OKLAHOMA SCHOOL TESTING PROGRAM

OKLAHOMA MODIFIED ALTERNATE ASSESSMENT PROGRAM

Test and Item Specifications

Science

Grade 8

2012-2013 Edition

Oklahoma State Department of Education
Oklahoma City, Oklahoma

Revised
March 2013

OKLAHOMA MODIFIED ALTERNATE ASSESSMENT PROGRAM

TEST AND ITEM SPECIFICATIONS

Table of Contents

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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 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 ($OK C^3$).*

***Oklahoma 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 (P3.6)
Interpret and Communicate • Data tables/line/bar/trend and circle graphs (P4.2) • Explanations/predictions (P4.3)

***Oklahoma 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 the Earth and Solar System • Landforms result from constructive and destructive forces (C4.1) • Rock cycle (C4.2)
Earth's History • Catastrophic events (C5.1) • Fossil evidence (C5.2)

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General Considerations

It is necessary to create test items that are reliable, fair, and targeted to the *Oklahoma C*^{3} objectives 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 all process/inquiry and content standards and objectives listed in the Test Blueprint for eighth-grade science. In the *Oklahoma College, Career, and Citizen Ready (C*^{3}*)* Standards document, asterisks have been used to identify standards and objectives that must be assessed by the local school district.

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

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

4. 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.

5. All multiple-choice items (the key and all distractors) are similar in length and syntax. Students should not be able to rule out a wrong answer or identify a correct response solely because it looks or sounds different from the other answer choices. Distractors are created so that students must 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 as much as possible equally distributed among As, Bs, and Cs.

6. Note of explanation: i.e. (*id est*: that is, namely) only items mentioned can be used and e.g. (*exemplí grátiá*: for example) items related to the examples may be assessed.

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 Modified Alternate Assessment Program, modifications have been made to some items that simplify and clarify instructions, and provide maximum readability, comprehensibility, and legibility.

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Universal Modifications
• Minimize the number of questions on the page (limit to 2 or 3) • Use a larger font size • Provide only three answer options instead of four • Highlight the main points in the question or passage by underlining and using boldface • Allow for the same accommodations as in the standard assessment • Avoid questions that require students to select the better/best answer • Eliminate answer choice that give students the option of making no changes to the item • Be consistent in wording of directions across grades and subjects • Minimize the use of pronouns and prepositional phrases • Avoid the use of multiple-meaning words and words that can function as more than one part of speech • Enlarge art when possible • Simplify art when possible, (i.e. removing unnecessary labels, use less gray scale, use thicker lines when outlining, etc.) • Box informational text in an item • Bullet information when possible (e.g. bullet detailed information or processes) • Reduce reading load of stem, stimuli, and answer options when possible • Use Verdana font • Revise answer options to address parallelism and minimize outliers
Science Items
• Reduce the amount of reading • Avoid complicated art • Simplify tables and charts by removing irrelevant rows or columns • Box formulas to make them stand out • Answer options align to content and process • Simplify reading load, including vocabulary, when possible • No stimuli sets • Delete cluster items, negative items, and items that cannot be modified based on guidelines • Delete extraneous information including irrelevant material and unnecessary words in items or graphics

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- Simplify complex sentence structure and vocabulary in item and answer choices without eliminating science vocabulary
- Change passive voice to active voice when appropriate
- Change item from an open-ended statement to a direct question or vice versa, as necessary, for clarification
- Add precise language to provide additional context for clarification
- Use consistent language within an item in order to focus student attention on what is being asked
- Revise text as necessary to maintain the authenticity and logic of the item due to modifications
- Use bullets to clearly organize complex items into smaller, meaningful parts
- Direct student attention to graphics
- Simplify visual complexity of graphics
- Provide new text and/or reorganize existing text within the question to explain or clarify the graphic; science content must remain accurate
- Provide additional graphics to support text, emphasize ideas, and facilitate comprehension
- Reduce the number of variables and simplify digits in item when appropriate
- Limit the number of steps and/or operations in multi-step problems
- May be provided appropriate formula and/or conversion near the item

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Example of Item Modification for OMAAP Science

OCCT *Oklahoma C*^{3} Sample Item:

Content Objective: 1.1
Process Objective: 4.3
Depth of Knowledge: 1
Correct Answer: 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 process results in the formation of

A a new element.

B a new substance.

C a new energy source.

D a new physical mixture.

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Modified *Oklahoma C*^{3} Sample Item:

Content Objective: 1.1
Process Objective: 4.3
Depth of Knowledge: 1
Correct Answer: B

Jackie stirs a powder into a liquid. She makes the following observations.

1. Bubbles
2. Releases heat
3. Forms a solid

Based on these observations, what was formed?

Ⓐ a new element
Ⓑ a new substance
Ⓒ a new energy source

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Multiple-Choice Item Rules

- All items clearly indicate what is expected in a response and help the students on their response.
- Each multiple-choice item has a stem (question, statement, or incomplete statement, and/or graphic component) and three 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 the student in determining the correct response.

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

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 or modified 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.

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Test Structure, Format, and Scoring

The test will consist of 40–43 operational multiple-choice items, which will be written at a reading level two grades below an eighth-grade audience and will include three responses from which to choose: the correct answer and two distractors. Of the total items, 5 items are field-test items and do not contribute to the student's scaled score.

Grades 3–8

Content Assessment	Total Items	Total Operational Items*	Total Field Test Items
Science Grades 5 and 8	48	43	5

* The actual number of items scored for a student may be slightly lower pending a review of item statistics.

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.

Test Alignment with Oklahoma C^3

Criteria for Aligning the Test with the *Oklahoma C^3* Standards and Objectives
1. Categorical Concurrence The test is constructed so that there are at least six items measuring each standard, with the content category consistent with the related standard. The number of items, six, 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 objective.
3. Range of Knowledge Correspondence The test is constructed so that at least 50% of the objectives for a standard are assessed.
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 *Oklahoma C^3* standard and objective in terms of the percent of total test items measuring each standard and the number of test items measuring each objective.
5. Source of Challenge Each test item is constructed in such a way that the major cognitive demand comes directly from the targeted skill or concept being assessed, not from specialized knowledge or cultural background that the test-taker may bring to the testing situation.

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Oklahoma School Testing Program
Oklahoma Modified Alternate Assessment Program
Grade 8 Science
Test Blueprint
School Year 2012-2013

The Test Blueprint reflects the degree to which each *Oklahoma C*[3] standard and objective is represented on the test. The overall distribution of operational items in a test form is intended to look as follows:

***Oklahoma C*[3] Process Standards and Objectives**	**Ideal Number of Items**	**Ideal[1] Percentage of Items**
Observe and Measure (P1.0)	**6-8**	**14-19%**
Qualitative/quantitative observations/ changes (P1.1)	3-5	
SI (metrics) units/appropriate tools (P1.2 and P1.3)	3-5	
Classify (P2.0)	**6-8**	**14-19%**
Classification system (P2.1)	3-5	
Properties ordered (P2.2)	3-5	
Experiment (P3.0)	**13-15**	**30-35%**
Experimental design (P3.2)	4-6	
Identify variables (P3.3)	4-6	
Hazards/practice safety (P3.6)	3-5	
Interpret and Communicate (P4.0)	**11-13**	**26-30%**
Data tables/line/bar/trend and circle graphs (P4.2)	6-8	
Explanations/prediction (P4.3)	4-6	
Total Test	**40-43[2]**	**100%**

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

2 The actual number of items scored for a student may be slightly lower pending a review of item statistics. Student performance on the multiple-choice test will be reported at the standard level.

- Student performance on the Multiple-Choice test will be reported at the standard level. A minimum of six 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.
- The OMAAP Grade 8 Science blueprint for 2012–2013 is the same as 2011–2012. No standard setting will be necessary summer of 2013.

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Oklahoma School Testing Program
Oklahoma Modified Alternate Assessment Program
Grade 8 Science (Continued)
Test Blueprint
School Year 2012-2013

Oklahoma C³ **Content Standards and Objectives**	**Ideal Number of Items**	**Ideal[1] Percentage of Items**
Properties and Chemical Changes in Matter (C1.0)	**6-8**	**14-19%**
Chemical reactions (C1.1)	2-4	
Conservation of matter (C1.2)	2-4	
Motion and Forces (C2.0)	**6-8**	**14-19%**
Motion of an object (C2.1)	2-4	
Object subjected to a force (C2.2)	2-4	
Diversity and Adaptations of Organisms (C3.0)	**7-9**	**16-21%**
Classification (C3.1)	3-5	
Internal and external structures (C3.2)	2-4	
Structures/Forces of the Earth/Solar System (C4.0)	**6-8**	**14-19%**
Landforms result from constructive and destructive forces (C4.1)	2-4	
Rock cycle (C4.2)	2-4	
Earth's History (C5.0)	**6-8**	**14-19%**
Catastrophic events (C5.1)	2-4	
Fossil evidence (C5.2)	2-4	
Total Test	**36-39[2*]**	**90%****

* Four out of 40 total items assess the "Safety" process standard, for which there is no corresponding content standard.

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

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

2 The actual number of items scored for a student may be slightly lower pending a review of item statistics.

- Student performance on the multiple-choice test will be reported at the standard level. A minimum of 6 items is required to report to a standard. While the actual number of items on the test may not match the blueprint exactly, each future test will move toward closer alignment with the ideal blueprint.

- The OMAAP Grade 8 Science blueprint for 2012–2013 is the same as 2011–2012. No standard setting will be necessary summer of 2013.

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Overview of Item Specifications

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

- *Oklahoma C*^{3} Standard and *Oklahoma C*^{3} Objective
- Item Specifications
  a. Emphasis
  b. Stimulus Attributes
  c. Format: Assessable content includes the following
  d. Assessment Limits: Non-assessable content includes the following
  e. Content Objectives May Include
  f. Distractor Domain
  g. Sample Test Items

The headings "*Oklahoma C*^{3} Standard" and "*Oklahoma C*^{3} Objective" state the standard and objective being measured as found in the eighth-grade science section of the *Oklahoma C*^{3} document.

The heading "Item Specifications" highlights important information about the item's 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 safety only. All items will assess objectives using only depth-of-knowledge levels 1, 2, or 3.

Note about the Item Specifications and Sample 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.

These sample test items are not intended to be definitive in nature or construction, as the stimuli and test items may differ from one test form to another, as may their presentation.

Depth of Knowledge Assessed by Test Items

The Oklahoma Modified Alternate Assessments will, as closely as possible, reflect the following "Depth of Knowledge" (DOK) distribution of items.

Grade 8

Depth of Knowledge	Percentage of Items
Level 1—Recall and Reproduction	10-15%
Level 2—Skills and Concepts	65-70%
Level 3—Strategic Thinking	15-25%

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Descriptions of the depth-of-knowledge levels for Grade 8 Science are as follows:

Level 1 (Recall and Reproduction) is the recall of information such as a fact, definition, term, or simple procedure, as well as performing a **simple** science process or procedure. Level 1 only requires students to demonstrate a rote response, use a well-known formula, follow a set 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, then the item is at Level 1. If the knowledge necessary to answer the item does not automatically provide the answer, the item is at least at Level 2.

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

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

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, requiring reading information from the graph, is at 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 Level 3.

Some examples that represent, but do not constitute all of Level 2 performance 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.

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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 multistep task requires **more demanding reasoning**. In most instances, requiring students to explain their thinking is at Level 3; requiring a very simple explanation of 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 nonroutine problems.

Some examples that represent, but do not constitute, all 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>

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Oklahoma College, Career and Citizen Ready (C^3) Standards

Grade 8

Science

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).

The skills should be taught by investigating content, concepts, and principles of major themes in Physical, Life, and Earth/Space Science.

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.

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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.

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.

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*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.

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Oklahoma College, Career and Citizen Ready (C^3) Standards

PHYSICAL SCIENCE

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

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, and 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).

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EARTH/SPACE SCIENCE

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 - 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, and extinction).

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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 these objectives to meet this process standard.

Process Objective:

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

Item Specifications:

Emphasis:

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

Stimulus Attributes:

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

Format: Assessable content includes the following:

- Compare and contrast 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, etc., value in a set of data.
- Identify qualitative changes occurring in an event.
- Analyze and/or identify quantitative changes using common formulas (refer to page 21).
- Items include grade-appropriate events in which students identify the change that occurs over time or determine the cause of the change.

Assessment Limits: Non-assessable content includes the following:

- Test items are limited to qualitative and quantitative changes.
- Line of best-fit graphs will not be used.

Content Objectives May Include:

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

Distractor Domain:

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

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Common Formulas for the OCCT and OMAAP
Grade 8 Science

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

1. Cellular respiration

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

2. Photosynthesis

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

3. Density

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

4. Speed

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

5. Force

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

6. Volume

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

7. Velocity

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

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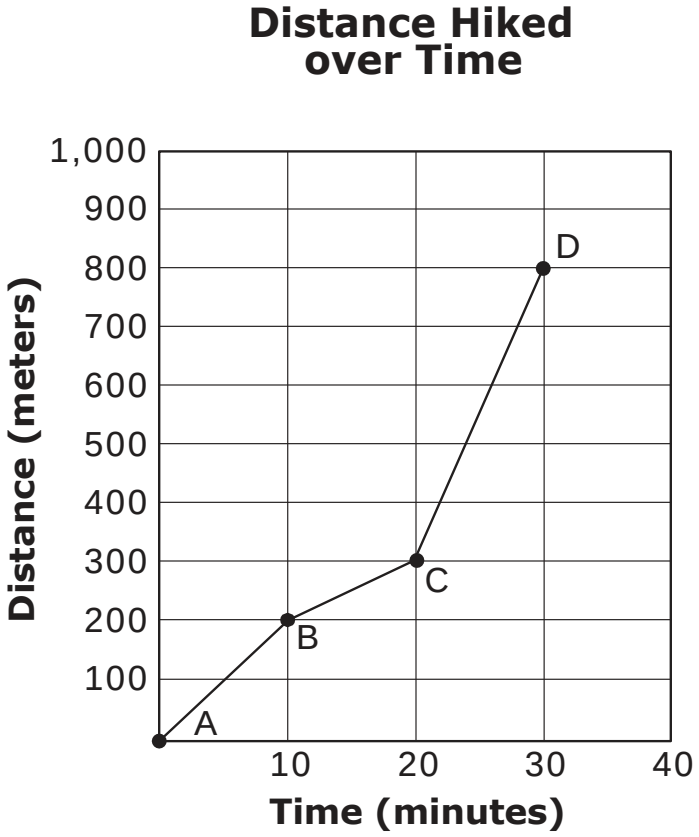
Modified *Oklahoma C*^{3} Sample Item:

Process Objective: 1.1
Content Objective: 2.1
Depth of Knowledge: 2
Correct Answer: B

The graph shows how fast a person moved at different points in a hike.



$$\text{Speed} = \frac{\text{Distance}}{\text{Time}}$$

What was the person's speed from point A to point B?

Ⓐ 10 meters/minute

Ⓑ 20 meters/minute

Ⓒ 200 meters/minute

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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 these objectives 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 data tables.

Format: Assessable content includes the following:

- Identify appropriate tools used when measuring objects, organisms, and/or events.
- Select tools to make quantitative measurements.
- Make basic calculations needed when measuring.

Assessment Limits: Non-assessable content

- Test items are limited to selecting the appropriate tools commonly used in eighth-grade science classrooms for measuring an object, organism, and/or event.
- Equipment not assessed (e.g., overflow container, tiltmeter, GPS).

Content Objectives May Include:

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

Distractor Domain:

- Inappropriate tools for measurement
- Inappropriate measurements for specific tools
- Incorrect calculations

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Modified *Oklahoma C*^{3} Sample Item:

Process Objective: 1.2
Content Objective: 1.2
Depth of Knowledge: 2
Correct Answer: A

Use the following information to calculate the volume of a rock in milliliters (mL).

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

What is the volume of the rock?

Ⓐ 68 mL
Ⓑ 318 mL
Ⓒ 568 mL

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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 these objectives 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.
- Make basic calculations needed when measuring with appropriate SI units.
- Identify appropriate SI prefixes.
- Identify derived units for speed or velocity.
- Utilize common science formulas to determine appropriate SI units (refer to page 21).

Assessment Limits: Non-assessable content includes the following:

- Test items are limited to the System International units listed in the objective above.
- English units will not be referenced.

Content Objectives May Include:

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

Distractor Domain:

- Incorrect use of metric unit
- Incorrect metric measure
- Incorrect calculations

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Modified *Oklahoma C*^{3} Sample Item:

Process Objective: 1.3
Content Objective: 1.2
Depth of Knowledge: 1
Correct Answer: A

A student wants to measure the <u>volume</u> of the liquid in the Petri dish.

Which unit of measurement should the student use?

Ⓐ milliliters

Ⓑ milligrams

Ⓒ milliseconds

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Process Standard:

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.

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., various line graphs, flowchart), and classification keys including simple dichotomous keys.
- Items include classification of science-related objects, organisms, or events.

Format: Assessable content includes the following:

- Use simple dichotomous keys to place objects and organisms 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 (i.e., atomic number, element name, atomic mass, and symbol).

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 should not include cladograms or phylogenetic trees.
- No more than three data lines on a multiple line graph.

Content Objectives May Include:

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

Distractor Domain:

- Plausible, but inaccurate, classification schemes

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Modified *Oklahoma C*^{3} Sample Item:

Process Objective: 2.1
Content Objective: 4.1
Depth of Knowledge: 2
Correct Answer: B

Earth's surface can be changed by both constructive or destructive forces. Examples of changes are shown in the diagrams or pictures.

1	2	3
		
4	**5**	**6**
		

Which three pictures represent changes from constructive forces?

Ⓐ 1, 2, 5
Ⓑ 1, 3, 6
Ⓒ 3, 4, 6

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Process Standard:

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.

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, or events.

Stimulus Attributes:

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

Assessment Limits: Non-assessable content includes the following:

- Test items may include a set of misordered objects, organisms, or events that students must reorder in the correct sequence.
- Students may need to determine the property by which the objects, organisms, or events are ordered.
- No more than six item properties may be used.

Content Objectives May Include:

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

Distractor Domain:

- Properties that are not similar
- Irrelevant properties used
- Misordered object, organism, or events

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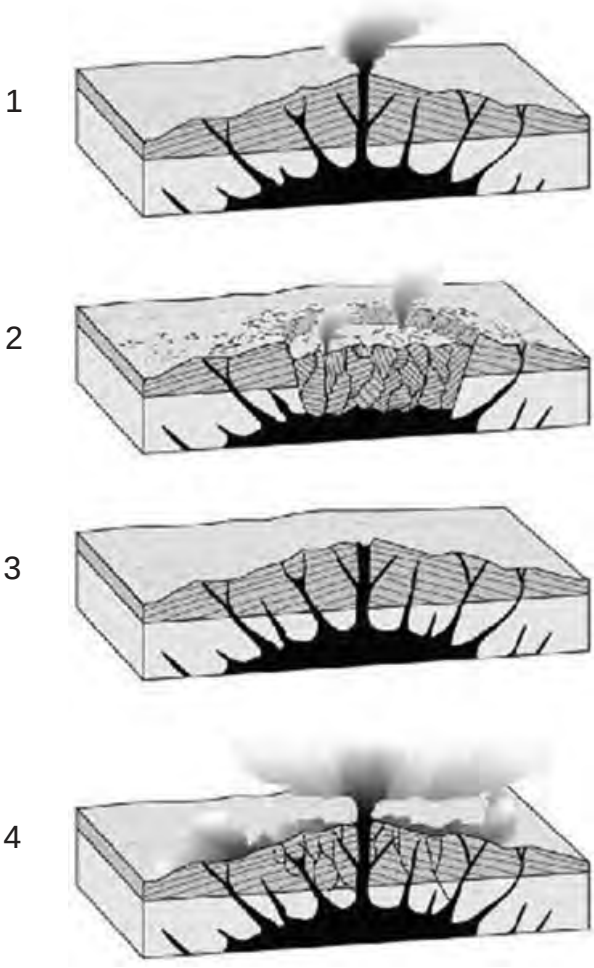
Modified *Oklahoma C*^{3} Sample Item:

Process Objective: 2.2
Content Objective: 4.1
Depth of Knowledge: 2
Correct Answer: B



Which list shows the order of events that formed the volcanic <u>crater</u>?

Ⓐ 2, 1, 3, 4
Ⓑ 3, 1, 4, 2
Ⓒ 3, 4, 1, 2

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Process Standard:

Standard 3: Experimental 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.

Process Objective:

2. Evaluate the design of a scientific investigation.

Item Specifications:

Emphasis:

- Identify the design of a scientific investigation.
- Sequence steps in logical progression and determine what steps are not needed or have been left out; 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 data tables.

Format: Assessable content includes the following:

- Determine the correct order for the steps of an experiment.
- Identify appropriate graphical representations of data.
- Identify necessary and/or unnecessary steps in an experiment.
- Identify or determine the correct hypothesis or conclusion.
- 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 left out; or identifying appropriate experimental designs.

Content Objectives May Include:

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

Distractor Domain:

- Steps listed in an incorrect order
- Steps not needed in an experiment
- Necessary steps for an experiment not included in scenario
- Inappropriate experiment procedures
- Incorrect purpose for experiment

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Modified *Oklahoma C*^{3} Sample Item:

Process Objective: 3.2
Content Objective: 1.2
Depth of Knowledge: 2
Correct Answer: C

A student wanted to see if a solid substance is an acid or a base.

1. **Place the blue litmus paper in the dissolved substance.**
2. **Dissolve the substance in water.**
3. **Look at any changes in the color of the litmus paper.**
4. **Grind the solid substance into a powder.**

In which order should the student do these steps?

Ⓐ 4, 1, 2, 3
Ⓑ 3, 2, 1, 4
Ⓒ 4, 2, 1, 3

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Process Standard:

Standard 3: Experimental 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.

Process Objective:

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

Item Specifications:

Emphasis:

- Identify variables and the controls in an experimental design.

Stimulus Attributes:

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

Format: Assessable content includes the following:

- Identify the independent or dependent variables in an experiment.
- Identify the control in 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 present an experimental setup or the results of an experiment. Students are asked to identify the control and/or variables. Items emphasize student-designed, classroom-conducted investigations.
- Differentiation between the independent and dependent variables is not assessed.
- Experimental scenarios are limited to no more than one constant variable.

Content Objectives May Include:

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

Distractor Domain:

- Irrelevant variables and/or control
- Wrong type of variable and/or control

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Modified *Oklahoma C*^{3} Sample Item:

Process Objective: 3.3
Content Objective: 3.2
Depth of Knowledge: 2
Correct Answer: 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?

Ⓐ environmental temperature; type of food eaten

Ⓑ environmental moisture; size of the ants

Ⓒ environmental temperature; number of ants

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Process Standard:

Standard 3: Experimental 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.

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 and/or field.

Stimulus Attributes:
- Test items may include illustrations and written descriptions.
- Items may include grade-appropriate situations or problems reflecting potential dangers related to science activities.

Format: Assessable content includes the following:
- Identify potential safety 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.

Content Objectives May Include:
- Content is nonspecific.

Distractor Domain:
- Wrong safety hazard
- Not a safety concern
- Wrong safety procedure
- Not a safety procedure

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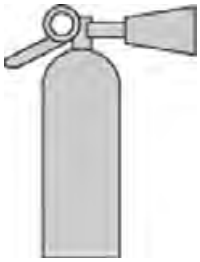
Modified *Oklahoma C*^{3} Sample Item:

Process Objective: 3.6
Content Objective: None
Depth of Knowledge: 1
Correct Answer: A



In which situation should this safety equipment be used?

Ⓐ fire
Ⓑ broken glass
Ⓒ chemical spills

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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 these objectives to meet this process standard.

Process Objective:

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

Item Specifications:

Emphasis:

- Compare and contrast information given in a data table, line, bar, or circle graph.

Stimulus Attributes:

- Test items may include data tables, line, bar, and/or circle graphs for students to interpret.

Format: Assessable content includes the following:

- Recognize trends in data.
- Compare and contrast 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, and/or circle graphs.
- No more than three data lines may be used on a multiple line graph.
- Line of best fit will not be used.

Content Objectives May Include:

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

Distractor Domain:

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

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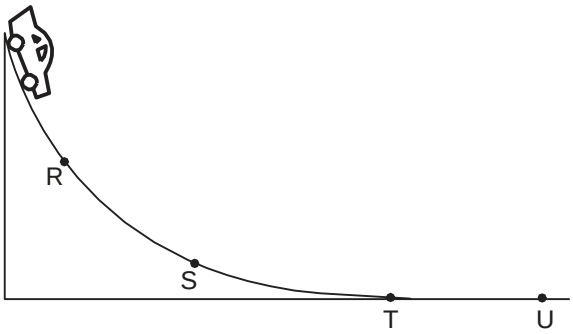
Modified *Oklahoma C*^{3} Sample Item:

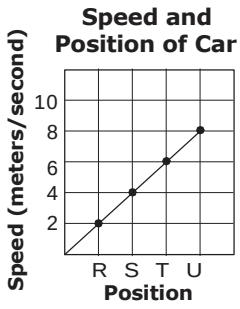
Process Objective: 4.2
Content Objective: 2.1
Depth of Knowledge: 2
Correct Answer: C

An investigation is completed using the set-up shown. A toy car is released from the top of the ramp. The car rolls down the ramp and stops at point U. The speed of the car was recorded at each position and plotted on a graph.

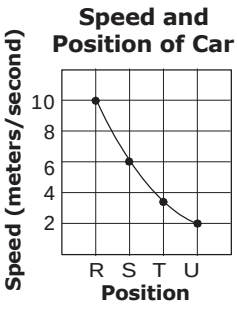


Which graph represents the data gathered for the investigation?

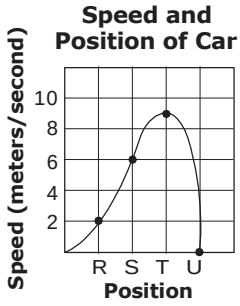
Ⓐ



Ⓑ



Ⓒ



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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 objectives to meet this process standard.

Process Objective:

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

Item Specifications:

Emphasis:

- Use data to share explanations and/or predictions.
- Use patterns in data and describe them; share explanations or make predictions based on interpretation of data provided.

Stimulus Attributes:

- Test items may include data tables parts, of the periodic table, flowcharts, graphs, or written descriptions.
- Items include data arranged in a format that is grade-appropriate and lends itself to description.
- A variety of data tables, or portions of the Periodic table may be used.

Format: Assessable content includes the following:

- Use patterns and trends in data to make predictions.
- Use data to develop basic scientific explanations.

Assessment Limits: Non-assessable content includes the following:

- Test items are limited to predictions and explanations based on data.
- Periodic chart information is limited to the most commonly used elements.

Content Objectives May Include:

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

Distractor Domain:

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

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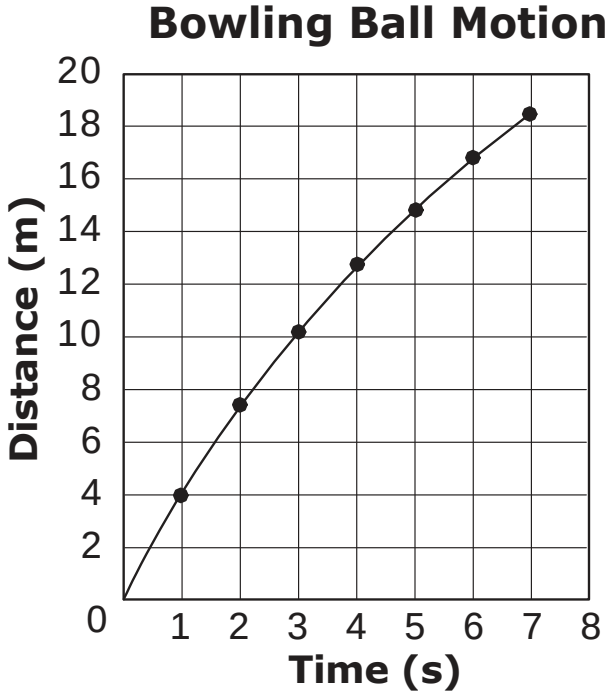
Modified *Oklahoma C*^{3} Sample Item:

Process Objective: 4.3
Content Objective: 2.1
Depth of Knowledge: 2
Correct Answer: C

The motion of a bowling ball when it is rolled down a lane is recorded and then plotted onto a distance vs. time graph. The graph shows the peed of the bowling ball as it was traveling down the lane.



D = rt

Based on the graph, which statement explains the motion of the bowling ball?

Ⓐ The bowling ball is traveling at a constant speed.

Ⓑ The bowling ball is increasing in speed as it travels down the lane.

Ⓒ The bowling ball is decreasing in speed as it travels down the lane.

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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 would include a temperature change, gas production, a 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 descriptions.
- Unfamiliar chemical reactions will be described with a chemical equation, diagram, picture, or text.
- Chemical reactions will be presented as a balanced chemical equation with 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, a 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/ or conclusion).
- Interpret data tables, graphs, graphic organizers, and models of a chemical reaction and its properties.
- Identify properties of acids and bases.
- Chemical formula for photosynthesis.
- Chemical formula for cellular respiration.

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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 and absorbing reactions, gas production, color change, formation of a solid, and basic equation for photosynthesis or cellular respiration).
- Students will not identify the type of chemical bonding between atoms during a chemical reaction or from an equation.
- Balancing equations, organic compounds, or specifics of the carbon cycle, how CO_2 is used to make glucose, the Krebs's cycle, or information related to photosynthesis and respiration outside of grade level 8 will not be assessed.

Process Objectives May Include:

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

Distractor Domain:

- 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, graphic organizers, and models
- Incorrect interpretation/explanation of chemical properties

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Modified *Oklahoma C*^{3} Sample Item:

Content Objective: 1.1
Process Objective: 4.3
Depth of Knowledge: 1
Correct Answer: B

A student stirs a powder into a liquid. She makes the following observations.

1. Bubbles
2. Releases heat
3. Forms a solid

Based on these observations, what was formed?

Ⓐ a new element
Ⓑ a new substance
Ⓒ a new energy source

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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 different 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, graphic organizers, and descriptions.
- Test items will include descriptions and/or data related to materials that are likely to be unfamiliar to students in this grade.
- The standard formula may be provided for calculations of density (d= m/v).

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., will burn, will 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 do change (e.g., size, shape).
- Identify common physical and chemical changes (e.g., heat melting ice, sugar dissolving in water, and wood being cut; leaves changing color, digestion, cooking, and rusting of metals).

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- Compare and contrast materials based on physical properties (i.e., mass, volume, temperature, color, texture, density, and hardness).
- Compare and contrast chemical reactions and physical changes (e.g., phase changes, solids dissolving, and/or substances changing shape; rate of gas production, temperature changes, color change, precipitate forming, production of light or sound).
- 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, and/or substances changing shape; rate of gas production, temperature changes, color change, precipitate forming, production of light or sound).
- Predict the type of change that has occurred based on the physical properties of the given end product(s).
- Evaluate the design of an experiment to investigate the physical or chemical properties and/or changes (e.g. comparing the mass of the reactants to the mass of the products in a chemical reaction) including, a testable hypothesis, control, variables, constants, procedure, results and/or conclusions.
- Interpret data tables, graphs, graphic organizers, and models of matter and their characteristic properties before and after physical and chemical changes.
- Make inferences that are supported by observations and/or measurements of physical properties.
- Analyze objects or groups of objects by measuring and/or observing their common physical properties using grade-level appropriate tools.

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.
- Comparing and/or contrasting the chemical make-up of minerals is not required (i.e., silicates, carbonates, and oxides).

Process Objectives May Include:

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

Distractor Domain:

- 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, graphic organizers, and models

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Modified *Oklahoma C*^{3} Sample Item:

Content Objective: 1.2
Process Objective: 1.3
Depth of Knowledge: 2
Correct Answer: B

The following equation shows the parts of a chemical reaction.

reactant + reactant ⟶ product

Which statement explains what happens during a chemical reaction?

Ⓐ The total mass of the product, measured in liters, is equal to the total mass of the reactants.

Ⓑ The total mass of the product, measured in grams, is equal to the total mass of the reactants.

Ⓒ The total mass of the product, measured in grams, is different than the total mass of the reactants.

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Modified *Oklahoma C*^{3} Sample Item:

Content Objective: 1.2
Process Objective: 4.3
Depth of Knowledge: 1
Correct Answer: C

A student places 2 grams of salt into a cup of water. He evaporates the water leaving only salt in the cup.

Why will all 2 grams of the salt still be in the cup?

Ⓐ A chemical change occurred.
Ⓑ Salt does not dissolve in water.
Ⓒ Salt does not evaporate with water.

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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:

- An object's motion 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, or descriptive text and used to make predictions.
- The standard formula may be provided for calculations of speed (s=d/t).

Stimulus Attributes:

- Test items may include grade-level appropriate text, illustrations, data tables, graphs, graphic organizers, and descriptions, (e.g. single, double, and multiple line).

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 a description, pictures, or data.
- Identify appropriate SI units and/or tools to determine the time, distance, and/or speed of an object.
- Determine accurate and/or 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 of an object based on description, pictures, or data about an object's motion.
- Evaluate the design of an experiment to investigate the motion of an object including a testable hypothesis, control, variables, constants, procedure, results and/or conclusions.
- Interpret data tables and models of an object's motion.
- Analyze distance vs. time graph, speed vs. time graph, and position vs. time graph.
- Calculation of an object's speed, distance, or time based on provided data, interpretation of graphs, and 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.
- Line of best fit will not be used.

Process Objectives May Include:

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

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Distractor Domain:

- Incorrect identification of an object's change in position, time, or speed
- Incorrect identification of SI units and/or tools to measure and identify an object's distance traveled, length of time, or speed
- Incorrect comparison of an object's motion
- 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, graphic organizers, and models
- Incorrect calculation

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Modified *Oklahoma C*^{3} Sample Item:

Content Objective: 2.1
Process Objective: 4.3
Depth of Knowledge: 2
Correct Answer: B

The data table shows the average breaking distance of a bicycle, moving at different speeds, on dry and wet concrete.

	Speed (km/hr)		
	5	10	15
Surface	**Breaking Distance (m)**		
Dry	0.5	1.4	2.8
Wet	1.0	2.3	??

Which breaking distance would be a reasonable prediction for the bicycle when traveling at 15 km/hr on wet concrete?

Ⓐ 3.3 m
Ⓑ 5.0 m
Ⓒ 8.0 m

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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, graphic organizers, and descriptions.
- Formulas may be provided in the stimulus.

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. (Reference the formula page 21.)
- Compare and contrast differences and similarities of balanced and unbalanced forces (e.g., compare different objects in motion and determine the type of force 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 an object's velocity.
- Evaluate the design of an experiment to investigate forces, motion, or velocity, including a testable hypothesis, control, variables, problem, results, and/or conclusion.
- Interpret models, graphs, graphic organizers, and 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.

Assessment Limits: Non-assessable content includes the following:

- Test items are limited to grade-level appropriate forces (e.g., a push or pull, gravity and friction).
- Centripetal forces will not be assessed.
- Calculations will only include forces in the same direction or opposite directions.
- Items will not include vector components

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- Acceleration will not be calculated.
- Line of best fit will not be used.

Process Objectives May Include:
- Items may be written to assess any of the process objectives except for 3.6.

Distractor Domain:
- 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 an object's motion due to balanced or unbalanced forces
- Incorrect evaluation of the scientific experiment
- Incorrect interpretation of data tables, graphs, graphic organizers, and models

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Modified *Oklahoma C*^{3} Sample Item:

Content Objective: 2.2
Process Objective: 4.3
Depth of Knowledge: 2
Correct Answer: A

The student is investigating the motion of an object. He slides the object across four surfaces using the same force for each trial. The table contains the data he collected.

Experimental Data of Sliding Object

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

Which caused the object to travel the farthest on ice?

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

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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, graphic organizers, and descriptions.
- 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, or level of complexity (unicellular cell vs. multi-cellular, cells, tissues, organs, organ systems).

Format: Assessable content includes the following:

- Identify the structures that are common to a given group of organisms that allow them to be classified together.
- Identify the appropriate SI units and/or tools that are used to classify organisms by measuring internal and/or external structures.
- 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., reproductive methods, body coverings, body appendages [limbs, fins, tentacles, antennae, etc.], type of body skeleton, plant characteristics).
- Evaluate the design of an experiment that would include the classification of organisms based on their internal or external structures, including a testable hypothesis, control, variables, problem, results and/or conclusion.
- Interpret data tables, graphs, graphic organizers, and models to classify individual organisms or groups of organisms.
- Use dichotomous keys 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.
- Unfamiliar organisms and structures will be described with text, diagrams, or pictures.

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Process Objectives May Include:

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

Distractor Domain:

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

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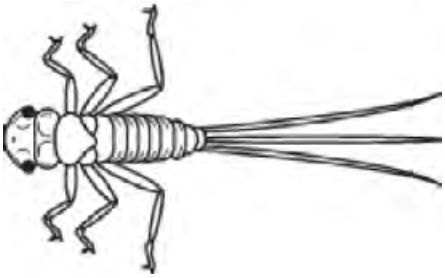
Modified *Oklahoma C*^{3} Sample Item:

Content Objective: 3.1
Process Objective: 4.2
Depth of Knowledge: 2
Correct Answer: B

The student collected an organism. He measured its length to be 4.5 centimeters (cm) and drew the following picture of the organism.



Characteristics of Three Different Organisms

Organism	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

Which organism did the student collect?

Ⓐ organism 1
Ⓑ organism 2
Ⓒ organism 3

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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 organisms to increase their chances of reproducing and survival in specific habitats.

Stimulus Attributes:

- Test items may include grade-level appropriate text, illustrations, data tables, graphs, graphic organizers, and descriptions.
- Unfamiliar habitats will be described 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 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, shape of beak, fur thickness, ability to use the sun's energy to produce food.)
- Classify organisms based on their adaptations that increase their ability to survive in specific habitats (e.g., arctic mammals with similar body coverings increased 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 the adaptations increase the survival of the organisms in specific habitats.
- Examine the relationship between different organisms when living together that allows them to increase their survival in specific habitats (symbiotic relationships that are positive or neutral for one or more species and mutualism and commensalism).
- Evaluate the design of an experiment to investigate the specialized internal or external structures, and physiology of an individual or group of organisms that enhance the chance of survival, including a testable hypothesis, control, variables, problem, results and/or conclusion.
- Interpret data tables, graphs, graphic organizers, and 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

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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), or type of body temperature regulation (warm or cold blooded).
- Distinguish between the various types of relationships (e.g., mutualism, predator, parasitism, commensalism).

Assessment Limits: Non-assessable content includes the following:
- Test items are limited to grade-level appropriate structures.
- Students will not be asked to recall the specific definition of the following terms: mimicry, symbiosis, mutualism, commensalism, and parasitism.

Process Objectives May Include:
- Items may be written to assess any of the process objectives except for 3.6.

Distractor Domain:
- Incorrect identification of structure used to enable survival in specific habitat
- Incorrect identification of SI units and/or tools to measure structure
- Incorrect comparison of internal and external structures
- Incorrect prediction of structure or survival of an organism in the specific habitat
- Incorrect analysis of adaptation and the role it plays in survival
- Incorrect analysis of relationship between organisms
- Incorrect evaluation of the scientific experiment
- Incorrect interpretation of data tables, graphs, graphic organizers, and models

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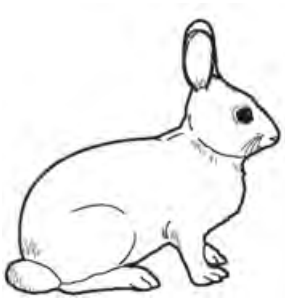
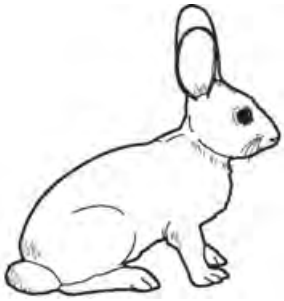
Modified *Oklahoma C*^{3} Sample Item:

Content Objective: 3.2
Process Objective: 1.2
Depth of Knowledge: 3
Correct Answer: C

Scientists studied two types of cottontail rabbits common to Oklahoma. The table shows their results and conclusions.



Eastern Cottontail Rabbit



Desert Cottontail Rabbit

Cottontail Rabbit Comparison

Scientist	Tool	Result	Conclusion
1	ruler	The desert cottontail rabbit has longer and wider ears.	The desert cottontail rabbit's ears provide shade.
2	balance	The desert cottontail rabbit has less mass.	The desert cottontail rabbit can blend more easily into its surroundings.
3	ruler	The desert cottontail rabbit has longer and wider ears.	The desert cottontail rabbit is able to release more heat into the environment.

Which scientist provides the evidence for the reason the desert cottontail rabbit can survive in locations with high temperatures?

Ⓐ scientist 1
Ⓑ scientist 2
Ⓒ scientist 3

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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:

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

Stimulus Attributes:

- Test items may include grade-level appropriate text, illustrations, data tables, graphs, graphic organizers, and descriptions.
- 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 a constructive or destructive event.
- Identify appropriate SI units and/or tools that can be used to identify and measure the landform or the force that causes the 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, tectonic plate movement including earthquakes, uplifting/convergence, crustal deformation, mountain building, rifting, faulting, and deposition of sediments).
- Draw conclusions from data on the forces that create and destroy landforms and/or the resulting impact on the environment and/or landscape.
- Evaluate an experiment (i.e., testable hypothesis, control, variables, procedure, constants, results and conclusion) designed to investigate constructive or destructive forces and their effects on different landforms.
- Interpret data tables, graphs, graphic organizers, and 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 and forces (e.g., 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 sediment.

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Process Objectives May Include:

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

Distractor Domain:

- Incorrect identification of the 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 and destructive forces and their resulting impact
- Incorrect evaluation of the scientific experiment
- Incorrect interpretation of data tables, graphs, graphic organizers, and models

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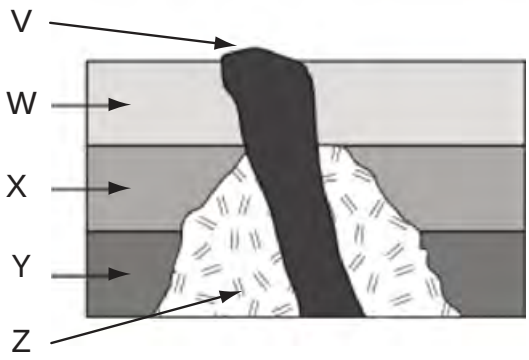
Modified *Oklahoma C*^{3} Sample Item:

Content Objective: 4.1
Process Objective: 2.1
Depth of Knowledge: 2
Correct Answer: C

Cross-Section of Rock Layers



Which locations are made of hardened magma?

Ⓐ locations W and V
Ⓑ locations X and Y
Ⓒ locations V and Z

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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 environmental forces acting upon the rock.
- When heat and pressure are applied to a rock, the rock will be transformed into a metamorphic rock.
- When a rock is melted and then cooled below or above Earth's surface, it can be classified as an igneous rock, (intrusive and extrusive).
- When sediments that are made from weathering and erosion are compacted and cemented together, they will form sedimentary rock.

Stimulus Attributes:

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

Format: Assessable content includes the following

- Identify the rock type based on the changes before, during, and/or after an event.
- Identify appropriate SI units and/or tools that can be used to identify and measure the different rock types.
- Compare and 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 a testable hypothesis, control, variables, problem, results and/or conclusions.
- Interpret data tables, graphs, graphic organizers, and models to identify, compare, and contrast the different rock types and the processes within the rock cycle.
- Identify characteristics of minerals and/or their basic mineral groups, (i.e. carbonates, silicates, oxides).

Assessment Limits: Non-assessable content includes the following:

- Test items will be limited to the rock types and minerals previously listed.
- Comparing or contrasting the chemical make-up of minerals is not required.

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Process Objectives May Include:

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

Distractor Domain:

- Incorrect identification of the rock type or processes in the rock cycle
- Incorrect identification of SI units and/or tools to measure and identify the 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 the rock
- Incorrect evaluation of the scientific experiment
- Incorrect interpretation of data tables, graphs, graphic organizers, and/or models

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Modified *Oklahoma C*^{3} Sample Item:

Content Objective: 4.2
Process Objective: 1.3
Depth of Knowledge: 3
Correct Answer: A

Students collect two rock samples of sandstone. They rub the two rocks together and observe that pieces of sand break off from the rocks. They measure the two rocks and the pieces of sand that broke off and record their information in the table.

Sedimentary Rock Activity

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

Which student made a correct measurement and <u>best</u> described the results of this activity?

Ⓐ student 1
Ⓑ student 2
Ⓒ student 3

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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:

- 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 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.
- The impact of the Gulf Stream on Western Europe will not be assessed.

Assessment Limits:

- 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 Ninõ and La Ninã
- Incorrect descriptions of effects of Mid Atlantic Gulf Stream
- Incorrect explanations/understandings of circulation patterns
- Incorrect explanation on the causes of El Ninõ and La Ninã

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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, graphic organizers, and descriptions.

Format: Assessable content includes the following:

- Identify or sequence the changes caused by a catastrophic event (e.g., changes due to flooding, asteroid or comet impact, landslides, floods, hurricanes, forest fires, tsunamis, mountain building, volcanic activity, earthquakes, glacier activity, sea level, 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 of catastrophic events on the Earth, including a testable hypothesis, control, variables, problem, results and/or conclusion.
- Interpret data tables, graphs, graphic organizers, and 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.

Process Objectives May Include:

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

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Distractor Domain:

- Incorrect identification of the catastrophic event or the impact that is a result of the 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 the scientific experiment
- Incorrect interpretation of data tables, graphs, graphic organizers, and models
- Incorrect sequencing of events or changes

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Modified *Oklahoma C*^{3} Sample Item:

Content Objective: 5.1
Process Objective: 1.2
Depth of Knowledge: 2
Correct Answer: C

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

Ⓐ They are locating nearby asteroids with an anemometer.
Ⓑ They are observing the direction of ocean currents using a telescope.
Ⓒ They are monitoring the potential for volcanic activity using a seismograph.

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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 had on plants and animals.
- Using fossils, scientists can infer the environmental conditions such as the temperature, amount of precipitation, and type of ecosystem (e.g., forest, ocean, desert) the fossilized organism once inhabited.

Stimulus Attributes:

- Test items may include grade-level appropriate text, illustrations, data tables, graphs, graphic organizers, and descriptions.
- Test items may include invertebrate fossils such as trilobites, sea stars, corals, mollusks (e.g., clams, gastropods, and oysters), and crustaceans.
- Test items may include vertebrate fossils such as dinosaurs and other reptiles, mammals, bird, fish (bony and cartilaginous), and amphibians, may also be included as well as plant fossils.

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 the change in environmental conditions based on the evidence provided by the fossil characteristics.
- Evaluate the design of an experiment to investigate the change in environmental conditions based on fossil evidence, including a testable hypothesis, control, variables, problem, results and/or conclusion.
- Interpret data tables, graphs, graphic organizers, and models of fossilization and the changing environment conditions of Earth's history.
- Interpret a geological time scale for relationships regarding the introduction of or extinction of a species.

Assessment Limits: Non-assessable content includes the following:

- Items are limited to grade-level appropriate fossils.
- Unfamiliar fossils will be described with text, diagrams, and/or pictures.

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Process Objectives May Include:
Items may be written to assess any of the process objectives except for 3.6.

Distractor Domain:

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

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Modified *Oklahoma C*^{3} Sample Item:

Content Objective: 5.2
Process Objective: 2.2
Depth of Knowledge: 2
Correct Answer: C

Bob and Sue studied rock layers in a hill by completing the following steps.

1. Measuring the thickness of the rock layers
2. Identifying the type of rock in each layer
3. Collecting fossils from each rock layer

Which step could help identify the geologic time period of each rock layer?

Ⓐ step 1
Ⓑ step 2
Ⓒ step 3

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