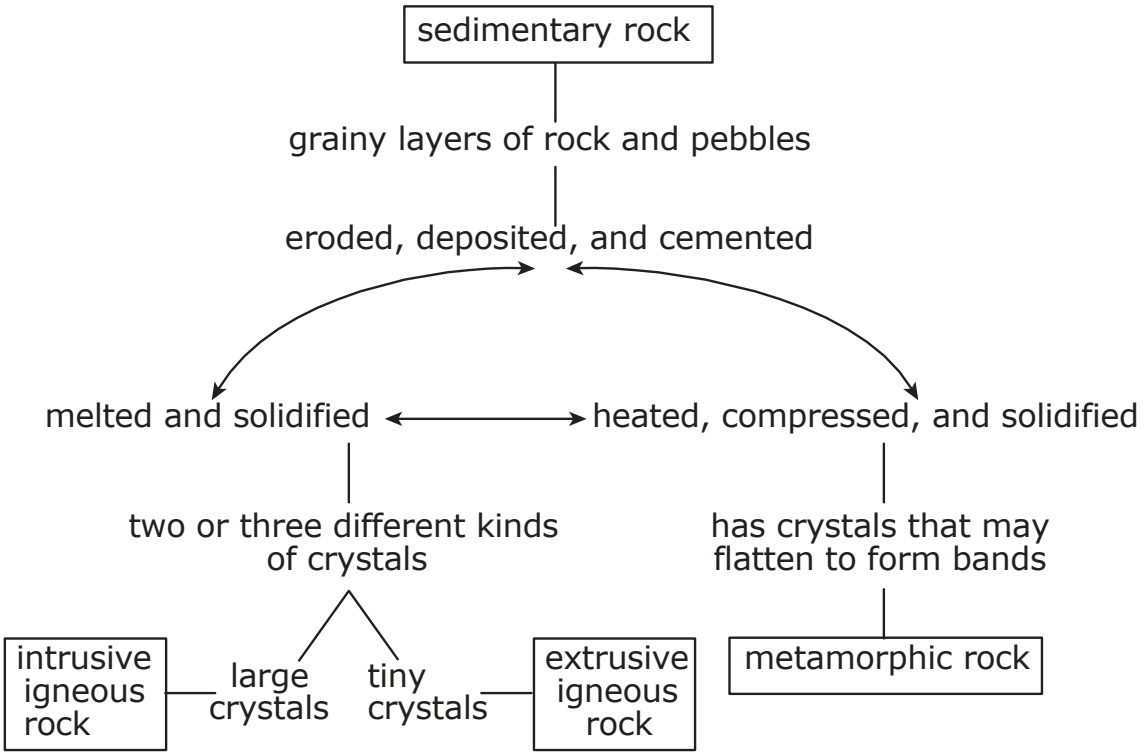
Copyright © 2013 by the Oklahoma State Department of Education

Sample Test Item:
Content Objective: 4.2
Process Objective: 2.1
Depth of Knowledge: 2
Correct Response: D

A student found a rock and listed some of its characteristics.

Student Observations of a Rock
• **rough texture** • **no fossils** • **crystals visible without using a tool** • **scattered arrangement of pink and black crystals**

Rock Cycle Diagram



Using the rock cycle diagram, which statement <u>best</u> describes the rock found by the student?

A The rock is metamorphic.

B The rock is extrusive igneous.

C The rock is sedimentary.

D The rock is intrusive igneous.

Copyright © 2013 by the Oklahoma State Department of Education

Content Standard:

Standard 4: Structures and Forces of the Earth and Solar System - The earth is mostly rock, three-fourths of its surface is covered by a relatively thin layer of water, and the entire planet is surrounded by a relatively thin blanket of air, and is able to support life. The student will engage in investigations that integrate the process standards and lead to the discovery of the following objectives:

Content Objective:

3. Atmospheric and ocean circulation patterns affect weather on a global scale (e.g., El Niño, La Niña, Gulf Stream).

Item Specifications:

Emphasis:

- Relate atmospheric and ocean circulation patterns to the effects on global weather.
- Explain the Gulf Stream and identify the effects the Gulf Stream has on weather in specified areas and its effect on plant and animal life.

Stimulus Attributes:

- Test items may include grade-level appropriate text, illustrations, data tables, graphs, and/or graphic organizers.

Format: Assessable content includes the following:

- Relate general temperature and precipitation effects of El Niño and La Niña for south central US.
- Explain what occurs in the Pacific Ocean during an El Niño and/or a La Niña event.
- Explain the significance of the Mid Atlantic Gulf Stream.
- Describe the importance and/or causes of circulation patterns (atmospheric, ocean) to global weather (e.g., point of origin and direction of movement of the Mid-Atlantic Gulf Stream to the North Atlantic, impact of the Gulf Stream on Western Europe, impact upon wildlife in the Mid-Atlantic warm water).
- Compare/contrast the weather pattern changes caused by El Niño and La Niña (e.g., precipitation and air/water temperature changes).
- Describe the cause and formation of the Mid-Atlantic Gulf Stream (wind creates friction as it travels over the water.)
- Gulf stream aids in the formation and strengthening of hurricanes in the Gulf of Mexico.

Assessment Limits: Non-assessable content includes the following:

- Test items will be limited to general effects on precipitation and temperature variances during El Niño and La Niña events.

Process Objectives May Include:

- Items may be written to assess any of the process objectives except for 3.6.

Distractor Domain May Include:

- Incorrect descriptions of effects of El Niño and La Niña
- Incorrect descriptions of effects of the Gulf Stream
- Incorrect explanations/understandings of circulation patterns
- Incorrect explanation on the causes of El Niño and La Niña

Copyright © 2013 by the Oklahoma State Department of Education

Content Standard:

Standard 5: Earth's History—The Earth's history involves periodic changes in the structures of the earth over time. The student will engage in investigations that integrate the process standards and lead to the discovery of the following objective:

Content Objective:

1. Earth's history has been punctuated by occasional catastrophic events (e.g., the impact of asteroids or comets, enormous volcanic eruptions, periods of continental glaciation, and the rise and fall of sea level).

Item Specifications:

Emphasis:

- Earth is a dynamic system that experiences occasional catastrophic events.
- These events can change Earth's system and the interactions between the atmosphere, solid earth, and oceans.
- The impacts resulting from a catastrophic event are often widespread and long-term.

Stimulus Attributes:

- Test items may include grade-level appropriate text, illustrations, data tables, graphs, and/or graphic organizers.

Format: Assessable content includes the following:

- Identify or sequence the changes caused by a catastrophic event (e.g., changes due to flooding, volcanic activity, earthquakes, or glacier activity, landslides, hurricanes, forest fires, tsunamis, mountain building, asteroid or comet impacts, sea level changes, and continental glaciation).
- Identify appropriate SI units and/or tools that can be used to identify and measure the impacts of a catastrophic event (e.g., crater size, sea level changes, and earthquakes).
- Compare and contrast catastrophic events and their impact on Earth as a system (e.g., changes in landscape, organism survival, global temperature).
- Classify catastrophic events based on location, impact on Earth, timing, and relation to other geologic or catastrophic events (e.g., mass extinctions, change in sea level related to glaciation, change in air temperature due to volcanic activity).
- Infer the type of catastrophic event based on its characteristics and evidence of the impact on Earth.
- Predict the impact of a given catastrophic event.
- Evaluate the design of an experiment to investigate the impact catastrophic events have on Earth, including: testable hypothesis, control, variables, procedure, results, and conclusion.
- Interpret data tables, graphs, and/or models of catastrophic events and/or their impacts on Earth's system.

Assessment Limits: Non-assessable content includes the following:

- Test items are limited to grade-level appropriate catastrophic events, as identified under Format.

Process Objectives May Include:

- Items may be written to assess any of the process objectives except for 3.6.

Copyright © 2013 by the Oklahoma State Department of Education

Distractor Domain May Include:

- Incorrect identification of a catastrophic event or the impact that results from a catastrophic event
- Incorrect identification of SI units and/or tools to measure and identify the impact of a catastrophic event
- Incorrect comparison of different catastrophic event characteristics and their impacts
- Incorrect classification of catastrophic events based on characteristics and impacts on Earth's system
- Incorrect evaluation of a scientific experiment
- Incorrect interpretation of data tables, graphs, and/or models

Copyright © 2013 by the Oklahoma State Department of Education

Sample Test Item:
Content Objective: 5.1
Process Objective: 1.2
Depth of Knowledge: 2
Correct Response: D

Which statement best describes how scientists are studying nature to predict a future event on Earth?

A They are observing nearby asteroids with an anemometer.

B They are measuring the temperature of ice sheets using a seismograph.

C They are observing the direction of ocean currents using an anemometer.

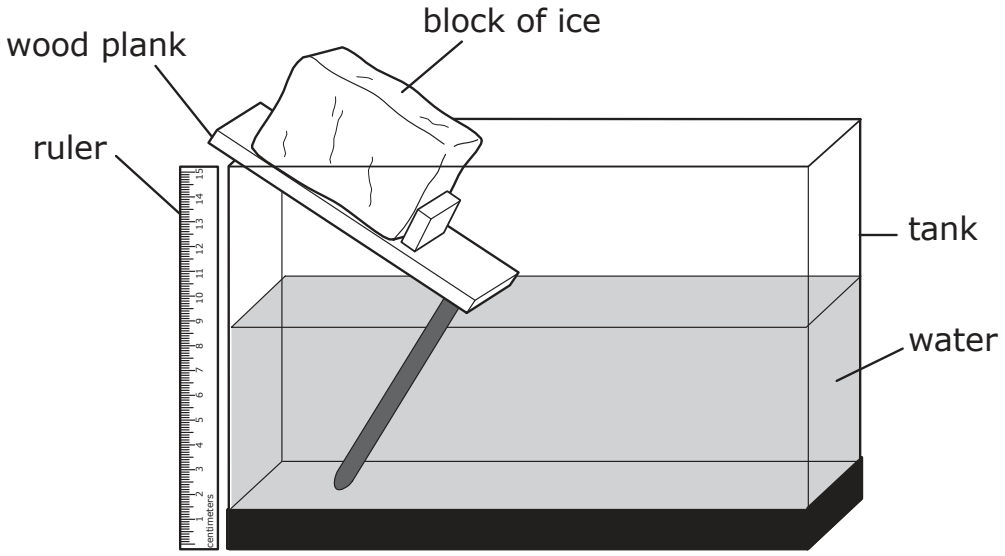
D They are monitoring for volcanic activity by using a seismograph.

Copyright © 2013 by the Oklahoma State Department of Education

Sample Test Item:
Content Objective: 5.1
Process Objective: 3.2
Depth of Knowledge: 3
Correct Response: B

Students are using this experimental setup in their classroom to learn about changing sea levels.

Experimental Setup



Student Questions and Predictions

Student	Question	Prediction
1	If sea ice decreases in size, what will happen to the sea level?	The sea level will decrease.
2	If a continental glacier melts, what will happen to the sea level?	The sea level will increase.
3	If sea ice increases in size, what will happen to the sea level?	The sea level will increase.
4	If a continental glacier increases in size, what will happen to the sea level?	The sea level will decrease.

Which student has written the <u>best</u> question and prediction that can be tested using this experimental setup?

A Student 1

B Student 2

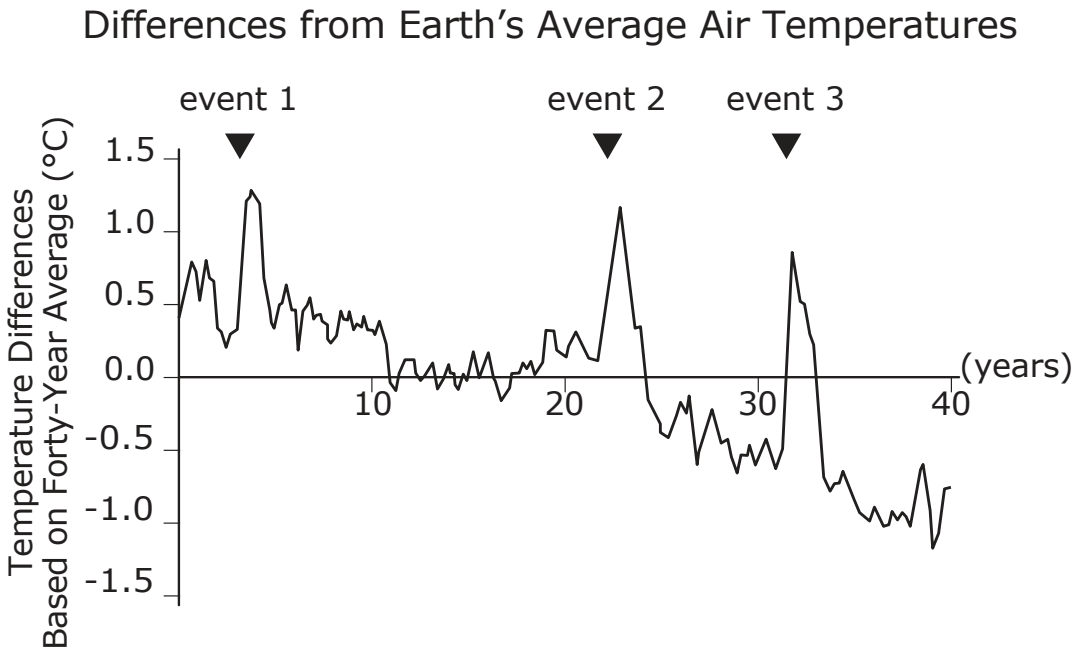
C Student 3

D Student 4

Copyright © 2013 by the Oklahoma State Department of Education

Sample Test Item:
Content Objective: 5.1
Process Objective: 4.3
Depth of Knowledge: 3
Correct Response: C

A student evaluates a graph that shows the differences in air temperature for each year from Earth's average air temperature during a forty-year period. The graph also shows when three events occurred on Earth.



Which statement <u>best</u> describes the three events and how they affect air temperature?

A The three events show how large earthquakes can cause the air temperature to increase.

B The three events demonstrate how a rise in sea level can cause the air temperature to increase.

C The three events show how volcanic eruptions can cause the air temperatures to increase and then decrease.

D The three events demonstrate how an increase in continental glacier size can cause the air temperature to increase and then decrease.

Copyright © 2013 by the Oklahoma State Department of Education

Content Standard:

Standard 5: Earth's History—The Earth's history involves periodic changes in the structures of the earth over time. The student will engage in investigations that integrate the process standards and lead to the discovery of the following objective:

Content Objective:

2. Fossils provide important evidence of how life and environmental conditions have changed (e.g., Law of Superposition, index fossil, geologic time period, extinction).

Item Specifications:

Emphasis:

- Earth is a dynamic system and environmental conditions have changed over time.
- Fossils can provide important evidence of the changing environmental conditions in an area and the impact these changes have had on plants and animals.
- Using fossils, scientists can infer environmental conditions such as the temperature, amount of precipitation, and type of ecosystem (forest, ocean, desert, etc.) that the fossilized organisms once inhabited.
- Fossil types include invertebrate fossils such as trilobites, sea stars, corals, mollusks (e.g., clams, gastropods, and oysters), and crustaceans; and, vertebrate fossils, such as dinosaurs and other reptiles, mammals, birds, fish (bony and cartilaginous), amphibians, and plant fossils.
- Unfamiliar fossils will be described with text, diagrams, and/or pictures.

Stimulus Attributes:

- Test items may include grade level appropriate text, illustrations, data tables, graphs, and/or graphic organizers.

Format: Assessable content includes the following:

- Identify the environmental changes before, during, and after an event based on evidence from fossils (e.g., identify the appropriate environmental conditions for each rock layer in a particular location based on the changing fossil types).
- Infer the type of environment that produced a given rock layer by analyzing fossil evidence.
- Identify appropriate SI units and/or tools that can be used to identify and measure different fossil types.
- Sequence past events based on rock layers and fossils within the layers.
- Predict a change in environmental conditions based on evidence provided by the fossil characteristics.
- Evaluate the design of an experiment to investigate the change in environmental conditions based on fossil evidence (including: testable hypothesis, control, variable, procedure, results, and conclusion).
- Interpret data tables, graphs, and/or models of fossils and the changing environment conditions of Earth's history.
- Interpret a geological time scale.

Assessment Limits: Non-assessable content includes the following:

- Items are limited to grade level appropriate fossils.

Process Objectives May Include:

- Items may be written to assess any of the process objectives except for 3.6.

Copyright © 2013 by the Oklahoma State Department of Education

Distractor Domain May Include:

- Incorrect inference of environmental condition based on fossil evidence
- Incorrect identification of SI units and/or tools to measure and identify different fossil types
- Incorrect comparison of a fossil type and the resulting environmental condition in which an organism once lived
- Incorrect classification of a fossil
- Incorrect prediction of a fossil type based on environmental conditions or predictions of environmental conditions based on the evidence of the fossil location and characteristics
- Incorrect evaluation of a scientific experiment
- Incorrect interpretation of data tables, graphs, and/or models

Copyright © 2013 by the Oklahoma State Department of Education

Sample Test Item:
Content Objective: 5.2
Process Objective: 2.2
Depth of Knowledge: 2
Correct Response: C

Some students studied the layers of rock in a hill. They measured the thickness of the rock layers, identified the rock type, and collected fossils from each rock layer.

Which is the best data that students could use to help identify the geologic time period of each rock layer?

A the thickness of each layer

B the type of rock of each layer

C the type of fossils in each layer

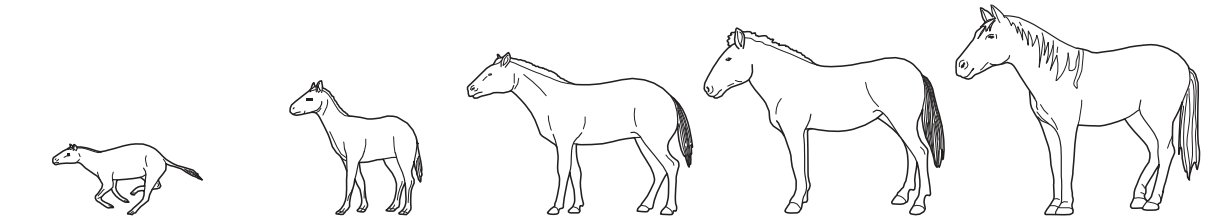
D the number of fossils in each layer

Copyright © 2013 by the Oklahoma State Department of Education

Sample Test Item:
Content Objective: 5.2
Process Objective: 2.2
Depth of Knowledge: 2
Correct Response: A

Scientific evidence suggests that the horse began changing 55 million years ago and became its current genus, *Equus*, 4 million years ago.

Drawings Based on the Horse Fossil Record



Hyracotherium Mesohippus Merychippus Pliohippus Equus

Which statement is the best conclusion based on this scientific evidence?

A The body size changed because its environment changed.

B The body size changed because its environment stayed the same.

C The tail length did not change because its environment changed.

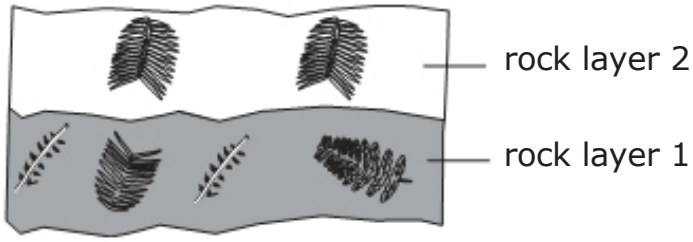
D The tail length did not change because its environment stayed the same.

Copyright © 2013 by the Oklahoma State Department of Education

Sample Test Item:
Content Objective: 5.2
Process Objective: 3.3
Depth of Knowledge: 3
Correct Response: B

Scientists are designing an investigation to determine why there is a difference in fern fossils found in two rock layers near each other. In their investigation, they use modern-day ferns similar to the fern fossils found in each of the rock layers.

Fern Fossils



Which investigation design would best help the scientists in determining why there is a difference in the fern fossils?

A

Investigation Question	Variables	
	Dependent	Independent
Did climate change have an effect on fern survival?	different air temperatures	type of ferns that survive

B

Investigation Question	Variables	
	Dependent	Independent
Did climate change have an effect on fern survival?	type of ferns that survive	different air temperatures

C

Investigation Question	Variables	
	Dependent	Independent
Does growing further below the surface of the ground have an effect on fern survival?	different amounts of water	number of ferns used

D

Investigation Question	Variables	
	Dependent	Independent
Does growing further below the surface of the ground have an effect on fern survival?	number of ferns used	different amounts of water

Copyright © 2013 by the Oklahoma State Department of Education