OKLAHOMA SCHOOL TESTING PROGRAM
OKLAHOMA CORE CURRICULUM TESTS

TEST AND ITEM SPECIFICATIONS

Science
Grade 8

OKLAHOMA
STATE DEPARTMENT of EDUCATION
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STATE SUPERINTENDENT of PUBLIC INSTRUCTION

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OKLAHOMA CORE CURRICULUM TESTS

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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 and objectives identified in the Oklahoma Academic Standards (OAS). 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 the Oklahoma Academic Standards.

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

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

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Test Structure, Format, and Scoring

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

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

Test Alignment with Oklahoma Academic Standards

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

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Test Blueprint

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

Process/Inquiry Standards and Objectives	Ideal Number of Items	Ideal Percentage of Items
P1.0 Observe and Measure	**8-11**	**18-24%**
P1.1 Qualitative/quantitative observations/changes	4-6	
P1.2 Appropriate tools & P 1.3 SI (metric) units	4-5	
P2.0 Classify	**7-9**	**16-20%**
P2.1 Classification system	4-6	
P2.2 Properties ordered	3-5	
P3.0 Experiment	**15-17**	**33-38%**
P3.2 Experimental design	6-7	
P3.3 Identify variables	6-7	
P3.6 Hazards/practice safety	3-4	
P4.0 Interpret and Communicate	**12-14**	**27-31%**
P4.2 Data tables/line/bar/trend and circle graphs	6-7	
P4.3 Explanations/prediction	6-7	
Total Test	**45**[1]	**100%**

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Test Blueprint (Continued)

Content Standards and Objectives	Ideal Number of Items	Ideal Percentage of Items
C1.0 Properties and Chemical Changes in Matter	**8**	**19%**
C1.1 Chemical reactions	4	
C1.2 Conservation of matter	4	
C2.0 Motion and Forces	**8**	**19%**
C2.1 Motion of an object	4	
C2.2Object subjected to a force	4	
C3.0 Diversity and Adaptations of Organisms	**7**	**17%**
3.1 Classification	3	
3.2 Internal and external structures	4	
C4.0 Structures/Forces of the Earth/Solar System	**11**	**27%**
C4.1 Landforms result from constructive and destructive forces	4	
C4.2 Rock cycle	3-4	
C4.3 Global Weather Patterns	3-4	
C5.0 Earth's History	**7-8**	**18%**
C5.1 Catastrophic events	3-4	
C5.2 Fossil evidence	3-4	
Total Test	**41-42[1,2]**	**100%**

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

[2] Three or four out of the 45 total items assess the "Safety" process standard for which there is no corresponding content standard.

- Percentages are approximations and may result in a sum other than 100 due to rounding.
- A minimum of 4 items is required to report results for an objective, and a minimum of 6 items is required to report a standard. While the actual 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 Oklahoma Academic Standards correspond to the PASS standards.

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Depth of Knowledge Assessed by Test Items

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

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

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

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

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

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

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

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

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

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

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

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

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

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

For an extended description of each Depth of Knowledge level, see the student assessment Web site at <www.ok.gov/sde>.

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Universal Test Design Considerations

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

Testing Schedules

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

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

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Multiple-Choice Item Guidelines

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

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

Stimulus Materials

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

1. When students are given information, data, or an experimental setup to evaluate, they should know the research question and the purpose of the research.
2. Tables, graphs, reading passages, and illustrations provide sufficient information for assessment of multiple standards.
3. Stimulus materials for a set of items may be a combination of multiple stimuli.
4. Information in stimulus materials is representative of concepts and principles described in Oklahoma Academic Standards.
5. For conceptual items, stimulus materials are necessary but not conceptually sufficient for student response.
6. There is a balance of graphic and textual stimulus materials within a test form. At least 50% of the items have appropriate pictorial and graphical representations. Graphs, tables, or figures are clearly associated with their intended items. Graphics appear either on the same page as the stimulus or on the facing page.
7. The stimuli avoid subject matter that might prompt emotional distress on the part of the students.
8. Permission to use stimuli from copyrighted material is obtained as necessary by the testing vendor.

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General Considerations

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

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

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

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

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

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

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

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

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

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

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

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11. Most stems are positively worded—avoiding the use of the word not. If a negative is required, the format is "All of the following . . . except."
12. The material presented is balanced, culturally diverse, well written, and interesting to students. The stimuli and items are presented fairly in order to gain a true picture of students' skills.
13. Across all forms, a balance of gender and active/passive roles by gender is maintained.
14. No resource materials or calculators may be used by students during the test.
15. Science: gridlines required on a graph only when a specific point on a graph is needed.
16. Note of explanation: i.e. (*id est*—that is) only such items mentioned may be assessed. e.g. (*exempli gratia*—for example, for instance) items related to the content may be assessed.

Vocabulary

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

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

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Overview of Item Specifications

For each OAS standard, item specifications are organized under the following headings:

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

The headings "OAS Process Standard" and "OAS Process Objective" or "OAS Content Standard" and "OAS Content Objective" state the standard and objective being measured as found in the fifth-grade science section of the Oklahoma Academic Standards document.

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

Note about the Item Specifications and Sample Test Items:

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

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Oklahoma Academic Standards

SCIENCE PROCESSES AND INQUIRY

Grade 8

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

OAS 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.

OAS 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.

OAS 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.

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*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.

OAS 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).

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

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

*2. Design and conduct experiments utilizing scientific processes.

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

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

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

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PHYSICAL SCIENCE

Grade 8

OAS Content 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).

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

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

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

LIFE SCIENCE

Grade 8

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

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

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

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EARTH/SPACE SCIENCE

Grade 8

OAS Content 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).

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

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

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Sample Test Items by Standard

OAS Process Standard:

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

OAS Process Objective:

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

Item Specifications:

Emphasis:

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

Stimulus Attributes:

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

Format: Assessable content includes the following:

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

Assessment Limits: Non-assessable content includes the following:

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

Content Objectives May Include:

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

Distractor Domain May Include:

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

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Science Formulas for OCCT Grade 8

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

1. Cellular respiration

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

2. Photosynthesis

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

3. Density

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

4. Speed

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

5. Force

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

6. Volume

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

7. Velocity

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

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

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

Temperatures in Beakers Over Time

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

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

A Beaker A
B Beaker B
C Beaker C
D Beaker D

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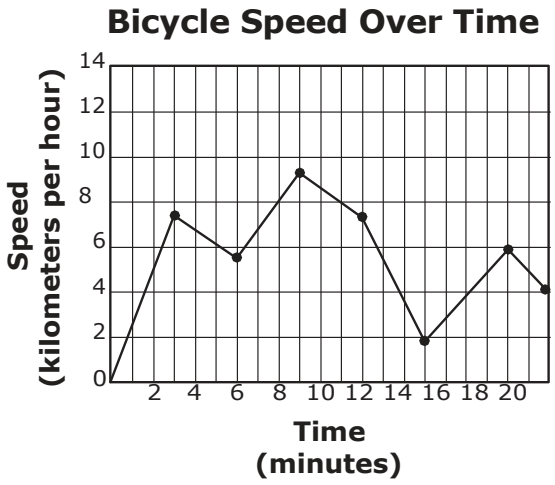
Oklahoma Academic Standards Sample Test Item:
OAS Process Objective: 1.1
OAS Content Objective: 2.1
Depth of Knowledge: 3
Correct Response: C

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



When was the person <u>most likely</u> traveling up the steepest hill?

A 2 to 4 minutes.

B 6 to 8 minutes.

C 12 to 14 minutes.

D 16 to 18 minutes.

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OAS Process Standard:

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

OAS Process Objective:

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

Item Specifications:

Emphasis:

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

Stimulus Attributes:

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

Format: Assessable content includes the following:

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

Assessment Limits: Non-assessable content includes the following:

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

Content Objectives May Include:

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

Distractor Domain May Include:

- Inappropriate tools for measurement
- Inappropriate measurements for specific tools

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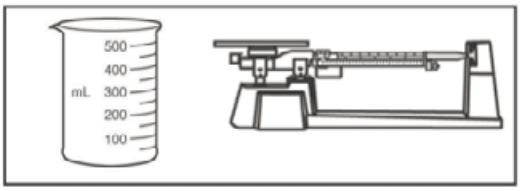
Oklahoma Academic Standards Sample Test Item:
OAS Process Objective: 1.2
OAS Content Objective: 3.1
Depth of Knowledge: 1
Correct Response: C

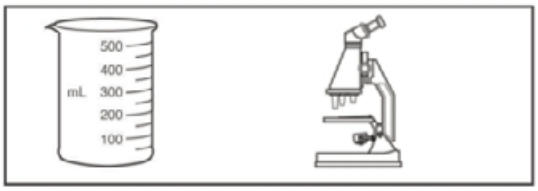
Students classified leaves by their lengths and the patterns of their veins.

Which pair of tools was <u>most likely</u> used for this activity?

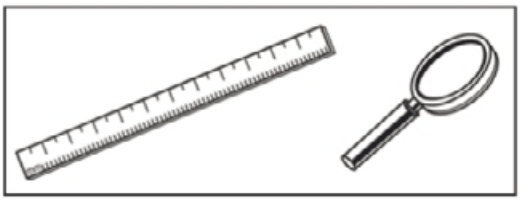
A



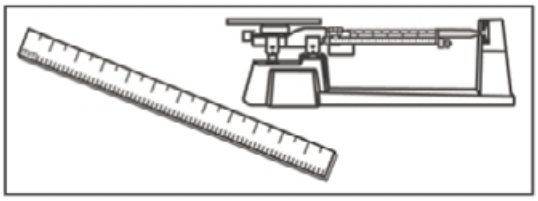
B



C



D



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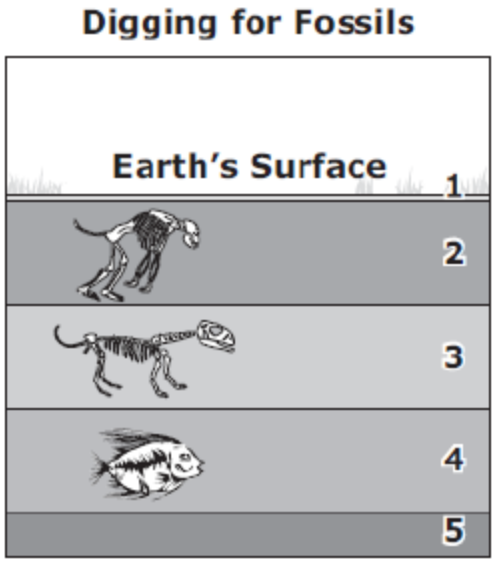
Oklahoma Academic Standards Sample Test Item:
OAS Process Objective: 1.2
OAS Content Objective: 5.2
Depth of Knowledge: 2
Correct Response: A

Fossil digs give clues about past environments.



In which environment did the fossil in layer 3 <u>most likely</u> live, and what instrument should be used to find the mass of the bones?

A on land; a balance

B in water; a balance

C on land; a spring scale

D in water; a spring scale

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OAS Process Standard:

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

OAS Process Objective:

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

Item Specifications:

Emphasis:

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

Stimulus Attributes:

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

Format: Assessable content includes the following:

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

Assessment Limits: Non-assessable content includes the following:

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

Content Objectives May Include:

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

Distractor Domain May Include:

- Incorrect use of SI unit
- Incorrect SI measurement

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

A student poured liquid into a shallow container.

What is the <u>most</u> appropriate scientific unit for measuring the volume of the liquid in the container?

A milliliters
B milligrams
C millimeters
D milliseconds

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Oklahoma Academic Standards Sample Test Item:
OAS Process Objective: 1.3
OAS Content Objective: 1.2
Depth of Knowledge: 2
Correct Response: D

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

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

Chemical Reaction Data

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

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

A (111 – 73) liters
B (111 – 73) grams
C (74 + 73 – 111) liters
D (74 + 73 – 111) grams

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

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

Which polar bear parts and measurements are <u>most</u> appropriate for this investigation?

A

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

B

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

C

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

D

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

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OAS Process Standard:

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

OAS Process Objective:

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

Item Specifications:

Emphasis:

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

Stimulus Attributes:

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

Format: Assessable content includes the following:

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

Assessment Limits: Non-assessable content includes the following:

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

Content Objectives May Include:

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

Distractor Domain May Include:

- Plausible, but inaccurate, classification schemes

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Oklahoma Academic Standards Sample Test Item:
OAS Process Objective: 2.1
OAS Content Objective: 4.2
Depth of Knowledge: 1
Correct Response: B

Sedimentary rocks are formed when layers of loose sediment cement together. Many contain fossils.

Use the information provided above to determine which of these is <u>most likely</u> a sedimentary rock?

A

B

C

D

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Oklahoma Academic Standards Sample Test Item:

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

Landforms Key

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

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

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

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

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

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

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

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

According to the key, which landform <u>best</u> represents a delta?

A Landform T

B Landform V

C Landform X

D Landform Z

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OAS Process Standard:

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

OAS Process Objective:

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

Item Specifications:

Emphasis:

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

Stimulus Attributes:

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

Format: Assessable content includes the following:

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

Assessment Limits: Non-assessable content includes the following:

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

Content Objectives May Include:

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

Distractor Domain May Include:

- Properties that are not similar
- Irrelevant properties

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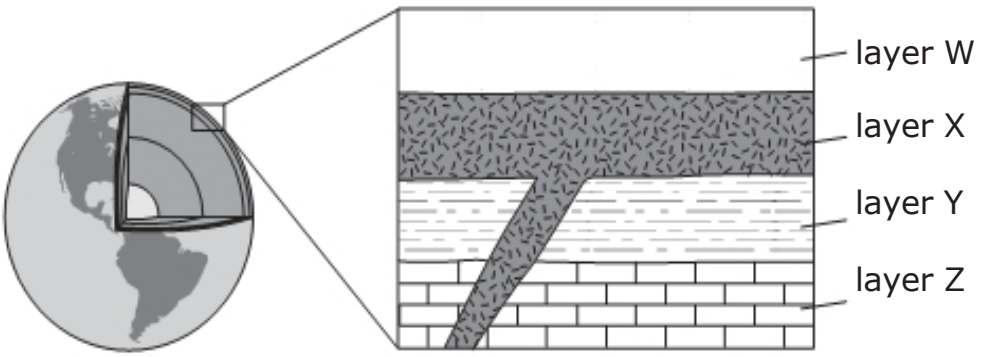
Oklahoma Academic Standards Sample Test Item:
OAS Process Objective: 2.2
OAS Content Objective: 5.1
Depth of Knowledge: 2
Correct Response: D

The diagram shows a cross-section of rock layers in Earth's crust.



Based on the diagram, which two layers <u>most likely</u> formed before a volcanic eruption?

A layers W and X
B layers X and Z
C layers Y and X
D layers Z and Y

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Oklahoma Academic Standards Sample Test Item:
OAS Process Objective: 2.2
OAS Content Objective: 1.2
Depth of Knowledge: 2
Correct Response: A

The chart shows whether different objects will scratch four different rocks.

Hardness

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

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

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

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

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

A Key to the Leaves of Some Trees in Oklahoma

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

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

A leaf size, leaf shape, and leaf color

B leaf veins, leaf size, and branch shape

C leaf shape, leaf arrangement, and leaf edges

D leaf arrangement, leaf edges, and bark texture

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OAS Process Standard:

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

OAS Process Objective:

2. Evaluate the design of a scientific investigation.

Item Specifications:

Emphasis:

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

Stimulus Attributes:

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

Format: Assessable content includes the following:

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

Assessment Limits: Non-assessable content includes the following:

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

Content Objectives May Include:

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

Distractor Domain May Include:

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

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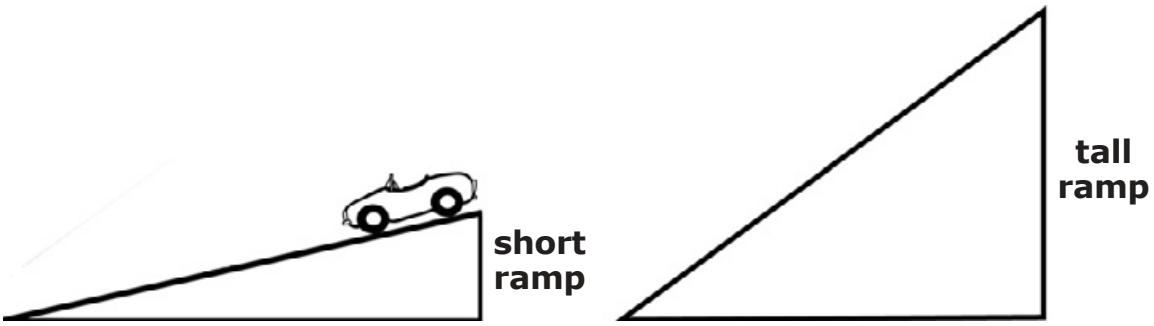
Oklahoma Academic Standards Sample Test Item:
OAS Process Objective: 3.2
OAS Content Objective: 2.2
Depth of Knowledge: 2
Correct Response: C

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



The students performed four steps during the experiment:

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

Which step should be completed next?

A Change the wheels on the car.

B Put a new surface on the short ramp.

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

D Identify which ramp will make the car go farther.

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

A student wants to determine if a solid substance is an acid or a base. He plans to follow the steps listed, but they are out of order.

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

In what order should the students complete the steps?

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

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Oklahoma Academic Standards Sample Test Item:
OAS Process Objective: 3.2
OAS Content Objective: 3.2
Depth of Knowledge: 3
Correct Response: D

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

Bean Plant Locations and Sounds

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

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

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

A Students did not plant the beans from seeds.

B Students did not use enough different types of music.

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

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

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OAS Process Standard:

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

OAS Process Objective:

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

Item Specifications:

Emphasis:

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

Stimulus Attributes:

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

Format: Assessable content includes the following:

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

Assessment Limits: Non-assessable content includes the following:

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

Content Objectives May Include:

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

Distractor Domain May Include:

- Irrelevant variables
- Wrong type of variable

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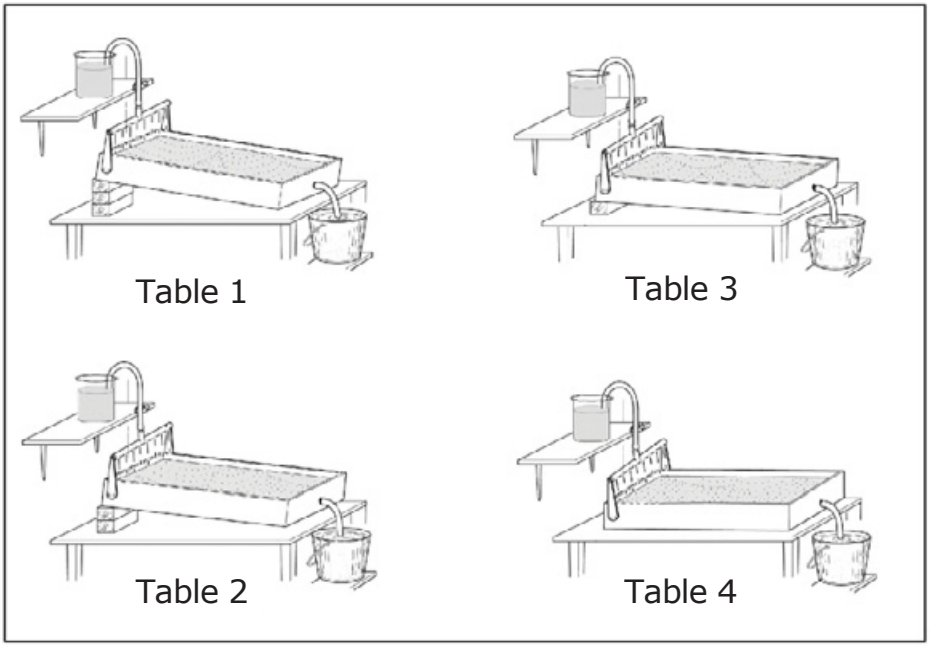
Oklahoma Academic Standards Sample Test Item:
OAS Process Objective: 3.3
OAS Content Objective: 4.1
Depth of Knowledge: 2
Correct Response: B

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



Procedure

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

What is the independent variable in this experiment?

A amount of sand eroded
B angle of the stream tables
C volume of water collected in the buckets
D volume of water added to the stream tables

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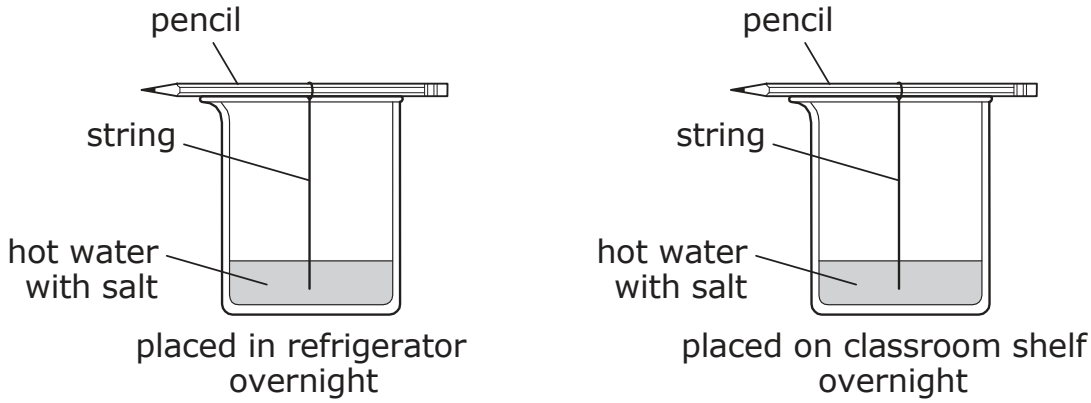
Oklahoma Academic Standards Sample Test Item:
OAS Process Objective: 3.3
OAS Content Objective: 4.2
Depth of Knowledge: 3
Correct Response: A

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

Rock Investigation Setup



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

A

Rock Type Investigated	Independent Variable
igneous	temperature

B

Rock Type Investigated	Independent Variable
igneous	size of crystal

C

Rock Type Investigated	Independent Variable
metamorphic	temperature

D

Rock Type Investigated	Independent Variable
metamorphic	size of crystal

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OAS Process Standard:

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

OAS Process Objective:

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

Item Specifications:

Emphasis:

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

Stimulus Attributes:

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

Format: Assessable content includes the following:

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

Assessment Limits: Non-assessable content includes the following:

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

Content Objectives may include:

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

Distractor Domain May Include:

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

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Oklahoma Academic Standards Sample Test Item:
OAS Process Objective: 3.6
Depth of Knowledge: 1
Correct Response: A

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

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

Oklahoma Academic Standards Sample Test Item:
OAS Process Objective: 3.6
Depth of Knowledge: 1
Correct Response: D

Which object is least likely to be heated during a laboratory activity?

A a glass flask
B a glass beaker
C an open container
D a closed container-

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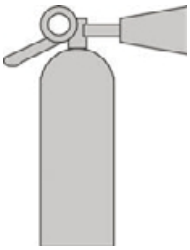
Oklahoma Academic Standards Sample Test Item:
OAS Process Objective: 3.6
Depth of Knowledge: 1
Correct Response: B



During which type of event should the safety equipment shown be used?

A broken glass

B laboratory fire

C chemical spills

D physical injuries

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OAS Process Standard:

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

OAS Process Objective:

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

Item Specifications:

Emphasis:

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

Stimulus Attributes:

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

Format: Assessable content includes the following:

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

Assessment Limits: Non-assessable content includes the following:

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

Content Objectives:

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

Distractor Domain May Include:

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

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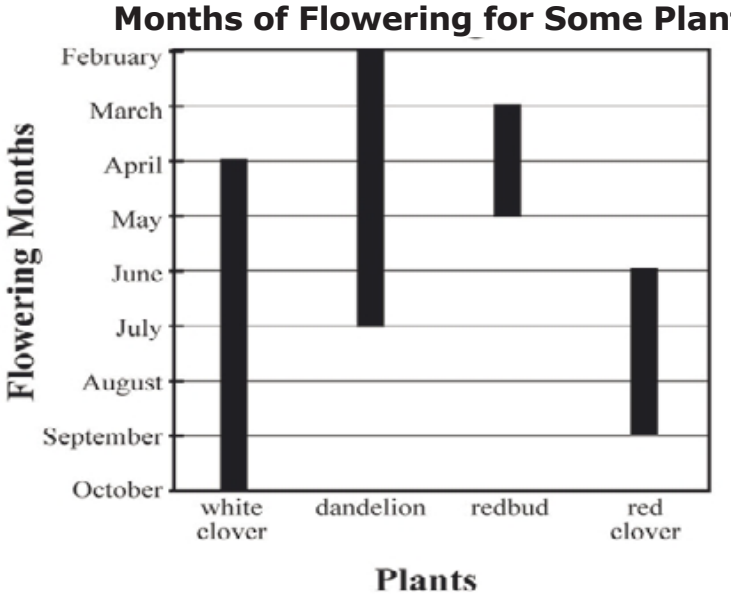
Oklahoma Academic Standards Sample Test Item:
OAS Process Objective: 4.2
OAS Content Objective: 3.2
Depth of Knowledge: 2
Correct Response: C

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



Months of Flowering for Some Plants

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

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

A 3
B 4
C 5
D 6

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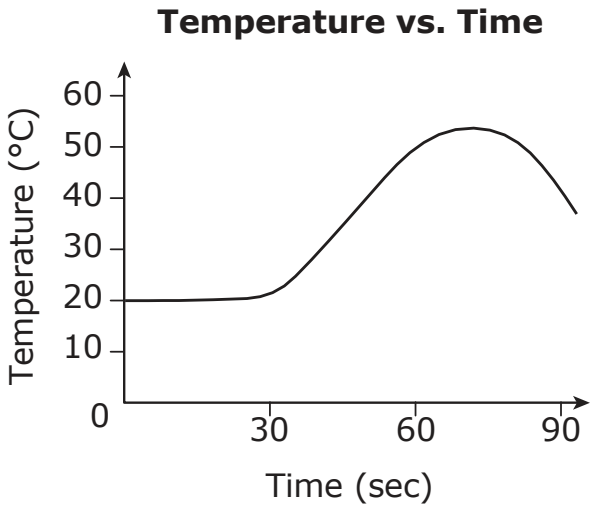
Oklahoma Academic Standards Sample Test Item:
OAS Process Objective: 4.2
OAS Content Objective: 1.1
Depth of Knowledge: 3
Correct Response: D

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



Based on the data, what <u>most likely</u> happened after the two liquids were combined?

A Each liquid stayed the same.

B Each liquid changed into a solid.

C The two liquids created a new element.

D The two liquids formed a new substance.

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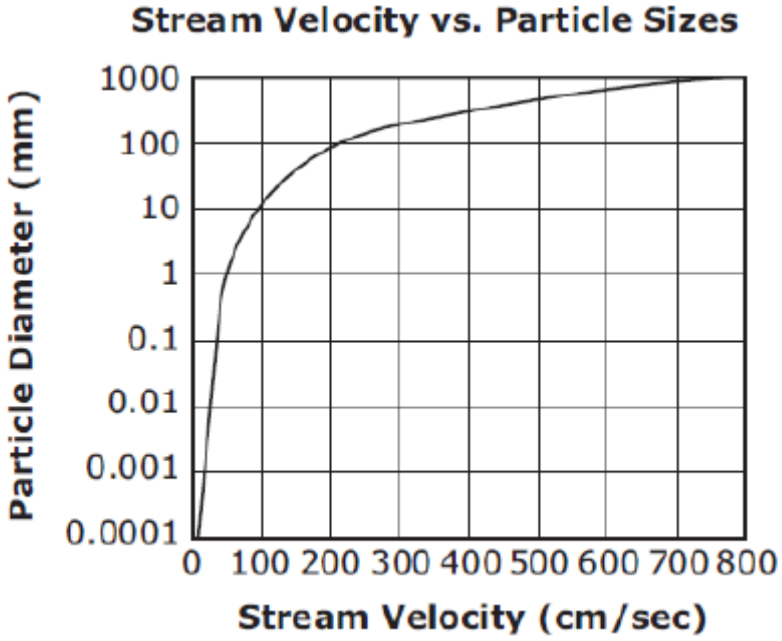
Oklahoma Academic Standards Sample Test Item:
OAS Process Objective: 4.2
OAS Content Objective: 4.1
Depth of Knowledge: 3
Correct Response: D

Stream Particle Types and Diameters

Particle Name	Diameter (mm)
Clay	Less than 0.004
Silt	0.004–0.06
Sand	0.07–2
Granule	2.1–4
Pebble	4.1–64
Cobble	64.1–256
Boulder	Greater than 256



Based on these data, which statement best describes what happens in a stream with a velocity of 100 cm/sec?

A Erosion of cobbles and boulders occurs at bends and in areas with rapids.

B Landforms like dunes and ripples form when silt and sand are deposited.

C The stream channel becomes V-shaped as pebbles and cobbles are carried downstream.

D Features like bars made of some pebble-sized particles are formed by deposition.

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OAS Process Standard:

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

OAS Process Objective:

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

Item Specifications:

Emphasis:

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

Stimulus Attributes:

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

Format: Assessable content includes the following:

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

Assessment Limits: Non-assessable content includes the following:

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

Content Objectives May Include:

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

Distractor Domain May Include:

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

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Oklahoma Academic Standards Sample Test Item:
OAS Process Objective: 4.3
OAS Content Objective: 1.1
Depth of Knowledge: 2
Correct Response: D

A student compares a copper penny before and after it has been left outside.

Penny Left Outside

Before **After**

The student finds the chemical formula for the observed change:

$$2\,Cu\ (copper) + O_2\ (oxygen) \longrightarrow 2\,CuO\ (copper\ oxide)$$

Based on this information, which is the <u>best</u> explanation for the chemical change in the penny?

A Products form a reactant with the same properties.

B Reactants form a product with the same properties.

C Products form a reactant with different properties.

D Reactants form a product with different properties.

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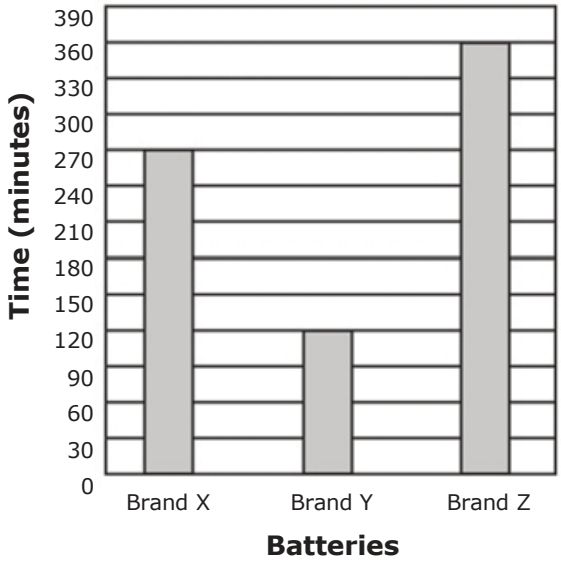
Oklahoma Academic Standards Sample Test Item:
OAS Process Objective: 4.3
OAS Content Objective: 1.2
Depth of Knowledge: 3
Correct Response: B

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

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

Battery Experiment Results



Which conclusion <u>best</u> explains the results?

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

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

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

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

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

Characteristics of Seven Objects

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

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

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

A Metal objects are more likely to float in water.

B An object floats in water if its mass is less than its volume.

C The color of an object determines if it will sink or float in water.

D The shape of an object determines if it will sink or float in water.

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OAS 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:

OAS Content Objective:

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

Item Specifications:

Emphasis:

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

Stimulus Attributes:

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

Format: Assessable content includes the following:

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

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

Process Objectives May Include:

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

Distractor Domain May Include:

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

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

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

Based on these observations, what is formed during the procedure?

A a new element
B a new substance
C a new energy source
D a new physical mixture

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Oklahoma Academic Standards Sample Test Item:
OAS Content Objective: 1.1
OAS Process Objective: 1.1
Depth of Knowledge: 2
Correct Response: B

Experimental Observations

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

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

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

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

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

Which table shows the <u>best</u> set of reactants and the dependent variable for the investigation?

A

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

B

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

C

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

D

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

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OAS 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:

OAS Content Objective:

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

Item Specifications:

Emphasis:

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

Stimulus Attributes:

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

Format: Assessable content includes the following:

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

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

Assessment Limits: Non-assessable content includes the following:

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

Process Objectives May Include:

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

Distractor Domain May Include:

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

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Oklahoma Academic Standards Sample Test Item:
OAS Content Objective: 1.2
OAS Process Objective: 3.2
Depth of Knowledge: 2
Correct Response: C

A student deigned an investigation to determine the volume of an irregularly shaped object.

Investigation Steps

Step 1. Determine the mass of a beaker filled with water.

Step 2. Place the object into the beaker filled with water.

Step 3. Determine the mass of the beaker of water with the object.

Step 4. Determine the volume of the object by subtracting the mass of the beaker and water from the mass of the beaker and water holding the object.

Which identifies an error with the investigation steps?

A The volume of water in the beaker was determined.

B The mass of the empty beaker was not determined in Step 1.

C The volume of water displaced by the object was not determined.

D The mass of the beaker of water should have been subtracted in Step 4.

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

Some Properties of Metal Objects

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

These metal objects are ordered by which physical property?

A Color
B Density
C Melting Point
D Reacts with Acid

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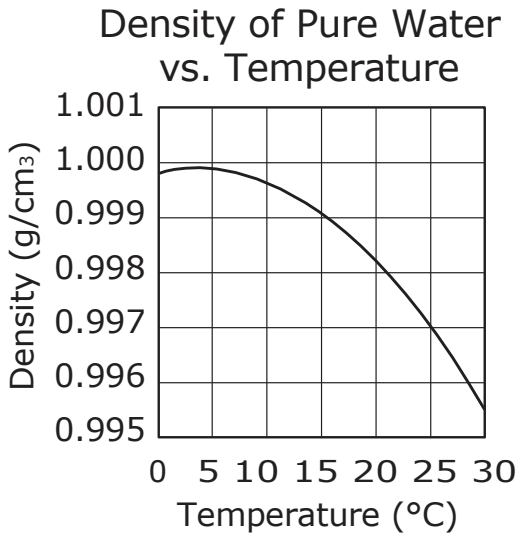
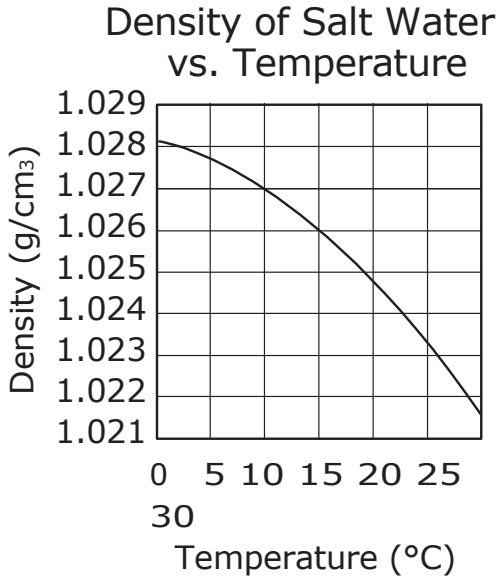
Oklahoma Academic Standards Sample Test Item:
OAS Content Objective: 1.2
OAS Process Objective: 1.1
Depth of Knowledge: 3
Correct Response: B

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





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

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

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

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

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

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OAS 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:

OAS Content Objective:

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

Item Specifications:

Emphasis:

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

Stimulus Attributes:

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

Format: Assessable content includes the following:

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

Assessment Limits: Non-assessable content includes the following:

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

Process Objectives May Include:

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

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Distractor Domain May Include:

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

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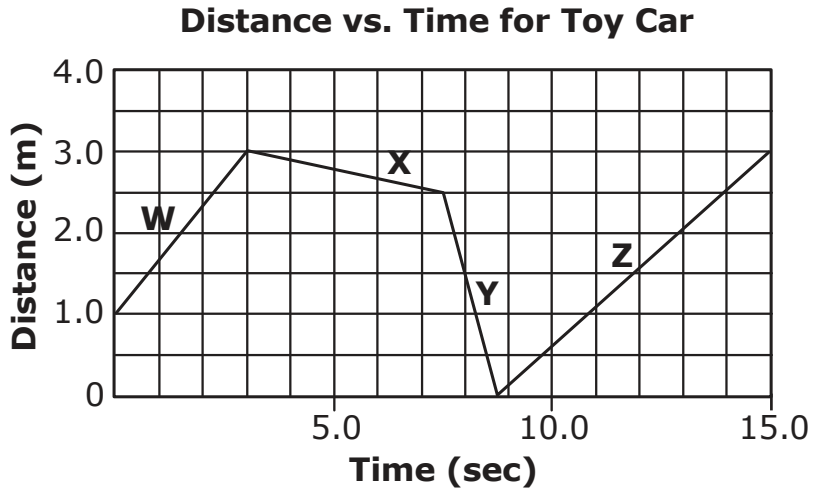
Oklahoma Academic Standards Sample Test Item:
OAS Content Objective: 2.1
OAS Process Objective: 2.2
Depth of Knowledge: 2
Correct Response: A

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



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

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

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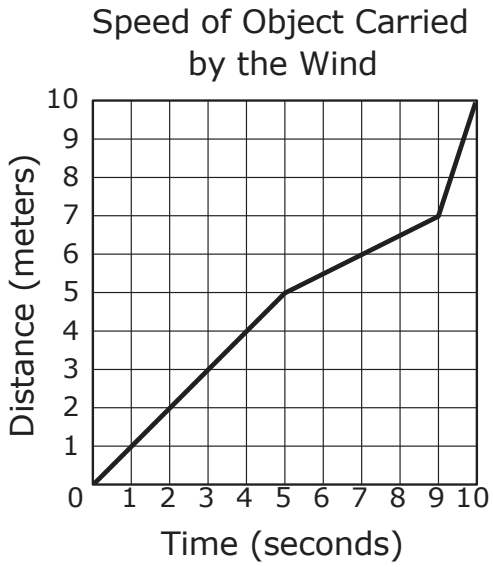
Oklahoma Academic Standards Sample Test Item:
OAS Content Objective: 2.1
OAS Process Objective: 2.1
Depth of Knowledge: 2
Correct Response: B

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



Wind Classification

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

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

A light wind
B gentle-moderate
C strong wind
D gale

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

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

Bicycle Data

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

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

A Water has no effect on braking distances.

B Braking distances decrease as the bicycle speeds increase.

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

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

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OAS 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:

OAS Content Objective:

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

Item Specifications:

Emphasis:

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

Stimulus Attributes:

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

Format: Assessable content includes the following:

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

Assessment Limits: Non-assessable content includes the following:

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

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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 May Include:

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

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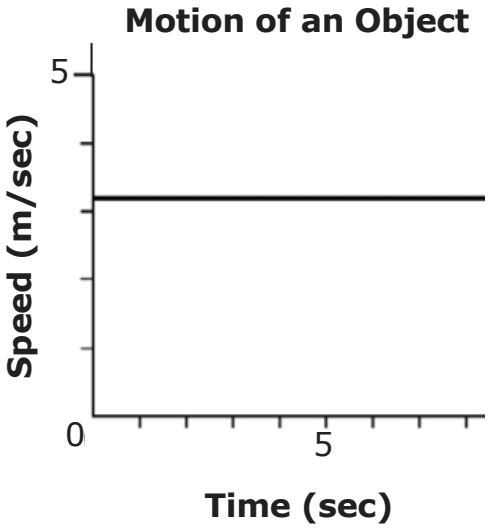
Oklahoma Academic Standards Sample Test Item:
OAS Content Objective: 2.2
OAS Process Objective: 4.2
Depth of Knowledge: 2
Correct Response: B

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



According to the graph, which statement best describes the forces acting on the object?

A Two opposite forces are unequal.

B The total of all forces equals zero.

C The forward forces change at a constant rate.

D The horizontal force is greater than the vertical force.

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Oklahoma Academic Standards Sample Test Item:
OAS Content Objective: 2.2
OAS Process Objective: 4.3
Depth of Knowledge: 2
Correct Response: A

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

Investigational Data

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

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

A The ice exerted the least friction on the object.

B The ice reduced the force of gravity on the object.

C The ice reduced the forward motion on the object.

D The ice exerted the least upward force on the object.

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

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

Which student best measures and describes the dependent variable?

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

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

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

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

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OAS 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:

OAS Content Objective:

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

Item Specifications:

Emphasis:

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

Stimulus Attributes:

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

Format: Assessable content includes the following:

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

Assessment Limits: Non-Assessable content includes the following:

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

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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 May Include:

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

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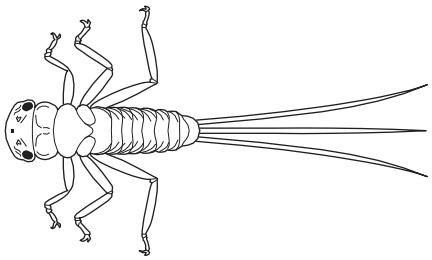
Oklahoma Academic Standards Sample Test Item:
OAS Content Objective: 3.1
OAS Process Objective: 2.1
Depth of Knowledge: 2
Correct Response: B

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

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

A student collected an organism and determined that the length of the organism was 4.5 cm. The student also drew a picture of the organism.



Which organism did the student <u>most likely</u> collect?

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

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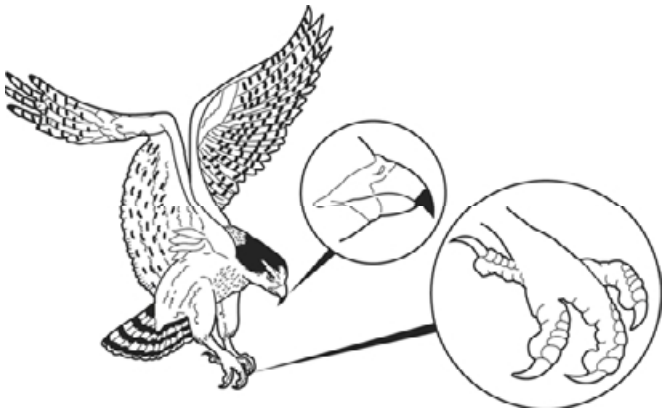
Oklahoma Academic Standards Sample Test Item:
OAS Content Objective: 3.1
OAS Process Objective: 2.1
Depth of Knowledge: 2
Correct Response: D

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



Bird Identification Key

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

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

A pelican
B woodpecker
C heron
D goshawk

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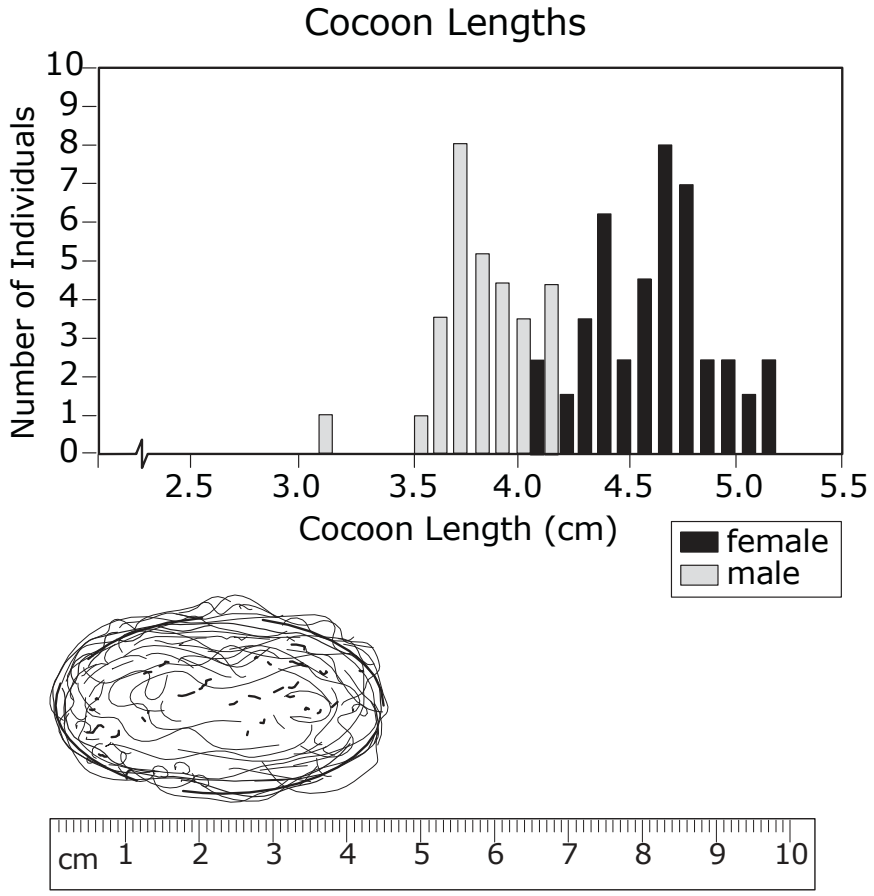
Oklahoma Academic Standards Sample Test Item:
OAS Content Objective: 3.1
OAS Process Objective: 4.3
Depth of Knowledge: 3
Correct Response: D

Use the data in the graph and the drawing of a silkworm cocoon to draw a conclusion about the caterpillar that spun the cocoon.



Which type of caterpillar <u>most likely</u> spun the cocoon and why?

A a male, because there are more males than females

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

C a female, because there are more females than males

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

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OAS 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:

OAS Content Objective:

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

Item Specifications:

Emphasis:

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

Stimulus Attributes:

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

Format: Assessable content includes the following:

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

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Assessment Limits: Non-assessable content includes the following:

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

Process Objectives May Include:

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

Distractor Domain May Include:

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

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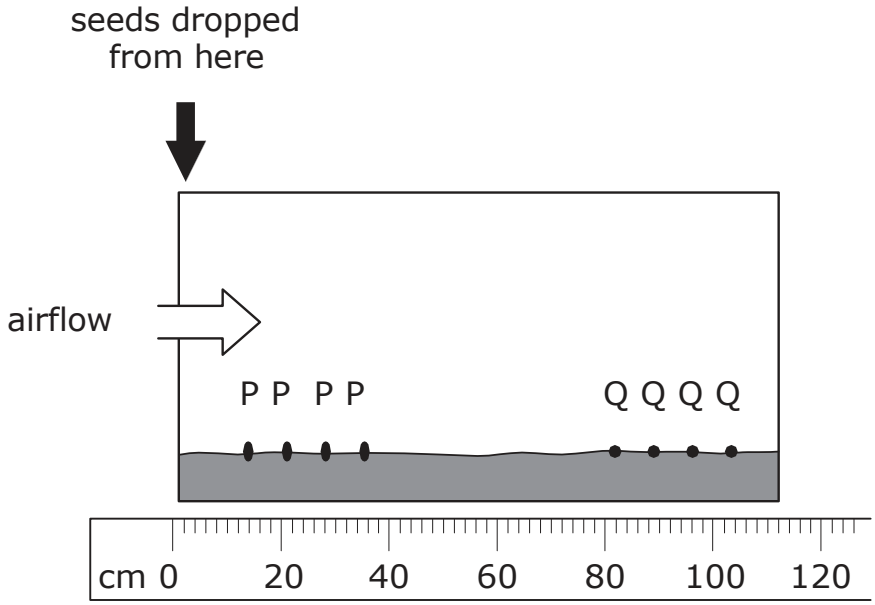
Oklahoma Academic Standards Sample Test Item:
OAS Content Objective: 3.2
OAS Process Objective: 4.3
Depth of Knowledge: 3
Correct Response: D

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



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

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

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

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

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

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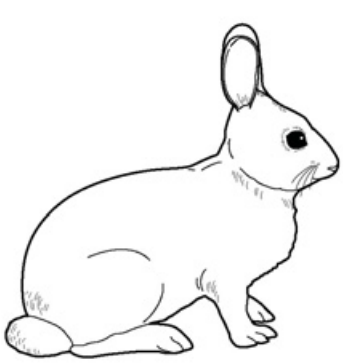
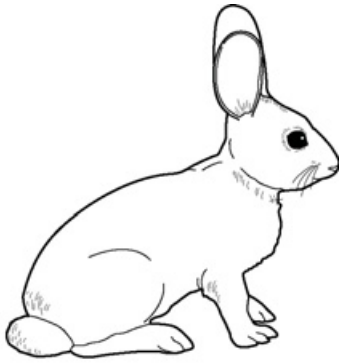
Oklahoma Academic Standards Sample Test Item:
OAS Content Objective: 3.2
OAS Process Objective: 1.2
Depth of Knowledge: 3
Correct Response: D

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



Eastern Cottontail Rabbit



Desert Cottontail Rabbit

Results for the Cottontail Comparison

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

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

A Scientist 1

B Scientist 2

C Scientist 3

D Scientist 4

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

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

Effects of Heat on Three Pine Tree Species

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

Key	
-	unable to reproduce
+	able to reproduce

Student Responses

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

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

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

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OAS 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:

OAS Content Objective:

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

Item Specifications:

Emphasis:

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

Stimulus Attributes:

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

Format: Assessable content includes the following:

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

Assessment Limits: Non-assessable content includes the following:

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

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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 May Include:

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

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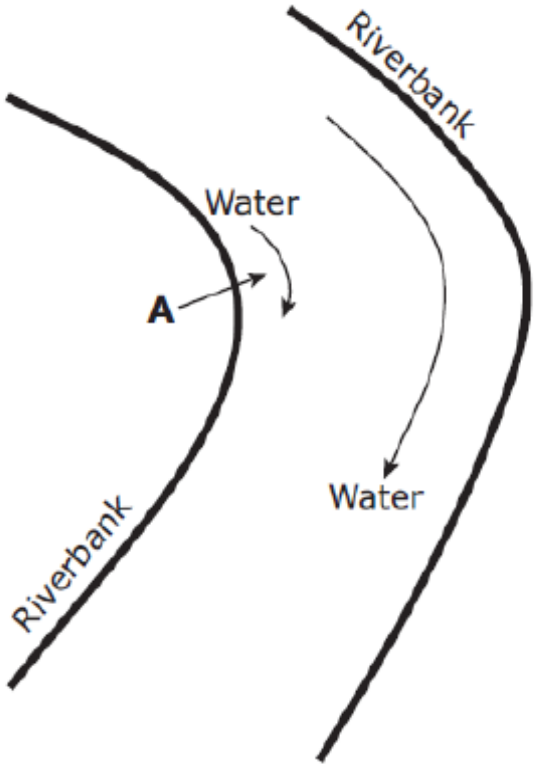
Oklahoma Academic Standards Sample Test Item:
OAS Content Objective: 4.1
OAS Process Objective: 1.1
Depth of Knowledge: 2
Correct Response: D

Top View of Bend in a River



What type of landform will be produced at point A, and what type of geologic force is at work?

A delta; erosion

B delta; deposition

C sand bar; erosion

D sand bar; deposition

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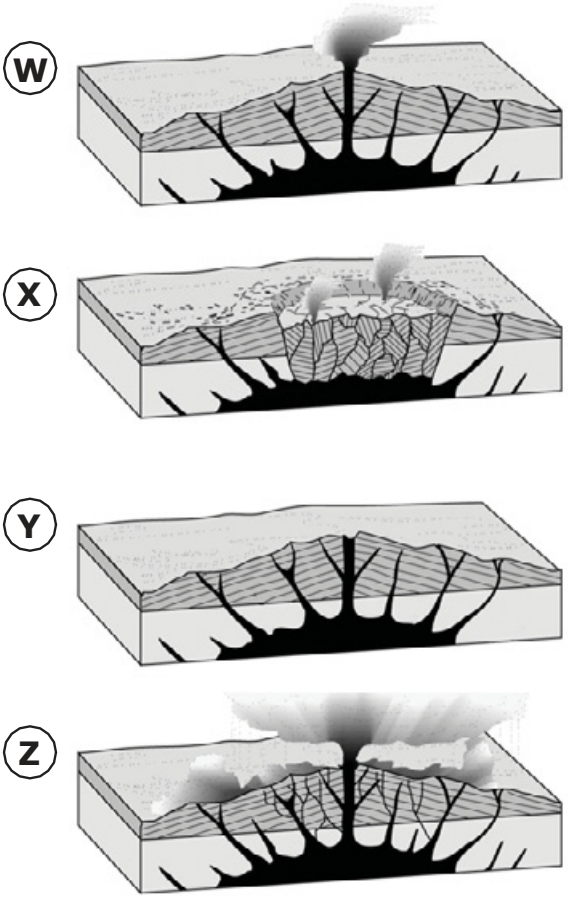
Oklahoma Academic Standards Sample Test Item:
OAS Content Objective: 4.1
OAS Process Objective: 2.2
Depth of Knowledge: 2
Correct Response: C

The diagrams show the cross-section of a volcano during an eruption.



Which list <u>best</u> orders the events that formed a volcanic crater?

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

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

A group of students performed an investigation.

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

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

Student's Response

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

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

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

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OAS 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:

OAS Content Objective:

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

Item Specifications:

Emphasis:

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

Stimulus Attributes:

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

Format: Assessable content includes the following:

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

Assessment Limits: Non-assessable content includes the following:

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

Process Objectives May Include:

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

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Distractor Domain May Include:

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

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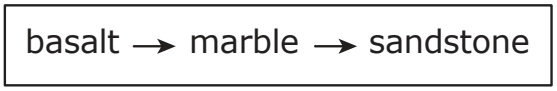
Oklahoma Academic Standards Sample Test Item:
OAS Content Objective: 4.2
OAS Process Objective: 1.3
Depth of Knowledge: 1
Correct Response: A

Part of the Rock Cycle



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

A the masses in grams of the basalt and sandstone

B the masses in meters of the basalt and sandstone

C the volumes in milliliters of the basalt and marble

D the volumes in kilometers of the basalt and marble

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

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

Sedimentary Rock Activity

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

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

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

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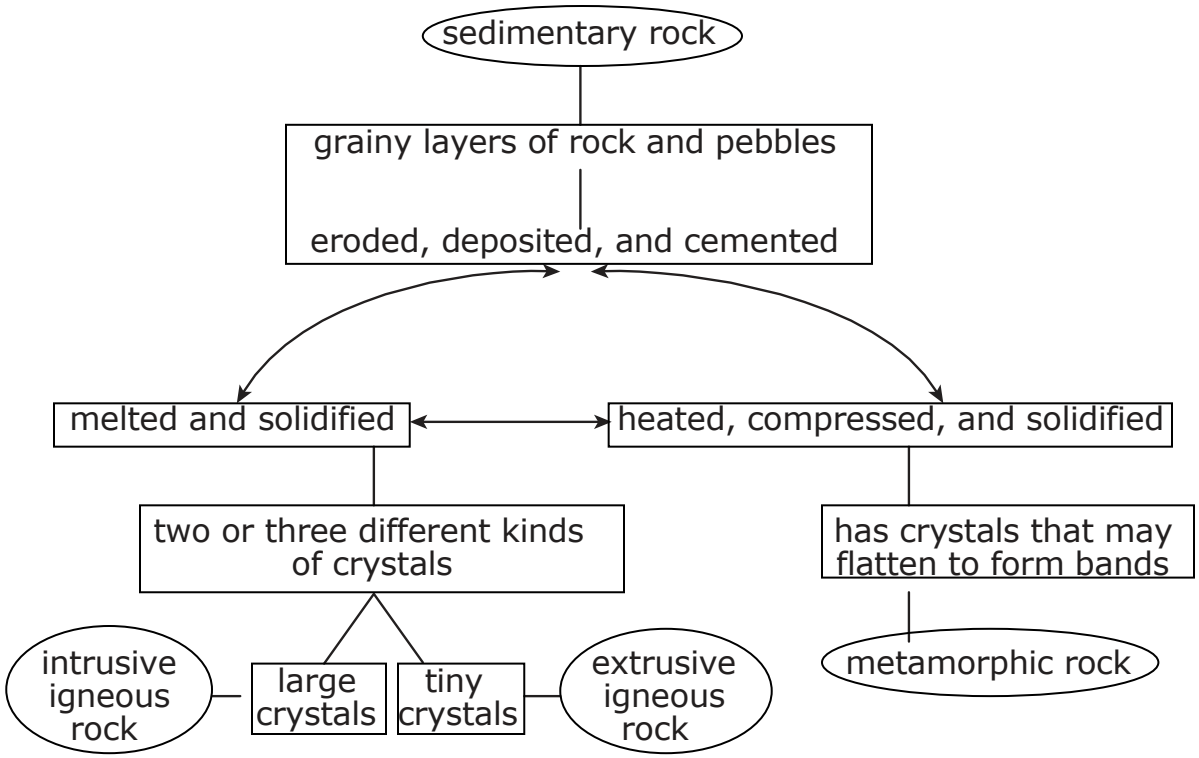
Oklahoma Academic Standards Sample Test Item:
OAS Content Objective: 4.2
OAS Process Objective: 2.1
Depth of Knowledge: 3
Correct Response: C

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

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

Rock Cycle Diagram



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

A The rock is sedimentary.

B The rock is metamorphic.

C The rock is intrusive igneous.

D The rock is extrusive igneous.

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OAS 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:

OAS Content Objective:

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

Item Specifications:

Emphasis:

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

Stimulus Attributes:

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

Format: Assessable content includes the following:

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

Assessment Limits: Non-assessable content includes the following:

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

Process Objectives May Include:

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

Distractor Domain May Include:

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

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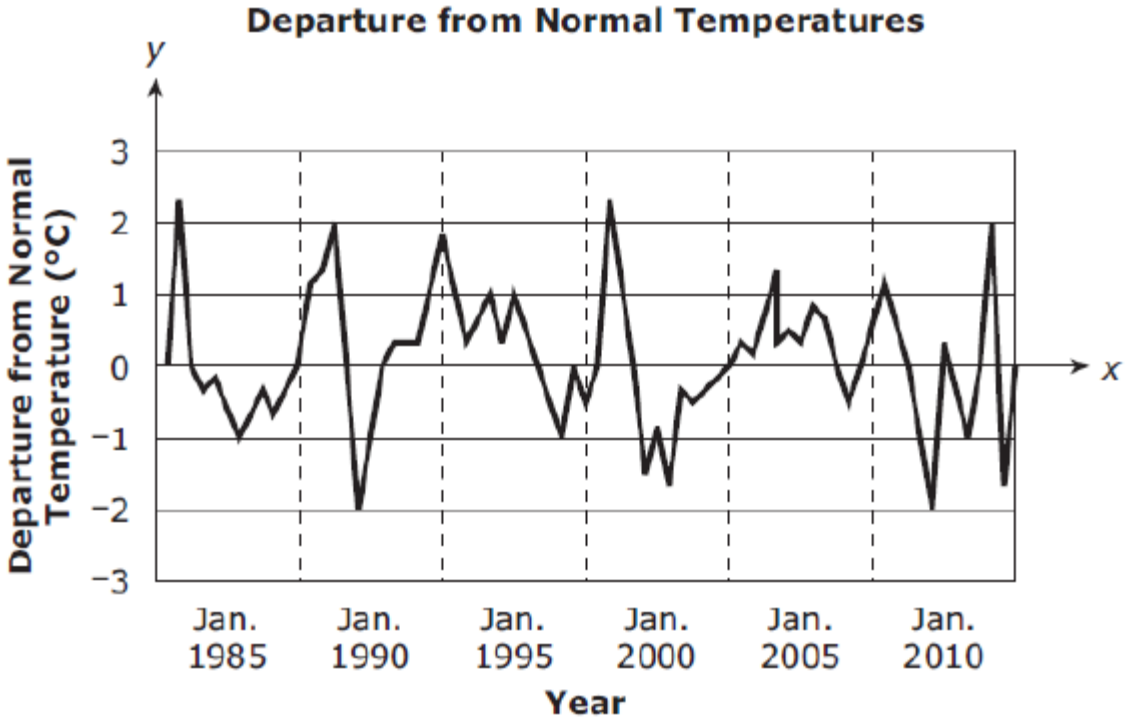
Oklahoma Academic Standards Sample Test Item:
OAS Content Objective: 4.3
OAS Process Objective: 4.2
Depth of Knowledge: 2
Correct Response: D

The graph shows measured differences from the normal temperatures for one location in North America in January for different years.



What event <u>most likely</u> caused this pattern of temperatures?

A climate changes due to greenhouse gases

B regular shifts in the Gulf Stream current

C seasonal changes due to the Earth's tilt

D changes in El Niño/La Niña cycles

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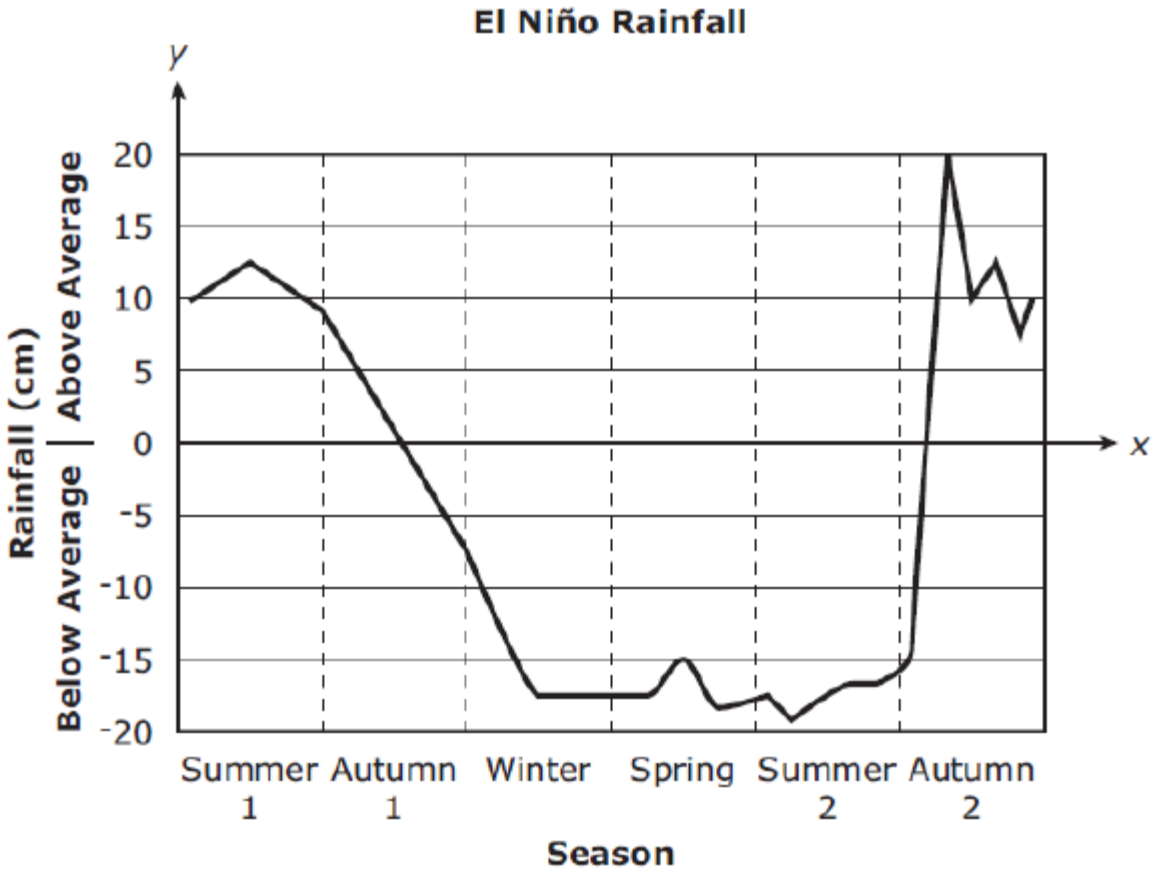
Oklahoma Academic Standards Sample Test Item:
OAS Content Objective: 4.3
OAS Process Objective: 4.2
Depth of Knowledge: 2
Correct Response: B

Warmer than usual sea surface temperatures initially developed during Summer 1 and lasted through Spring, then in Summer 2 the average sea surface temperatures dropped below normal through Autumn 2.



Based on the average rainfall information on the graph, what effect does an El Niño have on rainfall?

A Spring and Summer 1 rainfall was near average.

B Spring and Summer 2 rainfall was below average.

C Summer 1 and Autumn 1 rainfall was near average.

D Summer 1 and Autumn 2 rainfall was above average.

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OAS 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:

OAS Content Objective:

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

Item Specifications:

Emphasis:

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

Stimulus Attributes:

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

Format: Assessable content includes the following:

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

Assessment Limits: Non-assessable content includes the following:

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

Process Objectives May Include:

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

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Distractor Domain May Include:

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

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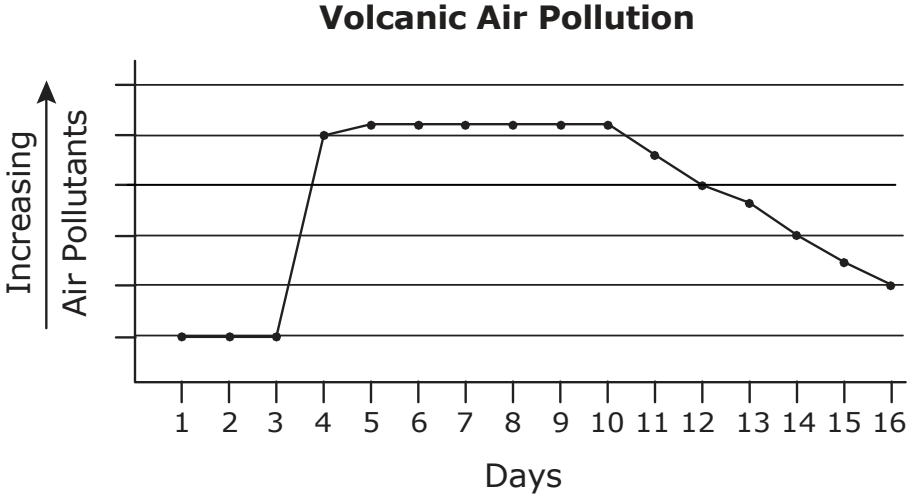
Oklahoma Academic Standards Sample Test Item:
OAS Content Objective: 5.1
OAS Process Objective: 4.2
Depth of Knowledge: 2
Correct Response: A

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



When did the eruption <u>most likely</u> occur?

A between days 3 and 4

B between days 5 and 6

C between days 10 and 11

D between days 14 and 15

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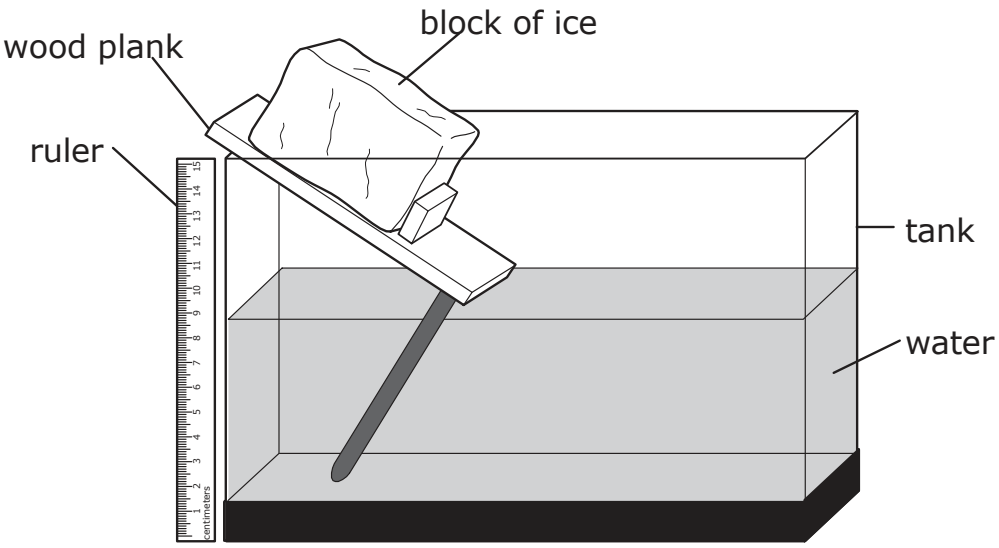
Oklahoma Academic Standards Sample Test Item:
OAS Content Objective: 5.1
OAS Process Objective: 3.2
Depth of Knowledge: 3
Correct Response: B

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

Experimental Setup



Student Questions and Predictions

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

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

A Student 1

B Student 2

C Student 3

D Student 4

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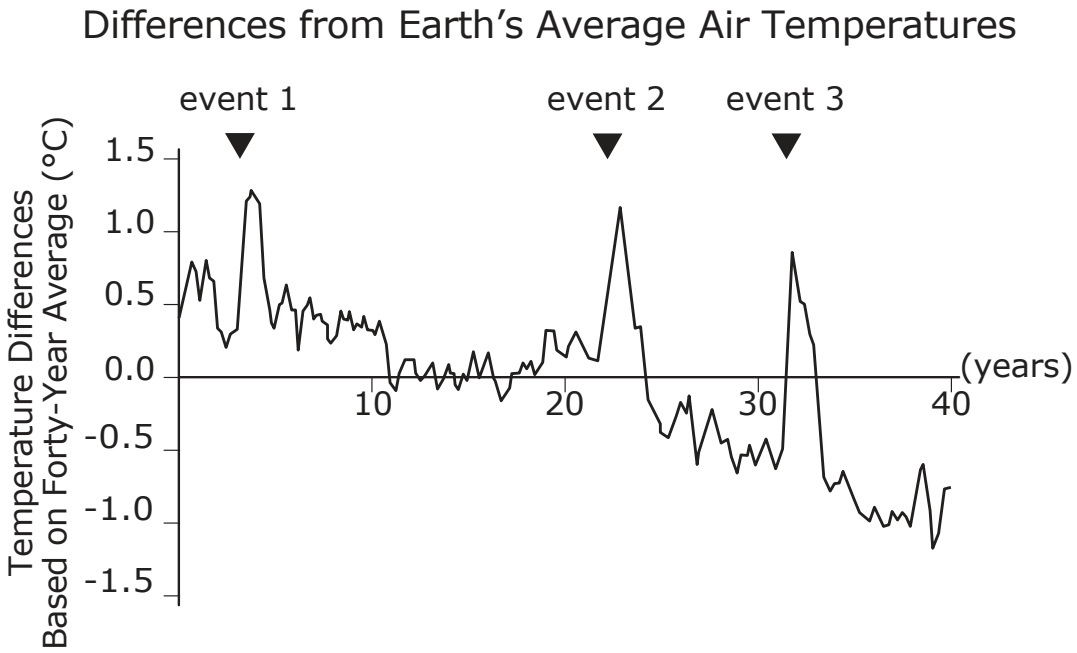
Oklahoma Academic Standards Sample Test Item:
OAS Content Objective: 5.1
OAS Process Objective: 4.3
Depth of Knowledge: 3
Correct Response: C

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



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

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

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

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

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

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OAS 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:

OAS Content Objective:

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

Item Specifications:

Emphasis:

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

Stimulus Attributes:

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

Format: Assessable content includes the following:

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

Assessment Limits: Non-assessable content includes the following:

- Items are limited to grade level appropriate fossils.

Process Objectives May Include:

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

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Distractor Domain May Include:

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

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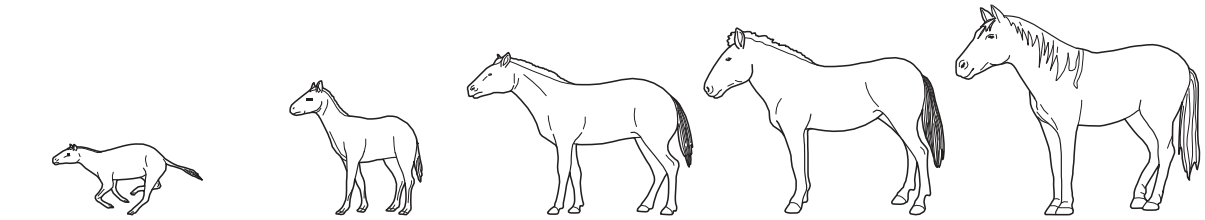
Oklahoma Academic Standards Sample Test Item:
OAS Content Objective: 5.2
OAS Process Objective: 2.2
Depth of Knowledge: 2
Correct Response: A

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

Drawings Based on the Horse Fossil Record



Hyracotherium Mesohippus Merychippus Pliohippus Equus

Which statement is the <u>best</u> conclusion based on this scientific evidence?

A The body size changed because its environment changed.

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

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

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

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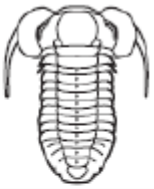
Oklahoma Academic Standards Sample Test Item:
OAS Content Objective: 5.2
OAS Process Objective: 4.3
Depth of Knowledge: 2
Correct Response: B

Number and Type of Fossils Found in Three Rock Layers

Layer				
1	10	3	0	0
2	0	0	3	1
3	0	0	20	10

Which statement best explains the change in the numbers and types of fossils found in the three rock layers?

A There are more fossils in Layer 3 than Layer 1 because Layer 3 is older.

B There are no fossils from water animals in Layer 1 because the water dried up.

C There are more fossils in Layer 3 than Layer 2 because the temperature became colder over time.

D There are no fossils from land plants or animals because water animals consumed them.

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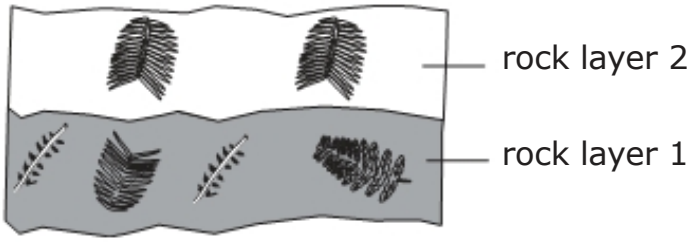
Oklahoma Academic Standards Sample Test Item:
OAS Content Objective: 5.2
OAS Process Objective: 3.3
Depth of Knowledge: 3
Correct Response: B

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

Fern Fossils



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

A

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

B

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

C

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

D

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

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