OKLAHOMA SCHOOL TESTING PROGRAM
OKLAHOMA CORE CURRICULUM TESTS

ITEM SPECIFICATIONS

Science
Grade 5

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Purpose

The purpose of the Grade 5 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 fifth-grade science process and content standards and objectives identified in the *Priority Academic Student Skills (PASS).* 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 *PASS*.

***PASS* Process Standards and Objectives**
Observe and Measure • SI (metric) units (P1.1) • Similar/different characteristics (P1.2)
Classify • Observable properties (P2.1) • Serial order (P2.2)
Experiment • Experimental design (P3.2) • Hazards/safety practices (P3.4)
Interpret and Communicate • Data tables/line/bar/trend/circle graphs (P4.2) • Prediction based on data (P4.3) • Explanations based on data (P4.4)

***PASS* Content Standards and Objectives**
Properties of Matter and Energy • Matter has physical properties (1.1) • Physical properties can be measured (1.2) • Energy can be transferred (1.3)
Organisms and Environments • Dependence upon community (2.1) • Individual organism and species survival (2.2)
Structures of Earth and the Solar System • Weather patterns (3.2) • Earth as a planet (3.3)

General Considerations

It is necessary to create test items that are reliable, fair, and targeted to the *PASS* 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 process/inquiry and content standards and objectives listed in the fifth-grade Test Blueprint. In the *Priority Academic Student Skills* (*PASS*) document, asterisks have been used to identify standards and objectives that must be assessed by the local school district.

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

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

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

5. All multiple-choice items, including the correct response and distractors, are similar in length and syntax. Students should not be able to rule out a wrong answer or identify a correct response solely because it looks or sounds different from the other answer choices. Distractors are created so that students 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 As, Bs, Cs, and Ds.

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 dual 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.

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 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. Reading tests will have vocabulary at grade level. In all other tests, the vocabulary level will be below the grade being tested except for content words. Grades 3 and 4 will be one grade level below, and grades 5, 6, 7, and 8 will be two grade levels below. These modifications are evident in the sample items included in this document.

Multiple-Choice Item Rules

- 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 scientific concepts and procedures; communicate their understandings effectively in scientific terms; approach problems; and develop viable solutions.

OVERVIEW OF ITEM SPECIFICATIONS

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

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

The headings "Process Standard" and "Process Objective" or "Content Standard" or "Content Objective" state the standard and objective being measured as found in the fifth-grade science section of the *Priority Academic Student Skills* 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 3.4 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 give 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.

PRIORITY ACADEMIC STUDENT SKILLS

SCIENCE PROCESSES AND INQUIRY

Grade 5

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).

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. Observe and measure objects, organisms, and/or events (e.g., mass, length, time, volume, temperature) using Systems International (SI) units (i.e., grams, milligrams, meters, millimeters, centimeters, kilometers, liters, milliliters, and degrees Celsius).

2. Compare and/or contrast similar and/or different characteristics (e.g., color, shape, size, texture, sound, position, change) in a given set of objects, organisms, or events.

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. Classify a set of objects, organisms, and/or events using two or more observable properties (e.g., simple dichotomous keys).

2. Arrange objects, organisms and/or events in serial order (e.g., least to greatest, fastest to slowest).

Standard 3: Experiment—Experimenting is a method of discovering information. It requires making observations and measurements to test ideas. The student will accomplish these objectives to meet this process standard.

*1. Ask questions about the world and formulate an orderly plan to investigate a question.

2. Evaluate the design of a scientific investigation.

*3. Design and conduct a scientific investigation.

4. Recognize potential hazards and practice safety procedures in all science investigations.

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 data using tables, line, bar, trend, and/or simple circle graphs.

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

3. Make predictions based on patterns in experimental data.

4. Communicate the results of investigations and/or give explanations based on data.

Standard 5: Inquiry—Inquiry can be defined as the skills necessary to carry out the process of scientific or systemic thinking. In order for inquiry to occur, students must have the opportunity to ask a question, formulate a procedure, and observe phenomena. The student will accomplish these objectives to meet this process standard.

*1. Use different ways to investigate questions and evaluate the fairness of the test.

*2. Use a variety of measurement tools and technology.

*3. Formulate a general statement to represent the data.

*4. Share results of an investigation in sufficient detail so that data may be combined with data from other students and analyzed further.

PHYSICAL SCIENCE

Grade 5

Standard 1: Properties of Matter and Energy—Describe characteristics of objects based on physical qualities such as size, shape, color, mass, temperature, and texture. Energy can produce changes in properties of objects such as changes in temperature. The student will engage in investigations that integrate the process standards and lead to the discovery of the following objectives:

1. Matter has physical properties that can be used for identification (e.g., color, texture, shape).

2. Physical properties of objects can be observed, described, and measured using tools such as simple microscopes, gram spring scales, metric rulers, metric balances, and Celsius thermometers.

3. Energy can be transferred in many ways (e.g., energy from the Sun to air, water, and metal).

LIFE SCIENCE

Grade 5

Standard 2: Organisms and Environments—Organisms within a community are dependent on one another and the environment. The student will engage in investigations that integrate the process standards and lead to the discovery of the following objectives:

1. Organisms in a community, interacting populations in a common location, depend on each other for food, shelter, and reproduction.

2. Changes in environmental conditions due to human interactions or natural phenomena can affect the survival of individual organisms and/or entire species.

EARTH/SPACE SCIENCE

Grade 5

Standard 3: Structure of Earth and the Solar System—Interaction between air, water, rocks/soil, and all living things. The student will engage in investigations that integrate the process standards and lead to the discovery of the following objectives:

*1. Soil consists of weathered rocks and decomposed organic material from dead plants, animals, and bacteria. Soils are often found in layers.

2. Weather exhibits daily and seasonal patterns (i.e., air temperature, cloud type, wind direction, wind speed, and precipitation).

3. Earth is the third planet from the Sun in a system that includes the moon, the Sun, and eight other planets.

Process Standard:

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

Process Objective:

1. Observe and measure objects, organisms, and/or events (e.g., mass, length, time, volume, temperature) using Systems International (SI) units (i.e., grams, milligrams, meters, millimeters, centimeters, kilometers, liters, milliliters, and degrees Celsius).

Item Specifications:

Emphasis:
Recognize and select units of measurement and/or measurement using SI units as appropriate.

Stimulus Attributes:
Test items may include illustrations and descriptions.

Format:
- Identify appropriate type of SI units for measurements
- Identify appropriate type of SI prefixes within a type of measurement
- Identify accurate measurements using SI units

Assessment Limits:
Test items are limited to Systems International (SI) units listed in the objective above. Students will determine the correct unit of measurement for a particular object, organism, event, or the correct measurement tool.

Content Objectives May Include:
Items may be written to any of the content objectives.

Distractor Domain May Include:
- Incorrect use of metric unit
- Incorrect metric measure

Sample Test Item:
Process Objective: 1.1
Content Objective: 1.2
Depth of Knowledge: 1
Correct Response: B

The mass of an ice cube is best measured in

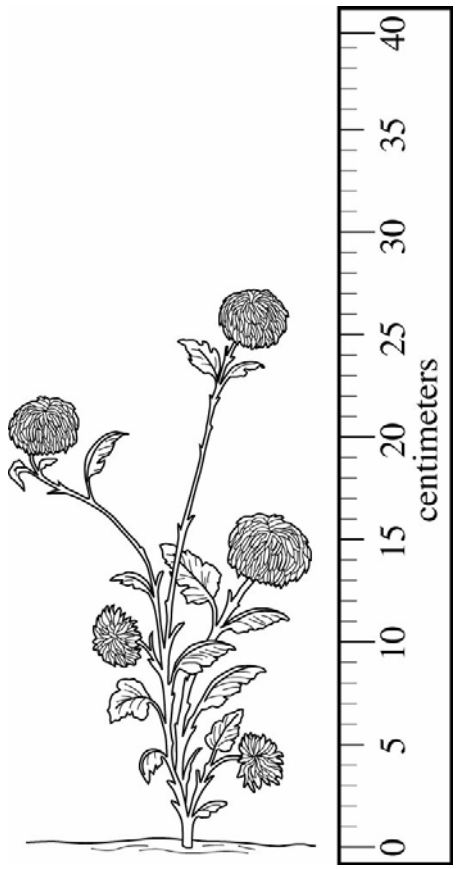
A liters.

B grams.

C meters.

D degrees Celsius.

Sample Test Item:
Process Objective: 1.1
Content Objective: 1.2
Depth of Knowledge: 1
Correct Response: C



Which metric measurement would be <u>closest</u> to the height of the plant?

A 17 centimeters

B 25 centimeters

C 27 centimeters

D 30 centimeters

Process Standard:

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

Process Objective:

2. Compare and/or contrast similar and/or different characteristics (e.g., color, shape, size, texture, sound, position, change) in a given set of objects, organisms, or events.

Item Specifications:

Emphasis:

Compare and contrast observable characteristics.

Stimulus Attributes:

Test items may include illustrations, graphs, data tables, and flow charts.

Format:

Use observable characteristics to compare and/or contrast similarities and/or differences in a given set of objects, organisms, and/or events.

Assessment Limits:

Test items are limited to comparing and/or contrasting of similar and/or different characteristics. Students make comparisons between two sets of objects, organisms, or events in terms of similar or different characteristics. Students also make comparisons within a single set of objects, organisms, or events in terms of similar or different characteristics. Tools used may include: graduated cylinder, metric balance, Celsius thermometer, beaker, metric ruler, spring scale, hotplate, anemometer, stopwatch, and rain gauge.

Content Objectives May Include:

Items may be written to any of the content objectives.

Distractor Domain May Include:

- Shared characteristics
- Characteristics that are not shared

Sample Test Item:
Process Objective: 1.2
Content Objective: 3.3
Depth of Knowledge: 2
Correct Response: C

Planet Diameters (kilometers)

Earth	Mars	Saturn	Venus	Jupiter
12,756	6,794	125,536	12,104	142,984

Which of these planets is closest in size to Earth?

A Mars

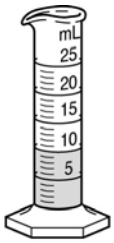
B Saturn

C Venus

D Jupiter

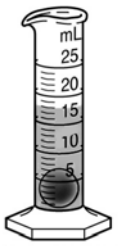
Sample Test Item:
Process Objective: 1.2
Content Objective: 1.2
Depth of Knowledge: 2
Correct Response: D

Four different objects are placed in this graduated cylinder, one at a time, to measure the volume of water each object displaces.



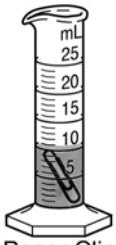
Which object displaces the <u>most</u> water?

A



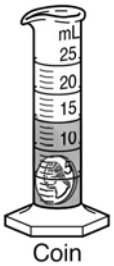
Glass Marble

C



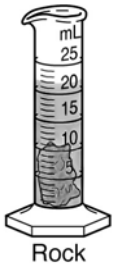
Paper Clip

B



Coin

D

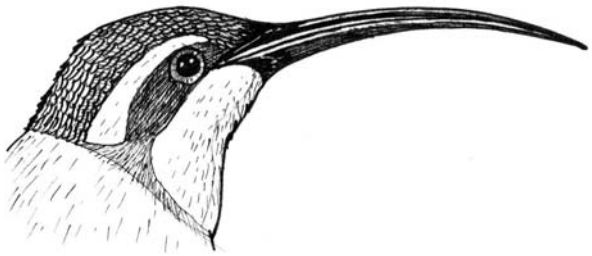


Rock

Sample Test Item:
Process Objective: 1.2
Content Objective: 2.1
Depth of Knowledge: 2
Correct Response: B

Bird Characteristics

Type of Bird	Main Diet	Feeding Habits
house finch	seeds	cracks open seeds with beak and eats the insides
ruby-throated hummingbird	flower nectar	puts beak into flower petals and drinks the nectar
scissortail flycatcher	flying insects	captures insects with beak while flying and swallows
screech owl	mice	captures mice with feet and tears them with beak



This beak most likely belongs to a

A house finch.

B ruby-throated hummingbird.

C scissortail flycatcher.

D screech owl.

Process Standard:

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

Process Objective:

1. Classify a set of objects, organisms, and/or events using two or more observable properties (e.g., simple dichotomous keys).

Item Specifications:

Emphasis:

Apply classification skills based on observations. Place objects, organisms, and/or events into a classification system using two or more observable properties.

Stimulus Attributes:

Test items may include illustrations, data tables, graphs, and classification keys including dichotomous keys.

Format:

- Use a simple dichotomous key to place objects and organisms into a classification system
- Identify similar and/or different characteristics used to classify objects, organisms, and/or events in a classification system.

Assessment Limits:

Test items assess only observable properties that are presented in the graphics or written descriptions. Test items may include one or more objects or organisms that the student must correctly place in a classification scheme based on two or more observable properties.

Content Objectives May Include:

Items may be written to any of the content objectives.

Distractor Domain May Include:

Objects or organisms that do not fit into the classification scheme in question.

Sample Test Item:
Process Objective: 2.1
Content Objective 3.2
Depth of Knowledge: 3
Correct Response: A

Mrs. Stevens asked her students to identify the clouds they saw outside. The students observed that the clouds were low in the sky and were light gray. The students could not see any blue sky through the clouds.

Identification Key

Line	Characteristics	Identification
1a	clouds are low in the sky	go to 2
1b	clouds are high in the sky	go to 3
2a	clouds are gray	go to 4
2b	clouds are white or gray and white	go to 5
3a	clouds are feathery	cirrus
3b	clouds are puffy with spaces in between like waves	cirrocumulus
4a	clouds are light gray and cover the sky like a blanket	stratus
4b	clouds are dark gray and hide the sun; it may be raining continuously	nimbostratus
5a	clouds are puffy like cotton balls	cumulus
5b	clouds are large, puffy, and tall like a tower; there may be a thunderstorm	cumulonimbus

Which cloud type was <u>most likely</u> observed by the students?

A stratus

B nimbostratus

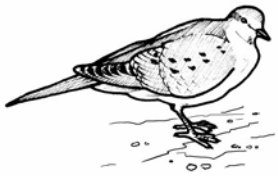
C cumulus

D cumulonimbus

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

Birds that eat other birds usually have short, curved beaks and strong feet with sharp talons.

blue jay



mourning dove

sharp-shinned hawk

house sparrow

Which of these birds <u>most likely</u> eats other birds?

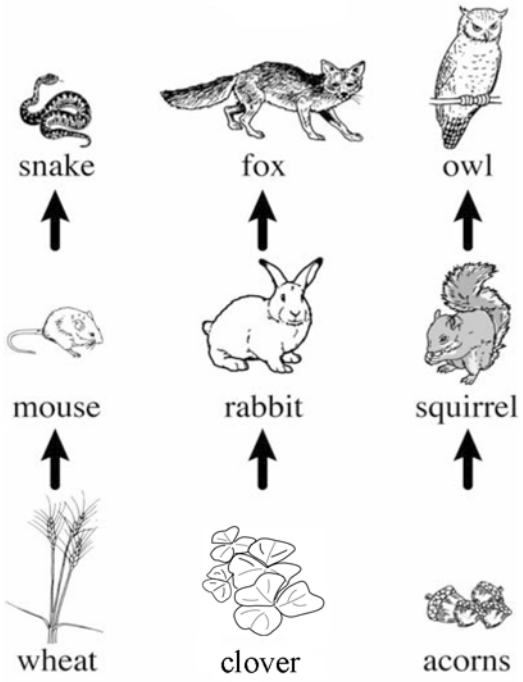
A blue jay

B sharp-shinned hawk

C mourning dove

D house sparrow

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



Characteristics of Organisms in Land Ecosystems

producers	organisms that make their own energy through photosynthesis
consumers	organisms that must consume other organisms for energy

Which set of organisms from the food chains above contains only consumers?

A snake, rabbit, acorns

B wheat, clover, acorns

C mouse, clover, owl

D snake, rabbit, squirrel

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

Process Objective:
2. Arrange objects, organisms and/or events in serial order (e.g., least to greatest, fastest to slowest).

Item Specifications:
Emphasis:
Use given properties to select a serial order or determine proper placement in the order for objects, organisms, and/or events.

Stimulus Attributes:
Test items may include illustrations, data tables, and graphs.

Format:
- Identify properties by which a set of objects, organisms, and/or events are ordered.
- Order a set of objects, organisms, and/or events.

Assessment Limits:
Test items are limited to serial order. Items may include a set of misordered objects, organisms, or events that students must reorder in the correct sequence.

Content Objectives May Include:
Items may be written to any of the content objectives.

Distractor Domain May Include:
- Objects, organisms, events that are out of correct sequence

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

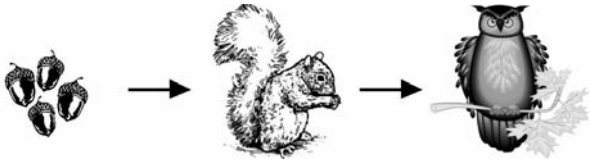
In what order do the owl, acorns, and squirrel form a food chain?

A

B

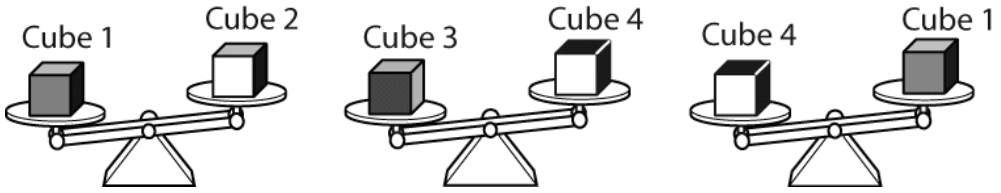
C

D



Sample Test Item:
Process Objective: 2.2
Content Objective: 1.1
Depth of Knowledge: 3
Correct Response: C

Students compared the masses of four different cubes. The balances below show their results.



Which cube has the greatest mass?

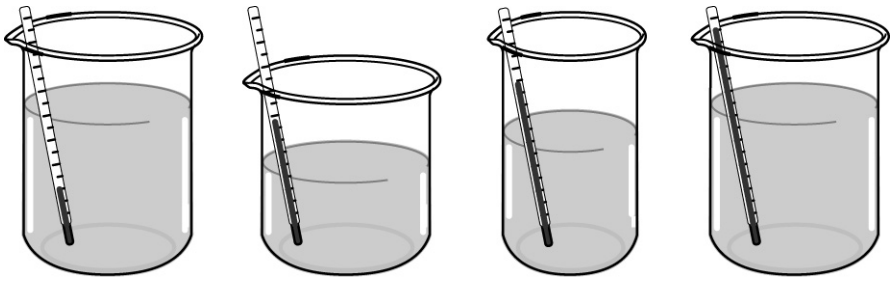
A Cube 1

B Cube 2

C Cube 3

D Cube 4

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



These containers are arranged according to the

A color of the liquid.

B size of the container.

C amount of the liquid.

D temperature of the liquid.

Process Standard:
Standard 3: Experiment—Experimenting is a method of discovering information. It requires making observations and measurements to test ideas. The student will accomplish the objective to meet this process standard.

Process Objective:
2. Evaluate the design of a scientific investigation.

Item Specifications:
Emphasis:
Sequence steps in logical progression and determine what steps are not needed or have been left out; identify correct and incorrect scientific procedures; identify purpose of experiments.

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

Format:
- 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 testable hypotheses
- Determine specific steps of an experiment
- Recognize the relationship of cause and effect in results of an experiment

Assessment Limits:
Test items are limited to determining what procedures are necessary and in what order they should be performed. Items may include identifying what is missing in an experimental procedure and steps of a scientific investigation listed in an incorrect order that the student must correctly reorder. Use of proper equipment may include: graduated cylinder, metric balance, Celsius thermometer, beaker, metric ruler, spring scale, hotplate, anemometer, stopwatch, and rain gauge.

Content Objectives May Include:
Items may be written to any of the content objectives.

Distractor Domain May Include:
- Incorrectly ordered steps to the scientific problem
- Inappropriate experimental procedures
- Incorrect purpose for experiment

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

Students conducted an experiment to show that heat moves from warmer objects to cooler objects.

1. **developed a conclusion based on their findings**
2. **gathered materials needed**
3. **followed their procedure**
4. **recorded their observations**

In what order did they complete the steps?

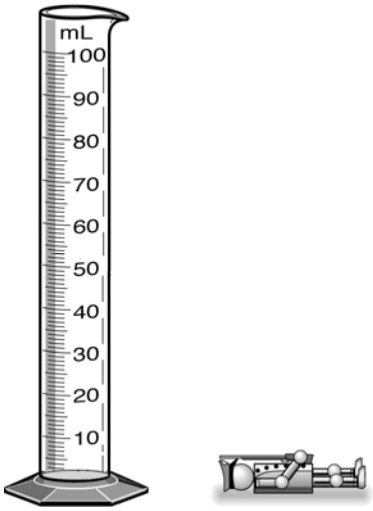
A 2, 3, 1, 4

B 2, 3, 4, 1

C 3, 2, 4, 1

D 3, 2, 1, 4

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



A student wants to know the volume of the toy. Using the equipment shown, the student did the following steps. Which step should have been left out?

A Fill the graduated cylinder with 50 mL of water.

B Measure the width of the object.

C Slowly place the toy into the water.

D Subtract the difference between the two water levels.

Process Standard:
Standard 3: Experiment—Experimenting is a method of discovering information. It requires making observations and measurements to test ideas. The student will accomplish the objective to meet this process standard.

Process Objective:
4. Recognize potential hazards and practice safety procedures in all science investigations.

Item Specifications:
Emphasis:
Identify potential hazards in science activities. Be aware of unsafe practices and appropriate procedures in science investigations conducted in the laboratory and/or field.

Stimulus Attributes:
Test items may include illustrations and verbal descriptions.

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

Assessment Limits:
Test items are limited to hazards and safety procedures in science activities. Items may include grade-appropriate situations or problems reflecting potential dangers related to science activities. Items may ask students to select the appropriate safety practice to follow.

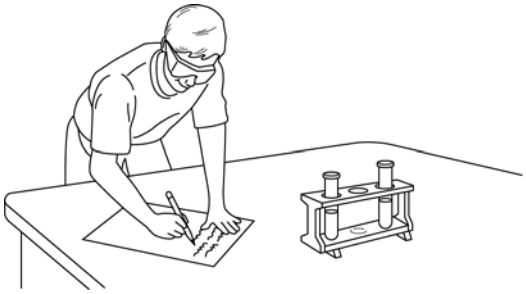
Content Objectives May Include:
Content is nonspecific.

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

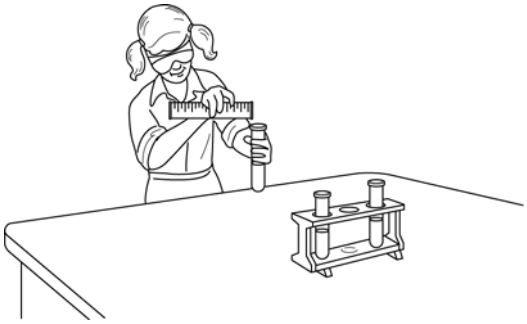
Sample Test Item:
Process Objective: 3.4
Depth of Knowledge: 2
Correct Response: B

Four students are performing a science experiment. Which picture shows a student being unsafe in the science laboratory?

A



C



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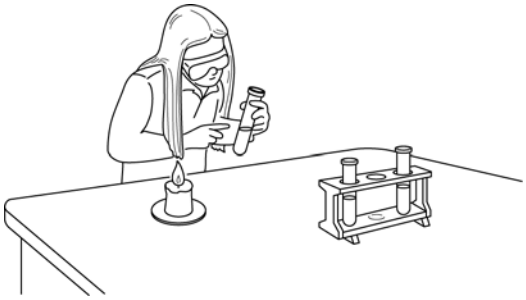

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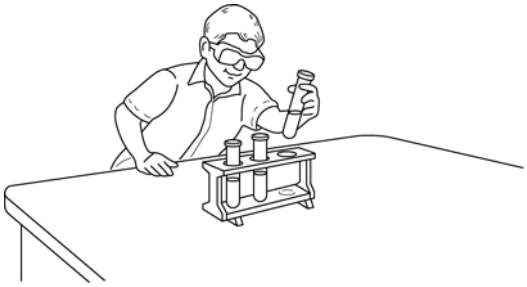
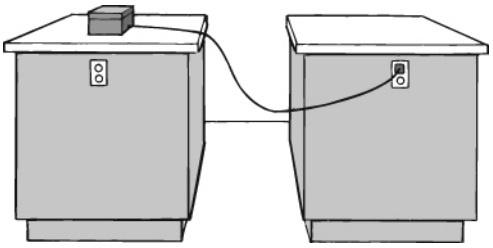


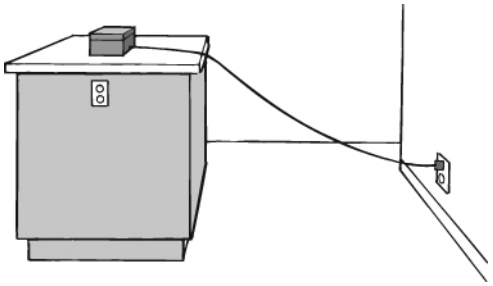
Sample Test Item:
Process Objective: 3.4
Depth of Knowledge: 1
Correct Response: C

Which of the following diagrams shows the safest way to plug in a hotplate?

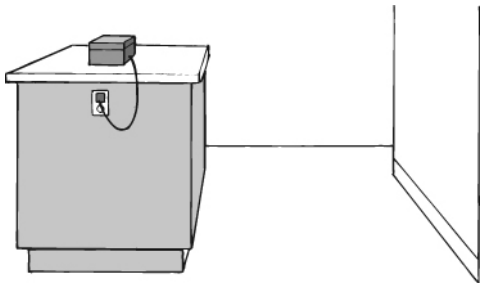
A



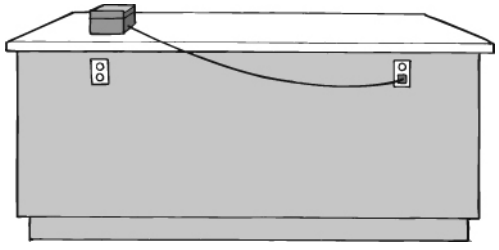
B



C



D



Sample Test Item:
Process Objective: 3.4
Depth of Knowledge: 1
Correct Response: A

Students are making observations using their senses to determine what substance is in a clear, plastic cup. Which activity is most dangerous for the students?

A tasting the liquid in the cup

B observing the liquid through the cup

C feeling the cup to check for temperature changes

D smelling the liquid by waving the odor to their noses with their hands

Process Standard:

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

Process Objective:

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

Item Specifications:

Emphasis:

Apply critical thinking skills to interpret graphical data.

Stimulus Attributes:

Test items may include data tables, line, bar, trend, and/or simple circle graphs.

Format:

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

Assessment Limits:

Test items are limited to the interpretation of data tables, line, bar, trend, and/or simple circle graphs. Items provide a data table, line, bar, trend, or simple circle graph for students to interpret.

Content Objectives May Include:

Items may be written to 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

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

Temperature Readings Taken at an Elementary School

	Low Temperature (°C)	High Temperature (°C)
Monday	19	28
Tuesday	20	27
Wednesday	20	28
Thursday	18	26
Friday	19	29

Students recorded the high and low temperatures in their schoolyard every day for five days. On which day did the temperature change the least?

A Monday

B Tuesday

C Wednesday

D Thursday

Sample Test Item:
Process Objective: 4.2
Content Objective: 3.3
Depth of Knowledge: 2
Correct Response: C

Planetary Information

Planet	Distance from Sun (millions of kilometers)
Earth	149.7
Jupiter	783.1
Mars	227.9
Mercury	57.9
Neptune	4,497.2
Saturn	1,427.0
Uranus	2,871.1
Venus	108.2

According to the information in the table, which planet revolves once around the sun in the shortest period of time?

A Earth

B Jupiter

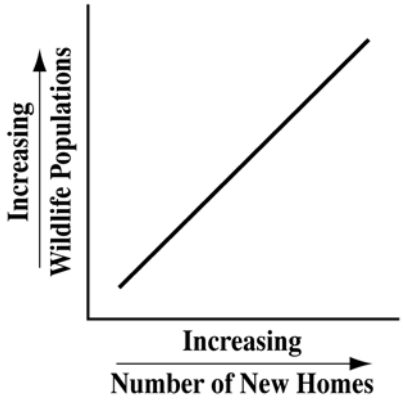
C Mercury

D Uranus

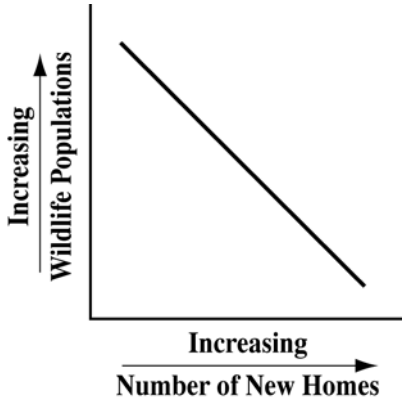
Sample Test Item:
Process Objective: 4.2
Content Objective: 2.2
Depth of Knowledge: 3
Correct Response: C

Many wildlife populations decrease in size when their habitats are changed because their habitat became developed. Which graph best shows this relationship?

A



C



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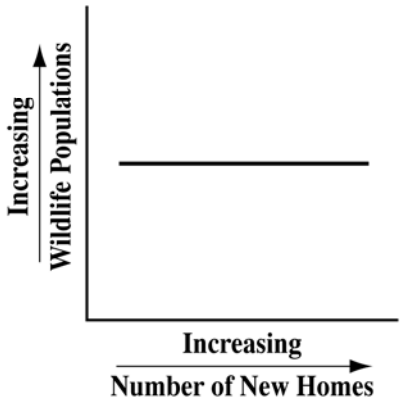
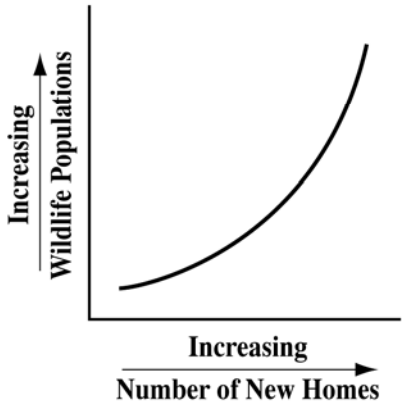


D



Process Standard:

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

Process Objective:

3. Make predictions based on patterns in experimental data.

Item Specifications:

Emphasis:

Demonstrate the ability to make predictions based on evidence within given data.

Stimulus Attributes:

Test items may include data tables, graphs (including single-line, double-line, and line-of-best-fit graphs), illustrations, or verbal descriptions.

Format:

Use patterns and trends in data to make predictions.

Assessment Limits:

Test items are limited to predications based on patterns. Students use data in a table, graph, or verbal description to make a prediction about an experiment or event.

Content Objectives May Include:

Items may be written to any of the content objectives.

Distractor Domain May Include:

- Logic errors
- Misreading of data

Sample Test Item:
Process Objective: 4.3
Content Objective 2.1
Depth of Knowledge: 2
Correct Response: A

The table below shows how fish populations in three aquariums changed over a four-month period. No fish were added to or taken from any of the aquariums during the four months.

Fish Populations

Aquarium #	September 8		January 8	
	Males	Females	Males	Females
1	2	3	21	26
2	0	5	0	4
3	5	0	5	0

The fish population will be counted again in the three aquariums on May 8th. Which of the following is the most likely population of Aquarium 3 in May?

A 0 to 5 male fish

B 0 to 4 female fish

C 6 to 20 male and female fish

D 20 or more male and female fish

Sample Test Item:
Process Objective: 4.3
Content Objective: 1.1
Depth of Knowledge: 2
Correct Response: C

Color and Streak of Five Minerals

Mineral	Color	Streak
anhydrite	**colorless, white, gray, bluish, or violet**	**white**
quartz	**colorless, white, purple, or gray**	**white**
graphite	**black to silver**	**black gray to brownish gray**
hematite	**silver gray, black, red, or brown**	**red or brown**

According to the table, which is the most likely streak color of the mineral halite, which can be colorless, white, blue, purple, pink, or yellow?

A brown

B black

C white

D red

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

Times of Sunrise and Sunset

Date	Sunrise (A.M.)	Sunset (P.M.)
7th	7:08	6:15
8th	7:06	6:17
9th	7:04	6:19
10th	7:02	6:21

Based on the data in the table, when will the sun rise on the 12th day of the same month?

A 7:02 A.M.

B 7:01 A.M.

C 7:00 A.M.

D 6:58 A.M.

Process Standard:

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

Process Objective:

4. Communicate the results of investigations and/or give explanations based on data.

Item Specifications:

Emphasis:

Given experimental data, students will effectively communicate results of experiments or events and draw conclusions.

Stimulus Attributes:

Test items may include illustrations, data tables, line, bar, trend, and/or simple circle graphs.

Format:

Evaluate data to develop scientific explanations and conclusions.

Assessment Limits:

Test items are limited to communicating results of experiments or events and drawing conclusions. Items use graphs, data tables, drawings, or verbal descriptions of data and results that students interpret and communicate in various formats.

Content Objectives May Include:

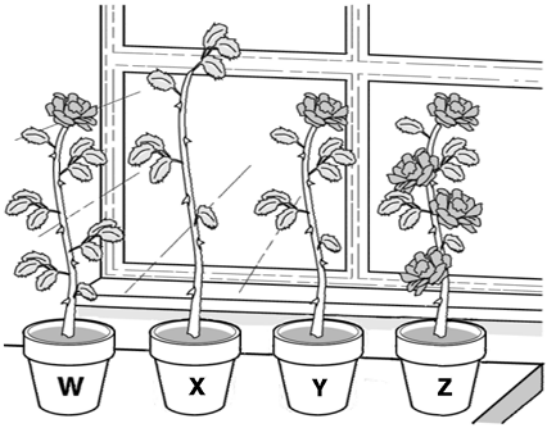
Items may be written to any of the content objectives.

Distractor Domain May Include:

- Logic errors
- Misinterpretation of data
- Ineffective or inaccurate communication of results
- Incorrect conclusions

Sample Test Item:
Process Objective: 4.4
Content Objective: 2.2
Depth of Knowledge: 2
Correct Response: D

A gardener watered each of these containers with equal amounts of water. Only one container was given fertilizer that increases the number of flowers on the plant.



Which plant was <u>most likely</u> given the fertilizer?

A plant W

B plant X

C plant Y

D plant Z

Sample Test Item:
Process Objective: 4.4
Content Objective: 1.3
Depth of Knowledge: 2
Correct Response: D

Students placed a metal spoon and a wooden spoon into a glass of hot water. They waited five minutes and touched the spoon handles. What most likely happened to the spoon handles?

A The wooden spoon became hotter.

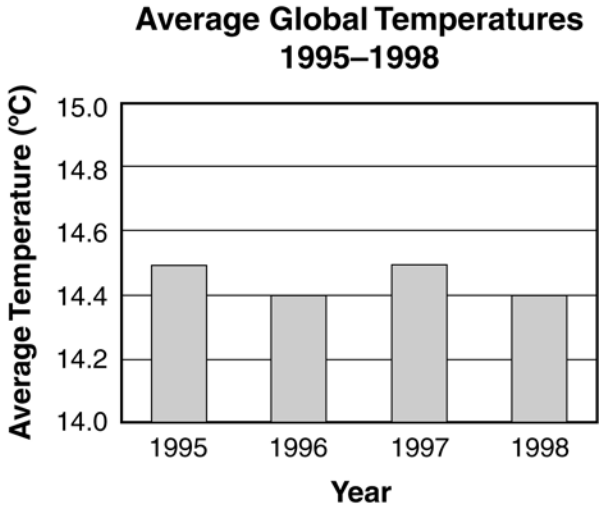
B The metal spoon changed color.

C The wooden spoon changed shape.

D The metal spoon became hotter.

Sample Test Item:
Process Objective: 4.4
Content Objective: 3.2
Depth of Knowledge: 2
Correct Response: B

Scientists collected data on the average global temperatures during four years.



Their graph shows that from 1995 to 1998 average global temperatures were

A increasing.

B increasing and decreasing.

C decreasing.

D the same.

Content Standard:

Standard 1: Properties of Matter and Energy—Describe characteristics of objects based on physical qualities such as size, shape, color, mass, temperature, and texture. Energy can produce changes in properties of objects such as changes in temperature. The student will engage in investigations that integrate the process standards and lead to the discovery of the following objective:

Content Objective:

1. Matter has physical properties that can be used for identification (e.g., color, texture, shape).

Item Specifications:

Emphasis:

All objects have physical properties. Physical properties can be used to identify, organize and classify objects. Physical properties can be changed by physical means. Energy is required to produce physical changes. The total amount of matter is the same before and after a change.

Stimulus Attributes:

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

Format:

- Identify physical properties (e.g., size, mass, shape, color, texture, hardness, density, boiling point, melting point, and freezing point) for an object or group of objects.
- Identify correct Systems International (SI) unit used to observe, measure and/or describe a physical property.
- Recognize that the mass of an object is equal to the sum of its parts after a physical change.
- Classify objects based on the identification of physical properties.
- Compare physical properties and describe the materials from which objects are made (e.g., color, texture, and hardness).
- Compare rates of change in physical properties given data or graphs (e.g., rate of melting of ice and candy with the same amount of heat applied, rate of melting of ice at different room temperatures).
- Predict changes or absence of changes in physical properties of objects caused by physical processes (e.g., changes in state of matter caused by changes in temperature, changes in shape caused by breaking, total mass remains the same after a physical change, different rates of change in different objects or materials).
- Infer the cause of a change in a physical property, such as cutting, heating, melting, grinding, or polishing.
- Infer the source of energy for a given physical change.
- Analyze groups of objects by identifying their common physical properties.

Assessment Limits:

Test items are limited to physical properties including states of matter. Items may include the physical properties of size, mass, shape, color, texture, hardness, density, phase changes, but not calculations of physical properties, such as density. Test items will not focus on students' ability to identify or compare the definitions of these physical properties. Test items will not include the recognition of the terms boiling point or melting point from phase change graphs or data tables.

Process Objectives May Include:
Items may be written to any of the process objectives except for 3.4.

Distractor Domain May Include:
- Incorrect identification of physical properties
- Incorrect sources of energy for a given physical change
- Incorrect predictions from given information
- Incorrect comparisons of given materials
- Incorrect interpretation of given information
- Incorrect inferences from given information

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

A student observed four unknown water plants.

unknown plant 1 unknown plant 2 unknown plant 3 unknown plant 4

Dichotomous Key of Four Floating Water Plants

1a. Plant has a round shape	**Go to line 2**
1b. Plant does not have a round shape	**Go to line 3**
2a. Plant has a rough texture	***Pediastrum***
2b. Plant does not have a rough texture	***Cyclotella***
3a. Plant has parts that look like a chain	***Anabaena***
3b. Plant does not have parts that look like a chain	***Scenedesmus***

Using this dichotomous key, which is the <u>best</u> identification for unknown plant 1?

A *Pediastrum*

B *Cyclotella*

C *Anabaena*

D *Scenedesmus*

Sample Test Item:
Content Objective: 1.1
Process Objective: 4.4
Depth of Knowledge: 3
Correct Response: D

Scientists observed birds living in a forest area. They recorded their observations in the chart.

Bird Observation Data

Type of Bird	Number of Birds	Location of Birds	Main Color of Feathers	Time
Cardinal	2	Tree	Red	Sunset
Crow	2	Ground	Black	Day
Snowy Owl	1	Tree	White	Night
Yellow Finch	5	Tree	Yellow	Day

Which graph would best show the physical properties of these birds?

A a circle graph showing differences in the main colors of feathers

B a circle graph showing differences in the times the birds were observed

C a bar graph showing the number of birds and their locations

D a bar graph showing the number of birds and the main colors of their feathers

Content Standard:

Standard 1: Properties of Matter and Energy—Describe characteristics of objects based on physical qualities such as size, shape, color, mass, temperature, and texture. Energy can produce changes in properties of objects such as changes in temperature. The student will engage in investigations that integrate the process standards and lead to the discovery of the following objective:

Content Objective:

2. Physical properties of objects can be observed, described, and measured using tools such as simple microscopes, gram spring scales, metric rulers, metric balances, and Celsius thermometers.

Item Specifications:

Emphasis:

Physical properties of objects can be observed, described, and measured using scientific tools.

Stimulus Attributes:

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

Format:

- Identify tools to measure and/or observe physical properties (e.g., meter stick, metric ruler, metric balance, magnifying glass/hand lens, microscope, thermometer, graduated cylinder, spring scale, stopwatch) using Systems International (SI) units for an object or group of objects.
- Identify the correct measurement of a physical property on a grade-level-appropriate tool.
- Identify the physical property measured by a given tool.
- Compare and contrast physical properties collected through measurements and/or observations (e.g., color, texture, shape, size, sound, and position).
- Classify or group objects, organisms, and/or events based on measurements and/or observations of physical properties.
- Arrange objects, organisms, and/or events in serial order based on measurements and/or observations of physical properties.
- Evaluate the appropriateness of tools used in the collection of data for a scientific investigation.
- Make predictions based on patterns in experimental data collected using grade-level-appropriate tools.
- Communicate or analyze the results of an investigation of physical properties.
- Make inferences that are supported by observations and/or measurements of physical properties.
- Analyze objects or groups of objects by measuring and/or observing their common physical properties using grade-level-appropriate tools.

Assessment Limits:

Test items are limited to grade-level-appropriate physical properties of matter (e.g., mass, volume, length, temperature, hardness, color, shape) and scientific tools (e.g., metric ruler, metric balance, simple microscope, Celsius thermometer, spring scale, magnifying glass/hand lens, graduated cylinder). Items will not include the identification of tools used to identify the density or hardness of objects. Items will not require the student to calculate the density of objects.

Process Objectives May Include:
Items may be written to any of the process objectives except for 3.4.

Distractor Domain May Include:
- Incorrect measurements and/or appropriate metric units of physical properties
- Incorrect scientific tools used to measure given physical properties
- Incorrect property that can be measured by a given tool
- Incorrect comparisons of the physical properties of objects
- Incorrect classification or grouping of objects or events from given information
- Incorrect arrangement of objects into a serial order based on physical properties
- Incorrect evaluation of a scientific investigation
- Predictions of physical properties not supported by given observations or data
- Results not supported by given observations or data
- Inferences, analyses, or conclusions not supported by given observations or data

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

A student wants to investigate how water temperature will change when placed into a refrigerator. The student will measure the temperature of a cup of water before and after placing it in a refrigerator for 30 minutes. The student plans to use a spring scale to make the measurement.

Which best explains the problem with the student's investigation?

A A spring scale does not measure the correct property.

B A spring scale does not measure small numbers.

C The investigation involves more than one measurement.

D The investigation involves measuring a liquid.

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

A student observes that gas bubbles rise higher in a column of water as the water gets warmer. The student measures the temperature of the water and the height of the bubbles in the column.

Investigation Data

Temperature (°C)	Bubble Height in Column (cm)
4	2
10	4
22	7
31	9
43	?

What is the most likely height of the bubbles at 43 °C and what tool did the student use to measure the bubble height in the column?

A The height will be 7 cm and is measured with a ruler.

B The height will be 7 cm and is measured with a thermometer.

C The height will be 12 cm and is measured with a ruler.

D The height will be 12 cm and is measured with a thermometer.

Content Standard:

Standard 1: Properties of Matter and Energy—Describe characteristics of objects based on physical qualities such as size, shape, color, mass, temperature, and texture. Energy can produce changes in properties of objects such as changes in temperature. The student will engage in investigations that integrate the process standards and lead to the discovery of the following objective:

Content Objective:

3. Energy can be transferred in many ways (e.g., energy from the Sun to air, water, and metal).

Item Specifications:

Emphasis:

Energy can be transferred from one material to another. Energy can be changed from one form to another (e.g., electricity to heat, light to electricity). Energy changes can be measured (e.g., increases in heat energy increase temperature, increases in sound energy increase loudness, increases in light energy increase brightness). Some substances are better able to transfer energy than others and are known as conductors (e.g., metals are good conductors of heat and electricity). Substances that transfer no or very little energy are called insulators (e.g., wood and cotton fabrics are poor conductors of heat and electricity).

Stimulus Attributes:

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

Format:

- Recognize, observe and/or measure the transfer of energy in a system.
- Identify correct measures of change in energy using Systems International (SI) units.
- Compare and contrast the transfer of energy though different materials (e.g., conductors, insulators).
- Classify or group a set of materials using their ability to transfer a given form of energy.
- Arrange objects and/or events in serial order based on the transfer of energy.
- Evaluate the design of a scientific investigation exploring energy transfer.
- Interpret data in tables, line, bar, trend, and/or simple circle graphs that show evidence of energy transfer.
- Predict energy transfer based on patterns in given data (e.g., speed of energy transfer in different sizes of copper wire, variable metal mixtures in cooking pans).
- Communicate the results of energy transfer investigations.
- Draw conclusions and/or identify correct explanations based on data collected.

Assessment Limits:

Items are limited to grade-level-appropriate forms of energy (e.g., heat, light, sound, motion and electrical), energy transformations (e.g., electrical to heat) and the effects of changes in the amount of energy. Items will not include identifying or classifying different forms of heat energy (i.e., radiation, convection, and conduction), kinetic, potential and/or chemical energy. Items will not include the kinetic molecular theory (e.g., molecules move more rapidly in heated substances).

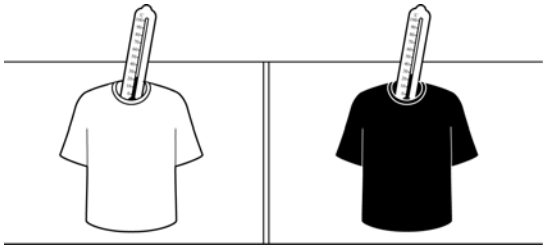
Process Objectives May Include:
Items may be written to any of the process objectives except for 3.4.

Distractor Domain May Include:
- Incorrect observation or measurement of energy transfer within a system
- Incorrect measurements of changes in energy
- Incorrect comparison of the transfer of energy through different materials
- Incorrect classification or grouping of materials based on provided information
- Incorrect serial order of objects and/or events based on transfer of energy
- Incorrect evaluation of a scientific investigation exploring the transfer of energy
- Incorrect interpretation of data in tables, line, bar, trend, and/or simple circle graphs
- Incorrect prediction of energy transfer based on provided information
- Incorrect conclusion and/or explanation based on given data

Sample Test Item:
Content Objective: 1.3
Process Objective: 1.2
Depth of Knowledge: 3
Correct Response: C

A teacher asks the following question to students in a class: "Does color affect the temperature of a material?" The students set up the following experiment.

- **place a white t-shirt and a black t-shirt on the sidewalk in direct sunlight**
- **insert a thermometer in the neck of each t-shirt**
- **measure the temperature using a thermometer every 5 minutes for 20 minutes**
- **record the data in the table**



Temperatures of T-shirts Over Time

Time (minutes)	Temperature (°C)	
	White T-shirt	Black T-shirt
0	22	22
5	22	23
10	23	24
15	23	26
20	23	28

Which statement best describes what happened during this experiment?

A Sunlight energy caused the temperature of each t-shirt to change equally.

B Sunlight energy decreased heat energy in the sidewalk under the t-shirts, which made them warmer.

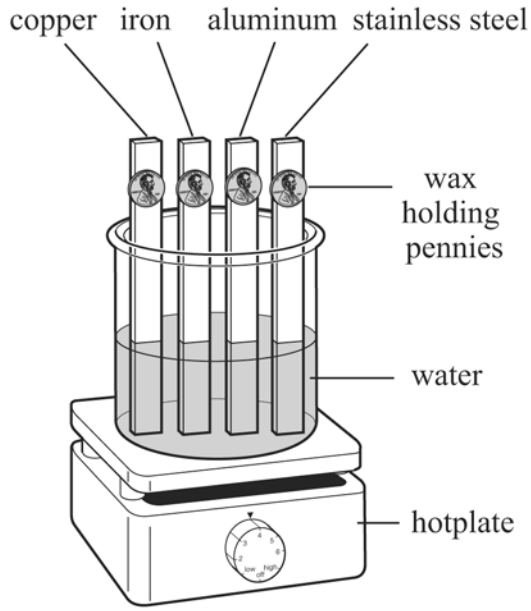
C Energy from the sun increased the temperature of the black t-shirt, more than the white t-shirt.

D Energy from the sidewalk caused the white t-shirt to lose more heat energy than the black t-shirt.

Sample Test Item:
Content Objective: 1.3
Process Objective: 4.4
Depth of Knowledge: 3
Correct Response: B

Four pennies were attached to the pieces of metal shown by using wax. The water in the beaker was heated using a hotplate. The table shows the order in which the pennies fell into the water.

Heat Conduction Experiment Set-up



Order that the Pennies Fell Off the Metals

Order	Metal
first	copper
second	aluminum
third	iron
fourth	stainless steel

Which statement <u>best</u> describes an observation during this activity?

A The iron transfers more heat energy from the air than the other metals.

B The copper transfers heat energy from the water faster than the other metals.

C The heat from the water transferred to the air instead of heating the aluminum.

D The heat from the stainless steel transferred to the water instead of heating the wax and the penny.

Content Standard:

Standard 2: Organisms and Environments—Organisms within a community are dependent on one another and the environment. The student will engage in investigations that integrate the process standards and lead to the discovery of the following objective:

Content Objective:

1. Organisms in a community, interacting populations in a common location, depend on each other for food, shelter, and reproduction.

Item Specifications:

Emphasis:

Organisms in a common location are interdependent. In a community, organisms can be classified as producers, consumers and decomposers. Producers are able to use energy (light or chemical) to help them make their own food. Consumers need to consume other organisms to obtain their energy. Decomposers are organisms that get their energy from dead plant or animal material. Organisms are part of food chains, food pyramids, and food webs. Organisms rely on other organisms to provide needs other than food energy (e.g., shelter, an area for nests, dispersal of seeds).

Stimulus Attributes:

Test items may include grade-level-appropriate text, illustrations, data tables, graphs and descriptions. Organisms likely to be unfamiliar to students at this grade level will be described and/or pictured.

Format:

- Complete a food chain or food web.
- Identify and/or compare the role of organisms in a given community as producers, consumers, or decomposers.
- Classify or group organisms and/or populations based on how they meet their needs (e.g., shelter, reproduction).
- Evaluate the design of a scientific investigation exploring the relationships between populations and/or organisms in a community.
- Predict outcomes based on changes in populations and organism relationships.
- Predict interactions among organisms in a given situation or by using given data.
- Analyze the interactions of organisms in a community and/or populations based on data.

Assessment Limits:

Items are limited to grade-level-appropriate organisms and their interactions (e.g., producers, consumers, decomposers; organisms dependent on other organisms for seed dispersal or nest sites). Items will not include identifying levels of consumers (e.g., primary, secondary and/or tertiary).

Process Objectives May Include:

Items may be written to any of the process objectives except for 3.4.

Distractor Domain May Include:

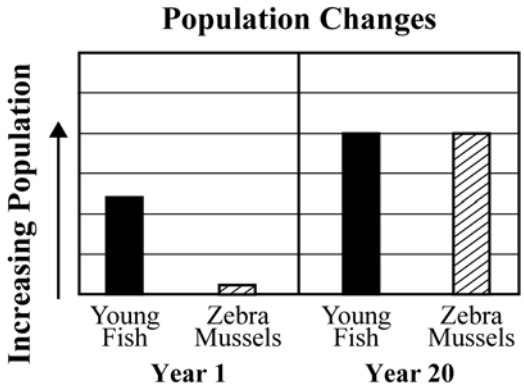
- Incorrect completion of food chains
- Incorrect identification of the role of given organisms
- Incorrect comparison of organisms in a given community
- Incorrect classification or grouping of organisms based on how they meet their needs
- Incorrect evaluation of a scientific investigation
- Incorrect predictions of changes in a community based on given information
- Incorrect predictions of organism interactions based on given data or situation
- Incorrect analysis of the interactions of organisms

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

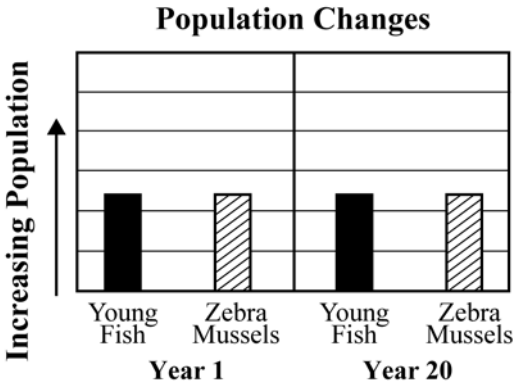
Zebra mussels are shelled animals introduced by humans into Lake Michigan. Zebra mussels compete with young fish for food. Researchers predicted the population of young fish one year after the zebra mussels were introduced and twenty years later.

Which graph shows how zebra mussels would most likely affect the population of young fish after a twenty year period?

A



C



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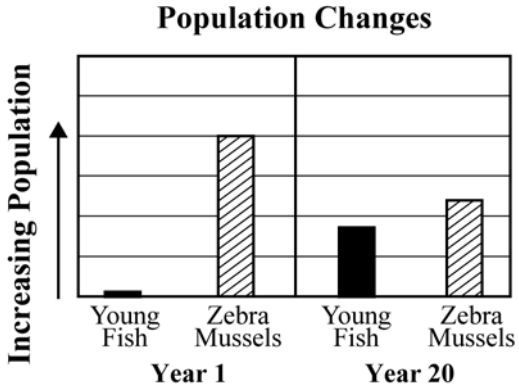
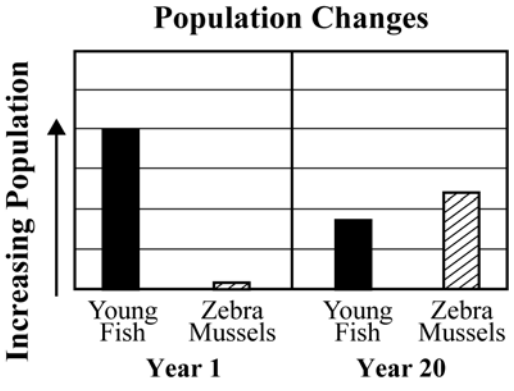
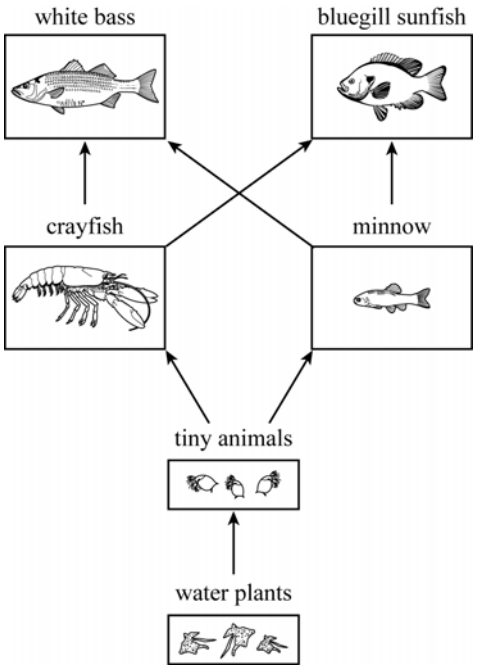


D



Sample Test Item:
Content Objective: 2.1
Process Objective: 4.4
Depth of Knowledge: 3
Correct Response: D



Yearly Count of White Bass and Bluegill Sunfish

Fish	Year 1	Year 2	Year 3	Year 4
white bass	100	120	125	95
bluegill sunfish	100	80	75	105

Two of the types of fish living together in a lake were counted for four years. Based on the food web and the data table, which statement best explains the changing numbers of white bass and bluegill sunfish in the lake?

A The white bass increased because they are eating the bluegill sunfish.

B The bluegill sunfish increased because they are eating the white bass.

C The bluegill sunfish and the white bass were both being eaten by crayfish and minnows, so their numbers go up and down.

D The white bass and the bluegill sunfish were competing for the same food sources, so their numbers go up and down.

Sample Test Item:
Content Objective: 2.1
Process Objective: 4.4
Depth of Knowledge: 3
Correct Response: D

Scientists have observed that blue jay birds feed on insects.

Average Insect Diet of Blue Jay Birds

Type of Insect Eaten	Percentage (%)
lacewing	33
grasshopper	27
moth	23
other insects	16
monarch butterfly	less than 1
viceroy butterfly	less than 1

Monarch butterfly Viceroy butterfly

The scientists want to learn why blue jay birds are not observed eating many butterflies. They learn that monarch butterflies taste bad to the blue jay birds. They also learn that viceroy butterflies taste good to blue jay birds. Which statement best explains why viceroy butterflies are only a small part of the blue jay birds' insect diet?

A Blue jay birds like to eat insects that cannot fly, so they will not eat viceroy butterflies.

B Blue jay birds like to eat a lot of lacewings, so they are not hungry enough to eat viceroy butterflies.

C Blue jay birds avoid eating moths, so they avoid eating viceroy butterflies too.

D Blue jay birds avoid eating viceroy butterflies because they look like monarch butterflies.

Content Standard:

Standard 2: Organisms and Environments—Organisms within a community are dependent on one another and the environment. The student will engage in investigations that integrate the process standards and lead to the discovery of the following objective:

Content Objective:

2. Changes in environmental conditions due to human interactions or natural phenomena can affect the survival of individual organisms and/or entire species.

Item Specifications:

Emphasis:

Understand how a change or changes in environmental conditions can affect the survival of organisms, populations, entire species, and/or ecosystems.

Stimulus Attributes:

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

Format:

- Observe and/or measure positive or negative changes in environmental conditions that result from human interactions and/or natural phenomena (e.g., food supply, air quality, water quality, habitats).
- Predict the survival of different organisms based on given changes in environmental conditions.
- Compare human interactions and/or natural phenomena that affect the survival of organisms.
- Classify or group organisms based on the effects of a change in environmental conditions.
- Sequence changes in environmental conditions due to human interactions or natural phenomena.
- Evaluate the design of a scientific investigation exploring a change in environmental conditions and/or the effects on the survival of organisms.
- Predict the effects of changes in environmental conditions that result from human interactions and/or natural phenomena.
- Communicate the results of an investigation exploring the concept of environmental change.
- Predict the effect or effects of given changes in environmental conditions on organisms.

Assessment Limits:

Test items are limited to grade-level-appropriate human interactions and/or natural phenomena (e.g., human polluting activities, human clean-up activities, earthquakes, tornados, hurricanes, floods). Ecosystems and/or organisms likely to be unfamiliar to students at this grade level will be described and/or pictured.

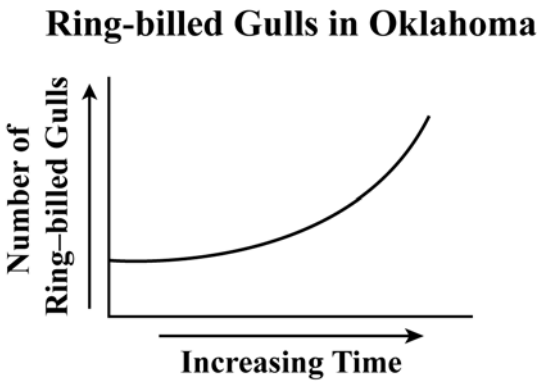
Process Objectives May Include:

Items may be written to any of the process objectives except for 3.4.

Distractor Domain May Include:

- Incorrect observation and/or measure of changes in environmental conditions
- Incorrect prediction of the survival of organisms in given situations
- Incorrect comparisons among given human interactions and/or natural phenomena that affect the survival of organisms
- Incorrect classification or grouping of organisms based on the effects of a change in environmental conditions
- Incorrect sequence of events in environmental conditions
- Incorrect evaluation of the design of a scientific investigation
- Incorrect prediction of the effects of changes in environmental conditions
- Incorrect communication of the results of an investigation
- Incorrect prediction of the effect of changes in environmental conditions on organisms

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



In recent years, the number of ring-billed gulls that migrate to Oklahoma during the winter has changed. Based on the graph, which statement best explains this change in ring-billed gulls?

A Their numbers are decreasing because weather conditions have been better for many years.

B Their numbers are increasing because weather conditions have been worse for many years.

C Their numbers are decreasing because they are unable to find food from human-made sources like landfills.

D Their numbers are increasing because they are able to get more food from human-made sources like landfills.

Sample Test Item:
Content Objective: 2.2
Process Objective: 1.1
Depth of Knowledge: 3
Correct Response: A

A scientist would like to observe how a fish responds when a solid chemical is added to the fish's tank. How should the scientist measure the solid chemical and what might the scientist learn from the experiment?

A

Chemical Measurement	What Might the Scientist Learn?
mass in grams	how changes to a fish's environment might affect its population

B

Chemical Measurement	What Might the Scientist Learn?
mass in grams	how an entire pond ecosystem is affected by a substance

C

Chemical Measurement	What Might the Scientist Learn?
volume in liters	how changes to a fish's environment might affect its population

D

Chemical Measurement	What Might the Scientist Learn?
volume in liters	how an entire pond ecosystem is affected by a substance

Content Standard:

Standard 3: Structure of Earth and the Solar System—Interaction between air, water, rocks/soil, and all living things. The student will engage in investigations that integrate the process standards and lead to the discovery of the following objective:

Content Objective:

2. Weather exhibits daily and seasonal patterns (i.e., air temperature, cloud type, wind direction, wind speed, and precipitation).

Item Specifications:

Emphasis:

Earth is a dynamic system and its weather conditions have predictable daily and seasonal patterns. Different cloud types are common under different weather conditions (e.g., cirrus, cumulus, stratus, cumulonimbus). The tilt of Earth plays a direct role in the seasonal patterns.

Stimulus Attributes:

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

Format:

- Identify tools and units (English system) used to measure and/or observe weather conditions (e.g., anemometer, barometer, rain gauge, meter stick, thermometer, weather vane).
- Identify the correct measurement on a grade-level-appropriate tool and units commonly used to report these measurements.
- Compare and/or classify daily and/or seasonal weather patterns (e.g., temperature, wind speed, wind direction, rainfall, snowfall, cloud types).
- Sequence daily and/or seasonal weather patterns from given information.
- Evaluate the design of a scientific investigation exploring daily and/or seasonal weather patterns.
- Recognize the relationship between the seasons and Earth's tilt in the Northern and Southern Hemispheres.
- Predict weather conditions based on given cloud types, seasonal weather patterns, temperature, wind speed, wind direction, and/or precipitation.
- Communicate or explain the results of an investigation exploring the concept of daily and/or seasonal weather patterns.

Assessment Limits:

Test items are limited to grade-level-appropriate weather conditions and seasonal patterns. Items will not include weather maps.

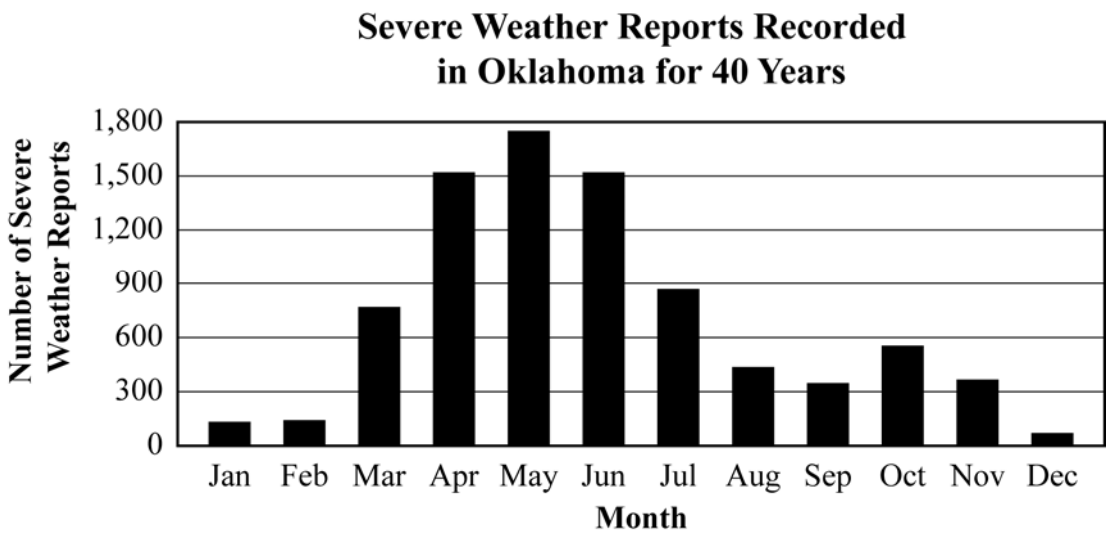
Process Objectives May Include:

Items may be written to any of the process objectives except for 3.4.

Distractor Domain May Include:

- Incorrect tool identified for measuring given weather conditions
- Incorrect observation and/or measurement of weather conditions, daily weather patterns, and/or seasonal weather patterns
- Incorrect comparison of daily and/or seasonal weather patterns
- Incorrect classification of daily and/or seasonal weather patterns
- Incorrect sequence of given daily and/or seasonal weather patterns
- Incorrect evaluation of a scientific investigation
- Incorrect relationship between the season and Earth's tilt in either hemisphere
- Incorrect predictions of weather conditions based on given information
- Incorrect results and/or explanation of daily and/or seasonal weather patterns

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



Which statement best describes the data shown in this graph?

A Daily weather conditions change when the amount of rainfall changes.

B Daily weather conditions stay the same when wind direction stays the same.

C Weather conditions follow a pattern based on the change in seasons.

D Weather conditions do not follow a pattern based on the change in air temperature.

Sample Test Item:
Content Objective: 3.2
Process Objective: 4.4
Depth of Knowledge: 3
Correct Response: D

Students in a science class studied a map of the central United States. They also studied a table that had average monthly temperature information for Tulsa, Oklahoma, and Omaha, Nebraska.

Average Monthly Temperature Information

Average Monthly High Temperatures (°F)												
City	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**
Tulsa	46	53	62	72	80	88	94	93	84	74	60	50
Omaha	32	38	51	64	73	82	86	84	76	65	48	35
Average Monthly Low Temperatures (°F)												
Tulsa	26	31	40	50	59	68	73	71	63	51	39	30
Omaha	13	19	29	40	51	61	66	64	55	43	29	17

Which statement is correct based on this data?

A December is the coldest month of the year in both cities because that is when winter begins.

B June is the hottest month of the year in both cities because that is when summer begins.

C Omaha is cooler than Tulsa in the winter because Omaha is located farther south.

D Tulsa has higher average temperatures than Omaha year round because Tulsa is located farther south.

Content Standard:

Standard 3: Structure of Earth and the Solar System—Interaction between air, water, rocks/soil, and all living things. The student will engage in investigations that integrate the process standards and lead to the discovery of the following objective:

Content Objective:

3. Earth is the third planet from the Sun in a system that includes the moon, the Sun, and eight other planets.

Item Specifications:

Emphasis:

The solar system is arranged in a predictable order. The solar system includes Earth, the moon, other planets and their moons, asteroids, meteoroids, comets, and the Sun.

Stimulus Attributes:

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

Format:

- Recognize appropriate units of dimensions of objects in our solar system.
- Observe and/or describe objects in our solar system (e.g., relative size, number of moons, ring system, rocky/gaseous planets, inner/outer planets, relative temperature differences).
- Classify or compare objects in our solar system.
- Arrange objects in our solar system based on given criteria.
- Evaluate the design of a scientific investigation that examines objects in our solar system.
- Evaluate a description of a model of the solar system and/or its parts.
- Predict conditions on and/or locations of objects in our solar system based on experimental data (e.g., predict the surface temperature of an unknown planet given the surface temperatures of surrounding planets).
- Predict phases of the moon based on observations and/or data.
- Communicate the results of and/or give explanations based on data in an investigation exploring objects in our solar system (e.g., explain why the surface temperature on one planet is greater than that of another planet).

Assessment Limits:

Test items are limited to grade-level-appropriate parts of the solar system including the planets and their moons, asteroids, meteoroids, comets, and the Sun. Items will not include the identification of specific measurements or distances in the solar system.

Process Objectives May Include:

Items may be written to any of the process objectives except for 3.4.

Distractor Domain May Include:

- Incorrect units for dimensions of objects in our solar system
- Incorrect observations or descriptions of objects in our solar system
- Incorrect classification or comparisons of object in our solar system
- Incorrect arrangement of objects in our solar system
- Incorrect evaluation of a scientific investigation
- Incorrect evaluation or description of a given model
- Incorrect prediction of conditions and/or locations of objects in our solar system
- Incorrect prediction of phases of the moon
- Incorrect results or explanations of results of an investigation

Sample Test Item:
Content Objective: 3.3
Process Objective: 2.2
Depth of Knowledge: 2
Correct Response: A

Which data table shows the correct sequence of planets in our solar system?

A

Planet Data

Planet closest to the sun	Mercury
	Venus
	Earth
	Mars
	Jupiter
	Saturn
Planet farthest from the sun	Uranus
	Neptune

C

Planet Data

Planet closest to the sun	Jupiter
	Neptune
	Uranus
	Saturn
	Mars
	Mercury
Planet farthest from the sun	Venus
	Earth

B

Planet Data

Planet closest to the sun	Earth
	Venus
	Mercury
	Mars
	Saturn
	Uranus
Planet farthest from the sun	Neptune
	Jupiter

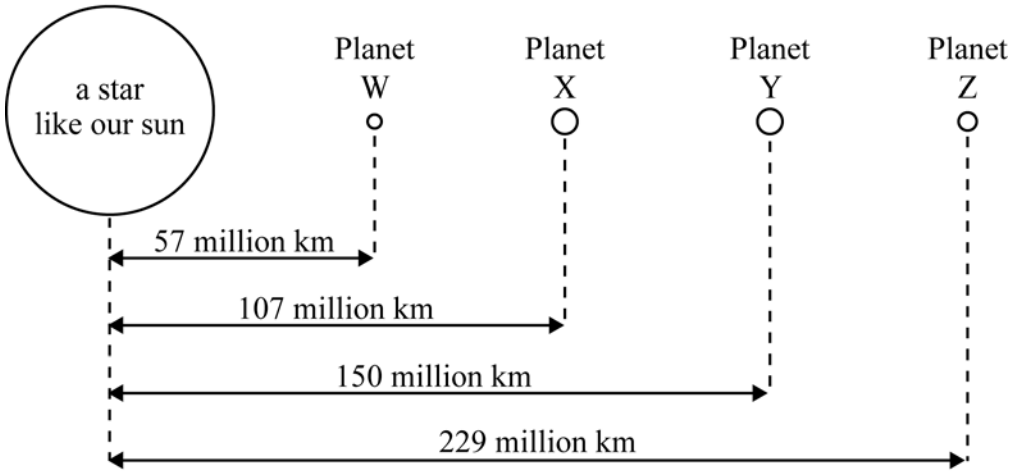
D

Planet Data

Planet closest to the sun	Neptune
	Uranus
	Saturn
	Jupiter
	Mars
	Earth
Planet farthest from the sun	Venus
	Mercury

Sample Test Item:
Content Objective: 3.3
Process Objective: 2.1
Depth of Knowledge: 3
Correct Response: C

Solar System Diagram



Number of Moons Orbiting Planets

Student	Planet	Number of Moons
Jana	W	1
Fred	W	2
Gaile	Y	1
Malcom	Y	2

Using the diagram and table, which student identified a planet that is <u>most</u> similar to Earth?

A Jana

B Fred

C Gaile

D Malcom