

Georgia Milestones

Assessment System



Study/Resource Guide for Students and Parents Science Grade 5



The Study/Resource Guides are intended to serve as a resource for parents and students. They contain practice questions and learning activities for each content area. The standards identified in the Study/Resource Guides address a sampling of the state-mandated content standards.

For the purposes of day-to-day classroom instruction, teachers should consult the wide array of resources that can be found at www.georgiastandards.org.

Study/Resource Guide

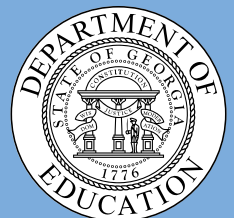


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INTRODUCTION

Please see the *Study/Resource Guide for Students and Parents: Introduction and Overview* document for valuable information about how to use this guide.

DEPTH OF KNOWLEDGE (DOK) EXAMPLE ITEMS

Example items that represent the applicable DOK levels across various Grade 5 Science content domains are provided.

All example and sample items contained in this guide are the property of the Georgia Department of Education.

Example Item 1

Selected-Response

DOK Level 1: This is a DOK level 1 item because the question requires the student to recall information concerning a known relationship between scientific quantities.

Science Grade 5 Content Domain: Physical Science

Standard: S5P2. Obtain, evaluate, and communicate information to investigate electricity.
b. Design a complete, simple electric circuit, and explain all necessary components.

A student wants to design a complete, simple circuit for a class project. The student has more materials available than are needed for the project.

What does a complete, simple circuit require to work?

- A. wire and a switch
- B. wire and a light bulb
- C. wire, a battery, and a switch
- D. wire, a battery, and a light bulb

Correct Answer: D

Explanation of Correct Answer: The correct answer is choice (D) wire, a battery, and a light bulb. The necessary components of a simple electric circuit are a path for the current, a source of power, and a component to consume power. Choice (A) is incorrect because a switch is not necessary, but a power source is a necessary component. Choice (B) is incorrect because a power source is a necessary component. Choice (C) is incorrect because a switch is not a necessary component.

Example Item 2

Selected-Response

DOK Level 2: This is a DOK level 2 item because the question requires the student to apply learned information to abstract and real-life situations.

Science Grade 5 Content Domain: Earth and Space Science

Standard: S5E1. Obtain, evaluate, and communicate information to identify surface features on the Earth caused by constructive and/or destructive processes.

- b. Develop simple interactive models to collect data that illustrate how changes in surface features are/were caused by constructive and/or destructive processes.

Deposition of sediments can change the depth of a lake over time. A student wants to make a model that shows how this process takes place.

Which model would provide data about changes in the depth of a lake caused by deposition?

- A. Fill a beaker with water. Slowly allow the water to evaporate from the beaker. Measure the change in the depth of the water.
- B. Fill a beaker with water. Slowly drop sand, gravel, and dead plant material into the beaker. Measure the change in the depth of the water.
- C. Fill a plastic box with water. Put a hose in the water on one end of the box and turn the water on to a slow flow. Measure the depth of the water when the box is full.
- D. Fill a plastic box with sand, gravel, and dead plant material. Put a hose in the middle of the box and turn the water on to a slow flow. Measure the depth of the water when the box is full.

Correct Answer: B

Explanation of Correct Answer: The correct answer is choice (B) Fill a beaker with water. Slowly drop sand, gravel, and dead plant material into the beaker. Measure the change in the depth of the water. Choice (A) is incorrect because there are no sediments being added to the water; the change in water level is due to evaporation. Choice (C) is incorrect because this would demonstrate increased water from runoff, not deposition. Choice (D) is incorrect because this would demonstrate increased rainfall and erosion as the sediments are redistributed by the water flow.

Example Item 3

Selected-Response

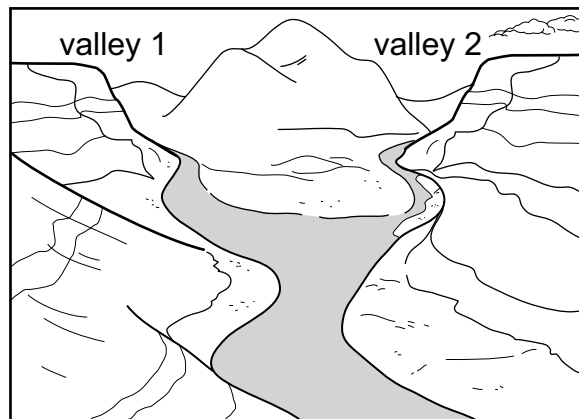
DOK Level 3: This is a DOK level 3 item because the question requires the student to make choices based on a reasoned argument.

Science Grade 5 Content Domain: Earth and Space Science

Standard: S5E1. Obtain, evaluate, and communicate information to identify surface features on the Earth caused by constructive and/or destructive processes.

- a. Construct an argument supported by scientific evidence to identify surface features (examples could include deltas, sand dunes, mountains, volcanoes) as being caused by constructive and/or destructive processes (examples could include deposition, weathering, erosion, and impact of organisms).

The picture shows two steep valleys and two rivers that join together and become one larger river in a wider valley.



A student claims that both valleys have been formed by the same process over a long period of time.

Which argument BEST explains why the student's claim is correct or incorrect?

- A. The student's claim is correct; the evidence in the picture shows that both valleys were formed by the constructive force of deposition because flowing water carries large rocks from far away and drops them along a river, making the banks taller.
- B. The student's claim is correct; the evidence in the picture shows that both valleys were formed by the destructive forces of weathering and erosion because flowing water breaks down rock and carries the small pieces downstream.
- C. The student's claim is not correct; the evidence in the picture shows that valley 1 was formed by the destructive forces of weathering and erosion because flowing water breaks down rock and carries the small pieces downstream, but valley 2 was formed by the constructive force of deposition because flowing water carries large rocks from far away and drops them along a river, making the banks taller.
- D. The student's claim is not correct; the evidence in the picture shows that valley 1 was formed by the constructive force of deposition because flowing water carries large rocks from far away and drops them along a river, making the banks taller, but valley 2 was formed by the destructive forces of weathering and erosion because flowing water breaks down rock and carries the small pieces downstream.

Example Item 3. *Continued.***Correct Answer:** B

Explanation of Correct Answer: The correct answer is choice (B) The student's claim is correct; the evidence in the picture shows that both valleys were formed by the destructive forces of weathering and erosion because flowing water breaks down rock and carries the small pieces downstream. Choice (A) is incorrect because water depositing rocks in the river did not form the valleys. Choice (C) is incorrect because the student's claim is correct, and the same evidence of weathering and erosion is found in both valleys. Choice (D) is incorrect because the student's claim is correct, and the same evidence of weathering and erosion is found in both valleys.

CONTENT DESCRIPTION AND ADDITIONAL SAMPLE ITEMS

In this section, you will find information about what to study in order to prepare for the Grade 5 Science EOG assessment. This includes main ideas and important concepts. This section also contains practice questions with an explanation of the correct answers that you can use to prepare for the test.

All example and sample items contained in this guide are the property of the Georgia Department of Education.

Content Description

- Compare and contrast the parts of plant and animal cells.
- Investigate and explain how microorganisms can benefit or harm larger organisms.
- Develop classification models for organisms.
- Compare and contrast inherited characteristics and acquired characteristics.
- Investigate different types of electricity, circuits, and the flow of electricity through common materials.
- Investigate and explain the relationship between magnetism and electricity.
- Investigate and explain the differences between physical and chemical changes.
- Investigate and identify how constructive or destructive processes form surface features on Earth.

Cells and Microorganisms

In this section, you will study life science. You will explain how magnifiers such as microscopes or hand lenses are used to observe cells and their structures. You will recognize and determine the functions of plant and/or animal cell structures (e.g., cell membrane, cell wall, cytoplasm, nucleus, chloroplasts). You will identify beneficial microorganisms and explain why they are beneficial, and you will identify harmful microorganisms and explain why they are harmful.

KEY CONCEPTS

Very small objects and parts of objects can be seen by **magnifying** them so they appear larger. Magnification can also make it easier to see small details of an object. (S5L3a)

Microscopes and **hand lenses** are used to magnify objects. Some objects are too small to be seen without magnification. (S5L3a)

Cells are the smallest unit of life and make up all living things. Cell structures perform basic life functions for the cell, such as making energy, growing, repairing, and getting rid of waste. Cells can look different and perform different roles in an organism. (S5L3b)

Cells are made up of many different parts. This table shows where you will find some cell **structures**. (S5L3b, c)

| | Animal Cell | Plant Cell |
|----------------------|-------------|------------|
| Cell Wall | no | yes |
| Cell Membrane | yes | yes |
| Cytoplasm | yes | yes |
| Nucleus | yes | yes |
| Chloroplast | no | yes |

Microorganisms are living things that are too small to be seen without magnification. Some microorganisms are **beneficial** to people and the environment. Other microorganisms can be **harmful** and cause disease. (S5L4a, b)

Bacteria are single-celled microorganisms that can live in almost every environment and grow and reproduce on their own. Many types of bacteria are beneficial, like the ones that make cheese or break down chemicals and waste. Many other bacteria are harmful, like the ones that cause illness or spoil food. (S5L4a, b)

Viruses are even smaller than bacteria and cannot reproduce or grow unless they infect another organism. The virus uses the organism's cells to reproduce by making copies of itself, eventually making the host organism sick. (S5L4b)

SAMPLE ITEMS

Item 1

Selected-Response

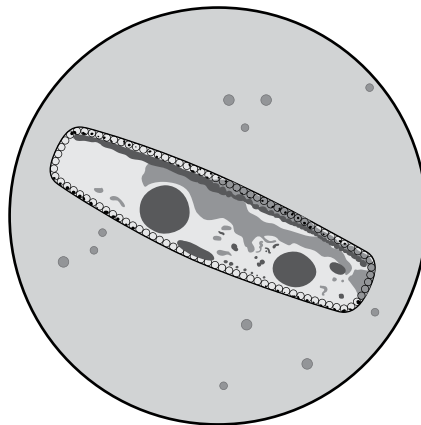
A student collects a sample of pond water in a jar to observe the microscopic algae that live in the water. The student then places a drop of the pond water on a microscope slide and observes it under a microscope. The drawings show what the student observed in the jar and on the slide.

Pond Water Observations



in jar

- cloudy water
- no visible algae in water



on slide

- sediments floating in water
- algae swimming in water

Which claim is supported by evidence in the drawings?

- The student observed microscopic algae only on the slide because algae grow larger when placed on a microscope slide.
- The student observed microscopic algae only on the slide because all of the algae cells were removed from the pond water on the microscope slide.
- The student observed microscopic algae only on the slide because algae cells are too small to be seen without magnification by a microscope.
- The student observed microscopic algae only on the slide because the water in the jar was too cloudy to see the algae.

Item 2**Selected-Response**

A student observed a label found on raw chicken meat sold at the grocery store.

Warning:
Cook thoroughly to kill bacteria.

Which argument should the student use to support a claim that some bacteria are harmful to humans?

- A. Some bacteria can harm humans because bacteria reproduce faster when they are cooked at high temperatures.
- B. Some bacteria can harm humans because bacteria become toxic when cooked at high temperatures.
- C. Some bacteria can harm humans because bacteria make food taste bad when it is not cooked properly.
- D. Some bacteria can harm humans because bacteria can cause food poisoning when contaminated food is not cooked properly.

Item 3**Selected-Response**

After a person takes an antibiotic to fight a bacterial infection in the body, some doctors recommend taking a pill called a probiotic every day. The list shows some facts about probiotics.

Facts about Probiotics

- They are made of living microorganisms.
- They improve food digestion and absorption of nutrients.
- They increase the body's ability to fight infections.
- They increase the number and types of normal bacteria in the gut.

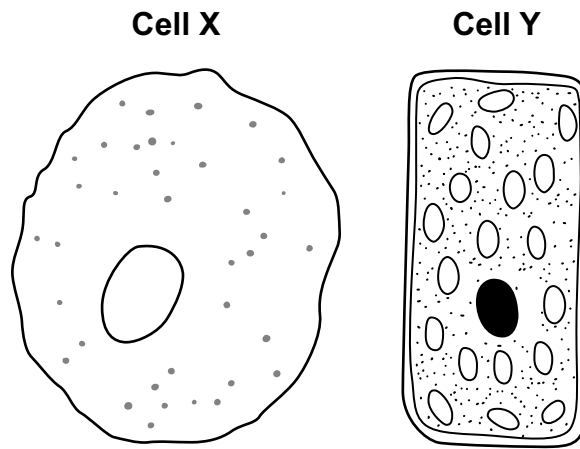
Which argument **BEST** supports the claim that humans benefit from taking probiotics?

- A. Humans benefit from probiotics because probiotics prevent people from getting sick.
- B. Humans benefit from probiotics because probiotics are made of living microorganisms.
- C. Humans benefit from probiotics because probiotics can be taken every day after having an infection.
- D. Humans benefit from probiotics because probiotics balance the number and types of bacteria that live in the gut.

Item 4

Multi-Part Technology-Enhanced

The pictures show the structure of two cells.



Part A

Which sentence explains why the shape and structure of the two cells are different?

- A. Cell X is shaped like a circle because it is an animal cell, which means it does not have a cell wall, and cell Y is shaped like a rectangle because it is a plant cell, which means it has a cell wall.
- B. Cell X is shaped like a circle because it is a plant cell, which means it does not have a cell wall, and cell Y is shaped like a rectangle because it is an animal cell, which means it has a cell wall.
- C. Cell X is shaped like a circle because it is an animal cell, which means it has a cell membrane, and cell Y is shaped like a rectangle because it is a plant cell, which means it does not have a cell membrane.
- D. Cell X is shaped like a circle because it is a plant cell, which means it has a cell membrane, and cell Y is shaped like a rectangle because it is an animal cell, which means it does not have a cell membrane.

Part B

Which sentence describes how the differences between a plant cell and an animal cell can be determined by looking at the parts inside the cell?

- A. Plant cells have a nucleus, but animal cells do not.
- B. Plant cells have chloroplasts, but animal cells do not.
- C. Plant cells do not have a nucleus, but animal cells do.
- D. Plant cells do not have chloroplasts, but animal cells do.

SAMPLE ITEM KEYS

| Item | Standard/ Element | DOK Level | Correct Answer | Explanation |
|------|----------------------|--------------|-------------------|---|
| 1 | S5L3a | 2 | C | The correct answer is choice (C) The student observed microscopic algae only on the slide because algae cells are too small to be seen without magnification by a microscope. Choice (A) is incorrect because the algae do not change size. Choice (B) is incorrect because the algae and water are both on the slide. Choice (D) is incorrect because even if the water were clear, the algae would be too small to see in the jar. |
| 2 | S5L4b | 2 | D | The correct answer is choice (D) Some bacteria can harm humans because bacteria can cause food poisoning when contaminated food is not cooked properly. Choice (A) is incorrect because bacteria die when they are cooked. Choice (B) is incorrect because cooking bacteria kills them. Choice (C) is incorrect because bad taste is not harmful. |
| 3 | S5L4a | 2 | D | The correct answer is choice (D) Humans benefit from probiotics because probiotics balance the number and types of bacteria that live in the digestive system. Choice (A) is incorrect because while probiotics reduce the chance of illness, they do not prevent illness. Choice (B) is incorrect because live microorganisms are not always a benefit. Choice (C) is incorrect because taking something every day does not make it a benefit. |
| 4 | S5L3c | 3 | A, B | <p>Part A: The correct answer is choice (A) Cell X is shaped like a circle because it is an animal cell, which means it does not have a cell wall, and cell Y is shaped like a rectangle because it is a plant cell, which means it has a cell wall. Choice (B) is incorrect because cell X is an animal cell without a cell wall and cell Y is a plant cell with a cell wall. Choices (C) and (D) are incorrect because both cells have a cell membrane.</p> <p>Part B: The correct answer is choice (B) Plant cells have chloroplasts, but animal cells do not. Choices (A) and (C) are incorrect because both cells have a nucleus. Choice (D) is incorrect because plant cells have chloroplasts and animal cells do not have chloroplasts.</p> |

Classification

In this life science section, you will learn how plants and animals are sorted into groups (e.g., fish, amphibian, reptile, bird, mammal) and how to classify organisms. You will classify things based on their characteristics by looking for similarities and differences. You will study vertebrates and invertebrates as well as producers, consumers, and decomposers.

KEY CONCEPTS

You **classify** things when you organize them into **groups** based on **characteristics** they share. Scientists classify things so that they can study ways those things are similar or different. A classification system can be used to identify and study species. (S5L1a)

Scientists use similarities, or things that the organisms have in common, to help them classify organisms into different groups. (S5L1a, b)

Sometimes scientists learn more things about a particular organism, and that new information makes them modify or change the way that the organism is classified. (S5L1a, b)


Animals are classified into animals with backbones, known as **vertebrates**, and animals without backbones, known as **invertebrates**. Vertebrates have a backbone, or spine, that runs the length of their body, and they are sorted into five groups: **fish, amphibian, reptile, bird, and mammal**. Bass, tree frogs, alligators, brown thrashers, and deer are examples of vertebrates. (S5L1a)

Animals without backbones are known as **invertebrates**. They include insects, spiders, and crabs. (S5L1a)

Plants are organisms that make their own food. They can be classified by the way in which they transport materials within the organism. They can also be classified by the way in which they reproduce. (S5L1b)

Some plants use **seeds** to reproduce, while others do not. Some plants make their seeds in flowers, while other plants do not. Ferns are classified as plants that do not make seeds. Pine trees are classified as plants that make seeds without using flowers. Apple trees and roses are examples of plants that make seeds by using flowers. (S5L1b)

Important Tip

 The ways scientists have classified organisms have changed over the years. In the earliest systems, organisms were either a plant or an animal. Over the years, scientists have learned to base their classification on similar body structures rather than on functions. For example, dolphins and sharks both live in the water, swim, and are gray. However, dolphins are mammals and have lungs, and sharks are fish and have gills. This has led scientists to classify organisms based on similar genetic backgrounds that have resulted in similar body structures. When you work on classifying organisms, keep in mind that you should look for similar traits and that new information may require you to modify your classification system. (S5L1a, b)

SAMPLE ITEMS

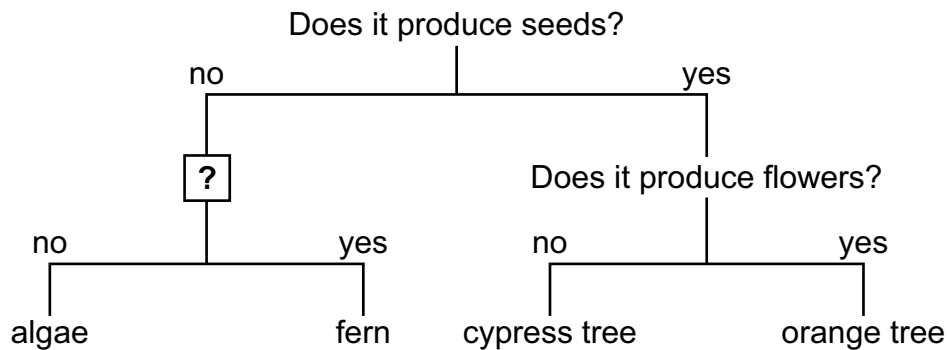
Item 5

Selected-Response

A student makes a model to sort plants using the information in the table.

| Plant | Characteristics |
|--------------|---|
| algae | <ul style="list-style-type: none"> • does not produce seeds • has no roots, stems, or leaves |
| fern | <ul style="list-style-type: none"> • does not produce seeds • has roots, stems, and leaves |
| cypress tree | <ul style="list-style-type: none"> • produces seeds from cones • has roots, stems, and leaves |
| orange tree | <ul style="list-style-type: none"> • produces seeds from flowers • has roots, stems, and leaves |

The student's model is not complete.



Which question should the student put in the box with a question mark to correctly complete the model?

- Does it produce cones?
- Does it grow into a tree?
- Does it produce flowers?
- Does it have roots, stems, or leaves?

Item 6

Drag-and-Drop Technology-Enhanced

A student uses a table showing characteristics of different animals to create a classification model.

Animal Classification Facts

| Animal | Characteristics |
|--------|---|
| eagle | <ul style="list-style-type: none"> is a warm-blooded vertebrate has wings and feathers, lives on land |
| shark | <ul style="list-style-type: none"> is a cold-blooded vertebrate has gills and fins, lives in water |
| beetle | <ul style="list-style-type: none"> is a cold-blooded invertebrate has wings and six legs, lives on land |
| cougar | <ul style="list-style-type: none"> is a warm-blooded vertebrate has hair and four legs, lives on land |
| snake | <ul style="list-style-type: none"> is a cold-blooded vertebrate has scales and no legs, lives on land |

Using the information in the table, move a set of steps for 2a and 2b into the box to BEST complete the classification model.

Classification Model

1a has a backbone.....go to 2

1b does not have a backbone..... Insect

.....go to 3

.....go to 4

3a has feathers.....Bird

3b has hair..... Mammal

4a lives in water.....Fish


4b lives on land..... Reptile

2a has gills
2b has scales

2a is warm blooded
2b is cold blooded

2a has wings
2b does not have wings

2a has six legs
2b does not have six legs

 Use a mouse, touchpad, or touchscreen to move the correct set of steps below the model into the box in the model.

Item 7

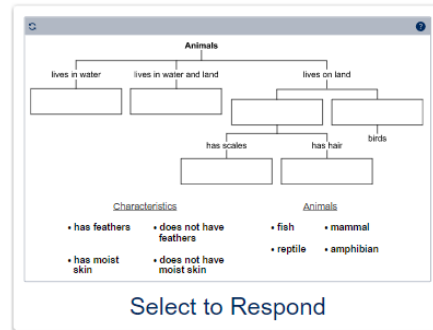
Drag-and-Drop Technology-Enhanced


A student is investigating animals and their characteristics. The student uses the information in the table.

| Characteristics of Animals | |
|----------------------------|---|
| Animal | Characteristics |
| Amphibian | <ul style="list-style-type: none"> lives in and out of water has moist skin |
| Bird | <ul style="list-style-type: none"> has feathers lives on land |
| Fish | <ul style="list-style-type: none"> has scales lives in water |
| Mammal | <ul style="list-style-type: none"> has hair lives on land |
| Reptile | <ul style="list-style-type: none"> has scales lives on land |

A student makes a model to sort some animals by their characteristics.

Move characteristics and types of animals into boxes to BEST complete the student's model. Not all characteristics need to be used.



 Due to the size of the response area, this item has a “Select to Respond” button on the screen. Clicking this button will bring up the response area at full size.

Go on to the next page to finish item 7.

Item 7. *Continued.*

↻
?

Animals

```

graph TD
    A[Animals] --> B[lives in water]
    A --> C[lives in water and land]
    A --> D[lives on land]
    B --> B1[ ]
    C --> C1[ ]
    D --> E[ ]
    D --> F[ ]
    E --> G[ ]
    F --> H[ ]
    H --> I[has scales]
    H --> J[has hair]
    I --> I1[ ]
    J --> J1[ ]
    F --> K[birds]
            
```

Characteristics

- has feathers
- has moist skin

Animals

- does not have feathers
- does not have moist skin

Animals

- fish
- reptile

Animals

- mammal
- amphibian

➡ Use a mouse, touchpad, or touchscreen to move the words or phrases below the model into the boxes. Each word or phrase can be used once. Some words or phrases will not be used.

SAMPLE ITEM KEYS

| Item | Standard/ Element | DOK Level | Correct Answer | Explanation |
|------|----------------------|--------------|-------------------|---|
| 5 | S5L1b | 2 | D | The correct answer is choice (D) Does it have roots, stems, or leaves? Choice (A) is incorrect because neither algae nor ferns produce seeds. Choice (B) is incorrect because neither algae nor ferns grow into trees. Choice (C) is incorrect because neither algae nor ferns produce flowers. |
| 6 | S5L1a | 3 | N/A | See scoring rubric and exemplar response on page 20. |
| 7 | S5L1a | 3 | N/A | See scoring rubric and exemplar response on page 21. |

EXAMPLE SCORING RUBRICS AND EXEMPLAR RESPONSES

Item 6

Scoring Rubric

| Points | Description |
|--------|---|
| 1 | The student correctly fills in the box. |
| 0 | The student does not correctly fill in the box. |

Exemplar Response

The correct response is shown below.

↶
?

Classification Model

1a has a backbone.....go to 2

1b does not have a backbone..... Insect

2a is warm blooded

2b is cold blooded

.....go to 3

.....go to 4

3a has feathers..... Bird

3b has hair..... Mammal

4a lives in water..... Fish

4b lives on land..... Reptile

2a has gills

2b has scales

2a has wings

2b does not have wings

2a has six legs

2b does not have six legs

This is the correct choice because the animals at step 3 are warm blooded and the animals in step 4 are cold blooded.

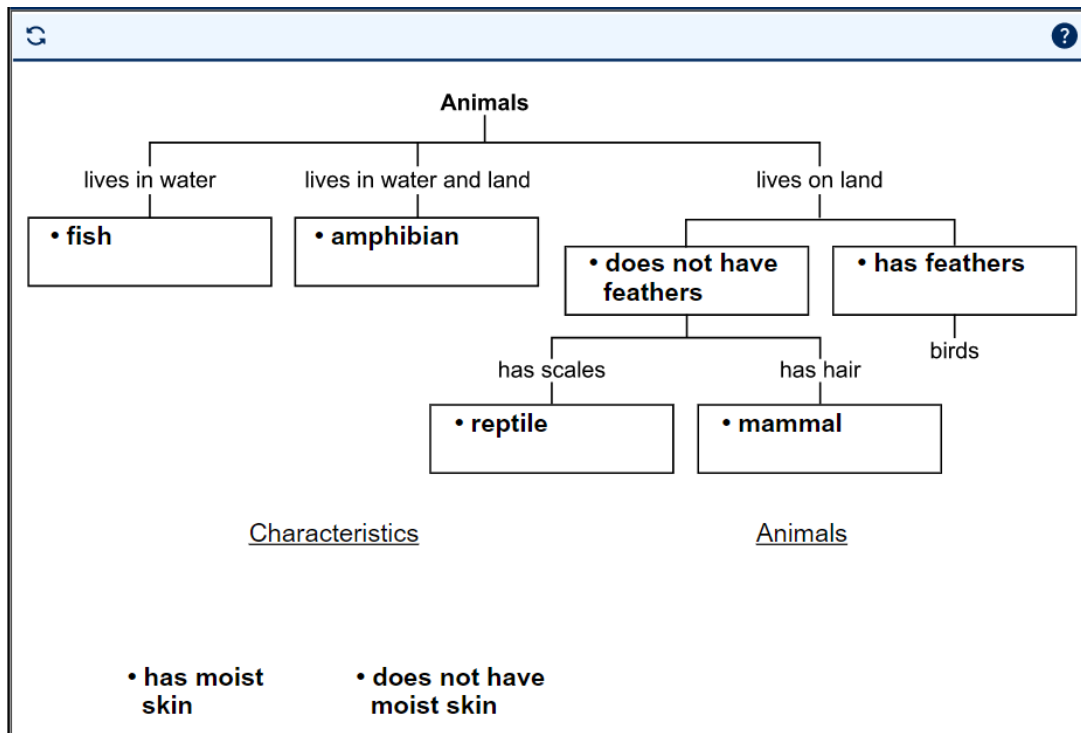
Item 7

Scoring Rubric

| Points | Description |
|--------|--|
| 2 | The student correctly fills in all six boxes. |
| 1 | The student correctly fills in any three boxes, OR correctly fills in “does not have feathers” AND either “mammal” or “reptile.” |
| 0 | The student gives a response that does not meet the criteria to receive 1 or 2 points. |

Exemplar Response

The correct response is shown below.



Because the purpose of the chart is to explain how animals are sorted into groups, the bottom row of each branch should be an animal name, and this is confirmed by the rightmost branch ending in “birds.”

The student can place the animal names in the boxes based on their characteristics and then decide which set of sorting characteristics is the most important to fill in after the “lives on land” branch. “Has moist skin” applies to amphibians, which live on both water and land, so the sorting characteristics “has moist skin” and “does not have moist skin” do not fit into this branch. Therefore, the sorting characteristics must be “has feathers” and “does not have feathers.” “Has feathers” helps sort birds from the other types of land animals, and “does not have feathers” applies to the other types of animals that live on land.

Acquired and Inherited Characteristics

In this life science section, you will learn about the characteristics of learned behaviors and inherited traits.

KEY CONCEPTS

The physical characteristics that are used to describe an organism can also be called traits. Some traits are unique to individual organisms, and some traits are common because they are shared by many individuals. Being right-handed is a common physical trait because most people are right-handed.

Physical traits can be divided into two main types: inherited and acquired. **Inherited traits** are passed from parent(s) to offspring. Fur color and beak shape are examples of inherited traits that are passed down from parents to offspring. **Acquired traits** are developed after the organism is born and are not passed to offspring by parents. Having a scar or being a fast runner are examples of acquired traits. (S5L2b)

In addition to physical traits, organisms can also be described by their learned and instinctive behaviors. Organisms interact with their environment, including other organisms, from the time they are born. Some interactions, like babies crying for food or being quiet in the nest when parents are away, are called **instincts** because the organism knows how to behave without being taught. By contrast, **learned behaviors** like where to find food or how to raise offspring are taught to an organism, or discovered through interactions with the environment. Being able to tie shoelaces is an example of a learned behavior. (S5L2a)

SAMPLE ITEMS

Item 8

Selected-Response

Two students listed some traits of their favorite football player.

Traits of a Football Player

- is the youngest of four children
- has brown hair and brown eyes
- is taller than the other teammates
- is good at throwing and catching a football

Which question would help the student determine which trait on the list is an acquired physical trait of the football player?

- A. How tall is the football player?
- B. Does the football player have any siblings?
- C. Why does the football player have brown eyes and hair?
- D. Has the football player always been good at catching a football?

Item 9

Selected-Response

Bottlenose dolphins live off the coast of Georgia. The list shows some characteristics of bottlenose dolphins.

Characteristics of Bottlenose Dolphins

- have 86 to 100 sharp teeth
- are light gray to almost black in color
- can be eaten by sharks and killer whales
- live in groups of females and groups of males

Which question can be asked to find out which characteristic of bottlenose dolphins is an instinct?

- A. Why do bottlenose dolphins live in groups?
- B. Why do sharks and killer whales hunt bottlenose dolphins?
- C. How many teeth do bottlenose dolphins have when they are born?
- D. How does the color of bottlenose dolphins help them hide from predators?

Item 10

Selected-Response

The eastern box turtle lives in Georgia. The list shows some characteristics of an eastern box turtle.

Characteristics of an Eastern Box Turtle

- can live 50 years or more
- will hide in its shell when frightened
- has a dark shell with many yellow or orange spots
- eats mushrooms, berries, fruits, worms, and insects

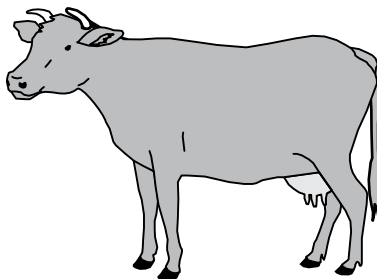
Which question can be asked to find out which characteristic is a learned behavior?

- A. Do all eastern box turtles like the same food?
- B. Do eastern box turtles in other states live for 50 years?
- C. Do eastern box turtles in other states have the same color of spots?
- D. Do all eastern box turtles hide in their shells when they are frightened?

Item 11

Selected-Response

The picture shows a cow.



Which question can be asked to learn about the inherited physical traits of the cow?

- A. How old is the cow?
- B. Has the cow been fed today?
- C. Is the cow tame enough to pet?
- D. Why does the cow have brown fur?

SAMPLE ITEM KEYS

| Item | Standard/ Element | DOK Level | Correct Answer | Explanation |
|------|----------------------|--------------|-------------------|--|
| 8 | S5L2b | 2 | D | The correct answer is choice (D) Has the football player always been good at catching a football? Choice (A) is incorrect because body height is an inherited trait. Choice (B) is incorrect because having siblings is not a physical trait of an individual. Choice (C) is incorrect because this is an inherited trait from parents, not an acquired trait. |
| 9 | S5L2a | 2 | A | The correct answer is choice (A) Why do bottlenose dolphins live in groups? Choice (B) is incorrect because this is an instinct of sharks and killer whales, not dolphins. Choices (C) and (D) are incorrect because physical characteristics are not instincts. |
| 10 | S5L2a | 2 | A | The correct answer is choice (A) Do all eastern box turtles like the same food? Choice (B) is incorrect because length of lifespan is not a learned behavior. Choice (C) is incorrect because physical characteristics are not learned behaviors. Choice (D) is incorrect because this is an instinctive behavior. |
| 11 | S5L2b | 2 | D | The correct answer is choice (D) Why does the cow have brown fur? Choice (A) is incorrect because age is not an inherited physical trait. Choice (B) is incorrect because feeding is not a physical trait. Choice (C) is incorrect because behavior is not an inherited physical trait. |

Electricity/Magnetism

In this section on physical science, you will learn to carry out investigations to become familiar with the characteristics of magnetic forces and static electricity. You will understand that an object that has been electrically charged pulls on uncharged objects and may either push or pull other charged objects without touching the uncharged or charged objects. You will gain an understanding of the relationship between magnetism and electricity. You will also learn about the conditions necessary for electricity to flow through an electric circuit.

KEY CONCEPTS

Electricity is the effect of the apparent flow of electrons through a conductor. People also refer to electricity when they talk about using electrical energy to power their homes, cars, and other things. (S5P2c)

Electric current is the flow of an electric charge through a conductor. When electric currents move through a conductor, they result in heat and magnetic fields. Lightning, the discharge of static electricity, and the movement of electricity in power lines are examples of electric currents. (S5P2a, c)

Static electricity is the buildup of an electrical charge in or on the surface of an object. When two objects, like a balloon and a piece of cloth, are rubbed together, some of the electrons from one object stick to the other object. This causes the buildup of a charge on one of the objects. When a second object is brought near the first object, the buildup of the electrical charge can jump across to that second object. When the electrical charge jumps from one object to another, it is said to have discharged. This is the spark you see. (S5P2a)

Electric force is the force of attraction between two electrically charged objects or a charged object and a neutral object. When you use a balloon to pick up pieces of paper, the electric force between the balloon and pieces of paper is great enough to pick up the pieces of paper. Objects cling to each other when there is enough electric force. (S5P2a)


To make an **electric circuit**, you need at least a **power source** and a path for the electric current to flow through, and a component to consume power such as a light bulb or an electric motor. You can add objects, such as light bulbs, along the path. You can also add a **switch** to start and stop the flow of an electric current through the circuit. (S5P2b)

Conductors are any type of object through which an electric current can flow. Metal wire is the most common conductor. Conductors are used in electric circuits. **Insulators** are any type of object through which an electric current cannot flow. Glass, plastic, and rubber are very common insulating materials. Insulators are used to protect people from electric currents. (S5P2c)

Magnetism is produced when **magnetic fields** are generated. Magnetism is a property of certain types of materials that allows them to attract or repel other objects that have this property. Magnetism is generated by the presence of magnetic fields or by the presence of an electric current. (S5P3a, b)

An **electromagnet** is created when an electric current flows through a wire. In general, the wire in an electromagnet is wrapped around a core made of a magnetic metal, such as iron or steel. A magnetic field is created around the wire, turning the core into a temporary magnet. When the electric current is turned off, the magnetic field quickly fades. You can make an electromagnet using a circuit with a battery, switch, and wire wrapped around a nail. (S5P3a)

Important Tip

 Electricity and magnetism are connected to each other. Electricity can produce magnetism. When an electric current flows through a wire, the current creates a very small magnetic field. The field is so small it can barely be measured. If you take a wire and create a bunch of loops around the wire, the current will generate a bigger magnetic field. If you wrap the wire around a magnetic metal core, the magnetic field generated from the wire will create a much stronger magnetic field. Magnetism can also create electricity. If you take the loops of wire and move a magnet by the wire, the magnetic field of the magnet will push the electrons in the wire around, creating an electric current. If you were to pass the magnet by the wire loops many times very, very quickly, you would create a stronger electric current. (S5P3a)

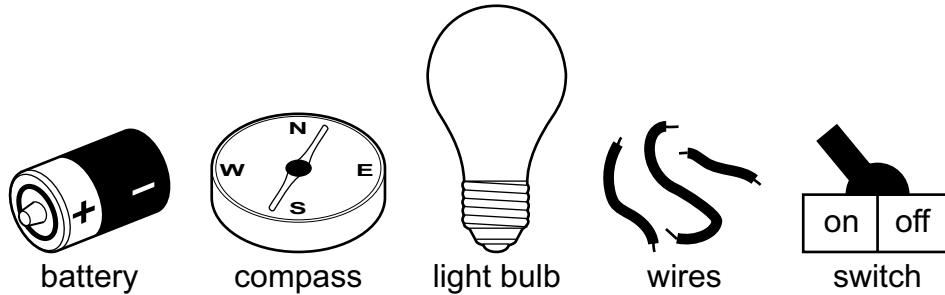
SAMPLE ITEMS

Item 12

Selected-Response

A student is investigating circuits. The student has the materials shown.

Materials Available



The student uses only three of the materials available to build a complete circuit that conducts electricity.

Go on to the next page to finish item 12.

Item 12. *Continued.*

Which table shows the materials used by the student and correctly explains why each material is needed to make the circuit work?

A.

| Material Used | Why It Is Necessary |
|---------------|---------------------------------------|
| battery | to provide energy to the circuit |
| wire | to connect parts of the circuit |
| switch | to conduct electricity in the circuit |

B.

| Material Used | Why It Is Necessary |
|---------------|---|
| battery | to provide energy to the circuit |
| light bulb | to show that the circuit conducts electricity |
| wire | to connect parts of the circuit and conduct electricity |

C.

| Material Used | Why It Is Necessary |
|---------------|---|
| compass | to show that the circuit conducts electricity |
| light bulb | to provide energy to the circuit |
| wire | to connect parts of the circuit and conduct electricity |

D.

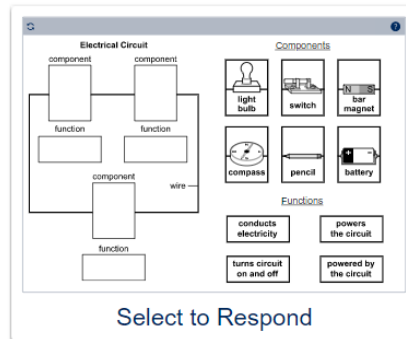
| Material Used | Why It Is Necessary |
|---------------|---|
| compass | to provide energy to the circuit |
| wire | to connect parts of the circuit |
| switch | to show that the circuit conducts electricity |

Item 13

Drag-and-Drop Technology-Enhanced

The diagram shows a circuit with missing components.

Move a component into each “component” box in the diagram to complete the electrical circuit. Then, move the matching function into the box below each component.



- ➡ Due to the size of the response area, this item has a “Select to Respond” button on the screen. Clicking this button will bring up the response area at full size.

Go on to the next page to finish item 13.

Item 13. *Continued.*

↺
?

Electrical Circuit

Components

| | | |
|----------------|------------|----------------|
| light bulb | switch | bar magnet |
| compass | pencil | battery |

Functions

| | |
|--------------------------|------------------------|
| conducts electricity | powers the circuit |
| turns circuit on and off | powered by the circuit |

➡ Use a mouse, touchpad, or touchscreen to move the components and functions next to the circuit diagram into the boxes in the diagram. Each component or function can be used once. Some components and functions will not be used.

Item 14

Selected-Response

A student is investigating whether certain materials are conductors or insulators. The student puts each material to be tested into a circuit to see whether a light bulb will light. The observations from the investigation are shown in the table.

Observations from Material Testing

| Material | Does the Light Bulb Light? |
|-----------------|-----------------------------------|
| glass | no |
| plastic | no |
| rubber | no |
| steel | yes |

Which Investigation Results table correctly explains the observations from the student's investigation?

Go on to the next page to finish item 14.

Item 14. *Continued.***Investigation Results**

A.

| Does the Bulb Light? | Is Electricity Flowing? | Conductor or Insulator? |
|----------------------|-------------------------|-------------------------|
| yes | yes | conductor |
| no | no | insulator |

Investigation Results

B.

| Does the Bulb Light? | Is Electricity Flowing? | Conductor or Insulator? |
|----------------------|-------------------------|-------------------------|
| yes | no | conductor |
| no | yes | insulator |

Investigation Results

C.

| Does the Bulb Light? | Is Electricity Flowing? | Conductor or Insulator? |
|----------------------|-------------------------|-------------------------|
| yes | yes | insulator |
| no | no | conductor |

Investigation Results

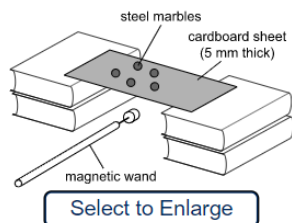
D.

| Does the Bulb Light? | Is Electricity Flowing? | Conductor or Insulator? |
|----------------------|-------------------------|-------------------------|
| yes | no | insulator |
| no | yes | conductor |

Item 15

Drop-Down Technology-Enhanced

A student creates the setup and procedure shown below to investigate the interaction between a magnetic wand and steel marbles through a piece of cardboard that is 5 millimeters (mm) thick. A magnetic wand is a wooden stick with a small magnet attached to the end.



The student has additional materials available to use during the investigation.

- cardboard sheet (10 mm thick)
- iron sheet (5 mm thick)

The student uses the following step to get started.

step 1: Slowly move the magnetic wand to different locations under the cardboard to see whether the marbles move with the wand.

Use the drop-down menus to describe which procedure would BEST demonstrate whether different materials affect the magnetic field of a magnetic wand and to predict the result the student should expect.

step 2: Replace the 5 mm thick cardboard sheet with the and repeat step 1. The marbles follow the magnetic wand because the magnetic field .

- ➡ Use a mouse, touchpad, or touchscreen to click the arrow beside each of the three blank boxes. When you click the arrow, a drop-down menu will appear showing you all the possible options for that blank. Each drop-down menu with its options is shown on the next page.

Go on to the next page to finish item 15.

Item 15. Continued.

step 2: Replace the 5 mm thick cardboard sheet with the and repeat step 1. The magnetic wand because the .

 5 mm thick iron sheet
 10 mm thick cardboard sheet

step 2: Replace the 5 mm thick cardboard sheet with the and repeat step 1. The marbles follow the magnetic wand because the magnetic .

 will
 will not

step 2: Replace the 5 mm thick cardboard sheet with the and repeat step 1. The marbles follow the magnetic wand because the magnetic field .

 will pass through all materials
 will be blocked by magnetic materials

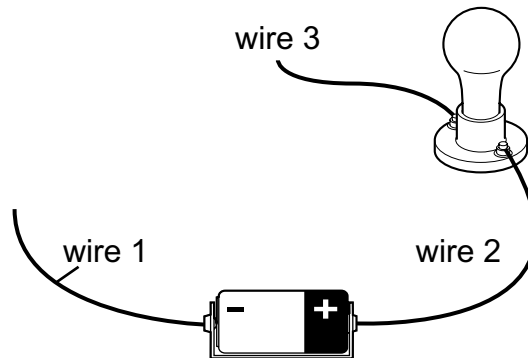
Item 16

Selected-Response

A student wants to test some materials to find out whether they conduct electricity or insulate electricity. The student uses the following steps to get started.

step 1: Attach wire 1 to the negative end of a battery.
step 2: Attach wire 2 to the positive end of the battery.
step 3: Attach the open end of wire 2 to a light bulb.
step 4: Attach wire 3 to the light bulb.
step 5: ?
step 6: ?

The diagram shows the result of steps 1 through 4.



The student has a variety of materials to test. Which steps would **BEST** complete the procedure and which conclusion should the student make?

- A. **step 5:** Connect a test material to the open ends of wire 1 and wire 3.
step 6: Make observations, and repeat step 5 with a different test material.
conclusion: If the bulb lights up, the material is a conductor. If the bulb does not light up, the material is an insulator.
- B. **step 5:** Connect a test material to the open ends of wire 1 and wire 3.
step 6: Make observations, and repeat step 5 with a different test material.
conclusion: If the bulb lights up, the material is an insulator. If the bulb does not light up, the material is a conductor.
- C. **step 5:** Connect the open ends of wire 1 and wire 3 to each other to complete the circuit.
step 6: Touch a test material to the completed circuit, and record observations.
conclusion: If the bulb lights up, the material is an insulator. If the bulb does not light up, the material is a conductor.
- D. **step 5:** Connect the open ends of wire 1 and wire 3 to each other to complete the circuit.
step 6: Touch a test material to the completed circuit, and record observations.
conclusion: If the bulb lights up, the material is a conductor. If the bulb does not light up, the material is an insulator.

Item 17**Multi-Select Technology-Enhanced**

A student is comparing two types of magnets. The student asks five questions and then finds the answers to the questions by experimenting with the magnets. The results are shown in the table.

Student Results

| Question | Magnet 1 | Magnet 2 |
|---|----------|----------|
| Can it be turned on and off? | yes | no |
| Does it require an energy source? | yes | no |
| Can its strength be changed? | yes | no |
| Does it attract iron and steel objects? | yes | yes |
| Can it lift 50 paper clips? | no | yes |

Based on the evidence, which TWO arguments correctly match a magnet to its best use?

- A. Magnet 1 should be used to pick up many small magnetic objects at once because the temporary magnet can pick up as many objects as the permanent magnet can.
- B. Magnet 1 should be used to pick up magnetic objects in one location and drop them off in another location because temporary magnets can be turned on and off.
- C. Magnet 1 can be used in all the ways magnet 2 is used because temporary magnets can be made stronger or weaker and permanent magnets cannot.
- D. Magnet 2 should be used to pick up magnetic objects in places where there is no power supply because permanent magnets do not run out of energy.
- E. Magnet 2 should be used to pick up large magnetic objects because permanent magnets are stronger than temporary magnets.
- F. Magnet 2 can be used in all the ways magnet 1 is used because permanent and temporary magnets can both pick up the same magnetic objects.

Item 18

Drag-and-Drop Multi-Part Technology-Enhanced

Part A

A student is investigating whether the magnetic field of magnets is affected by different materials.

Part A

Move a statement into each blank space in the table to show the CORRECT order of steps for the investigation.

| Procedure | |
|-----------|--|
| step 1 | Place 10 iron thumbtacks close together on a table. |
| step 2 | |
| step 3 | Tie a string around the magnet. |
| step 4 | |
| step 5 | |
| step 6 | Repeat steps 1-5 using cotton fabric, notebook paper, and aluminum foil. |

Wrap a piece of clear plastic wrap around the magnet and hold it in place with a rubber band.

Count the number of iron thumbtacks attracted by the magnet and record the data.

Slowly lower the magnet toward the thumbtacks until they start being picked up by the magnet.

Select to Respond

- ➡ Due to the size of the response area, this item has a “Select to Respond” button on the screen. Clicking this button will bring up the response area at full size.

Go on to the next page to finish item 18.


Item 18. *Continued.*

| Procedure | |
|------------------|--|
| step 1 | Place 10 iron thumbtacks close together on a table. |
| step 2 | |
| step 3 | Tie a string around the magnet. |
| step 4 | |
| step 5 | |
| step 6 | Repeat steps 1–5 using cotton fabric, notebook paper, and aluminum foil. |

Wrap a piece of clear plastic wrap around the magnet and hold it in place with a rubber band.

Count the number of iron thumbtacks attracted by the magnet and record the data.

Slowly lower the magnet toward the thumbtacks until they start being picked up by the magnet.

-  Use a mouse, touchpad, or touchscreen to move the steps below the table into the boxes in the table. Each step can be used once. After the response is entered and the OK button is clicked, Part B will appear on the screen.

Go on to the next page to finish item 18.

Item 18. Continued.

Part B

A student is investigating whether the magnetic field of magnets is affected by different materials.

Part B

Move the comparison word(s) into the table to compare the amount of thumbtacks that were MOST LIKELY picked up with the magnet wrapped in those materials to the amount of thumbtacks picked up when the magnet was wrapped in plastic wrap. Words might be used more than once or not used at all.

↺
?

Expected Results

| Material | Amount of Thumbtacks Picked Up Compared to Plastic Wrap |
|----------------|---|
| cotton fabric | |
| notebook paper | |
| aluminum foil | |

more
fewer
no change

Use a mouse, touchpad, or touchscreen to move the result word(s) below the table into the boxes in the table. Each result can be used more than once. Some results may not be used.

SAMPLE ITEM KEYS

| Item | Standard/ Element | DOK Level | Correct Answer | Explanation |
|------|----------------------|--------------|-------------------|--|
| 12 | S5P2b | 2 | B | The correct answer is choice (B). Choice (A) is incorrect because the wire also conducts the electricity, and a light bulb, not a switch, is needed. Choice (C) is incorrect because a compass will not be used in the circuit and a light bulb does not provide energy. Choice (D) is incorrect because a compass will not be used in the circuit and a switch opens and closes a circuit. |
| 13 | S5P2b | 3 | N/A | See scoring rubric and exemplar response on page 43. |
| 14 | S5P2c | 1 | A | The correct answer is choice (A) the table showing “yes” for “Does the bulb light?” and “Is electricity flowing?” and the material is a conductor, and “no” for “Does the bulb light?” and “Is electricity flowing?” and the material is an insulator. The other options are incorrect because electricity must flow for the bulb to light and must not flow for the bulb to not light, and flowing electricity means the material is a conductor. |
| 15 | S5P3b | 2 | N/A | See scoring rubric and exemplar response on page 44. |
| 16 | S5P2c | 3 | A | <p>The correct answer is choice (A)</p> <p>step 5: Connect a test material to the open ends of wire 1 and wire 3.</p> <p>step 6: Make observations and repeat step 5 with a different test material.</p> <p>conclusion: If the bulb lights up, the material is a conductor. If the bulb does not light up, the material is an insulator.</p> <p>Choice (B) is incorrect because the student has reversed the definition of insulator and conductor. Choice (C) is incorrect because the circuit is already complete without the test material; this is not an effective way to test each material. Also, the student has reversed the definition of insulator and conductor. Choice (D) is incorrect because the circuit is already complete without the test material; this is not an effective way to test each material.</p> |

| Item | Standard/ Element | DOK Level | Correct Answer | Explanation |
|------|----------------------|--------------|-------------------|--|
| 17 | S5P3a | 3 | B, D | The correct answers are choice (B) Magnet 1 should be used to pick up magnetic objects in one location and drop them off in another location because temporary magnets can be turned on and off, and choice (D) Magnet 2 should be used to pick up magnetic objects in places where there is no power supply because permanent magnets do not run out of energy. Choice (A) is incorrect because magnet 1 is the temporary magnet and the permanent magnet can pick up more small magnetic objects. Choice (C) is incorrect because magnet 1 cannot pick up 50 paper clips like magnet 2 can, so magnet 1 cannot be used in all the same ways. Choice (E) is incorrect because permanent magnets are not always stronger than temporary magnets. Choice (F) is incorrect because magnet 2 cannot be turned on and off or made stronger like magnet 1 can, so magnet 2 cannot be used in all the same ways. |
| 18 | S5P3b | 3 | N/A | See scoring rubric and exemplar response beginning on page 45. |

EXAMPLE SCORING RUBRICS AND EXEMPLAR RESPONSES

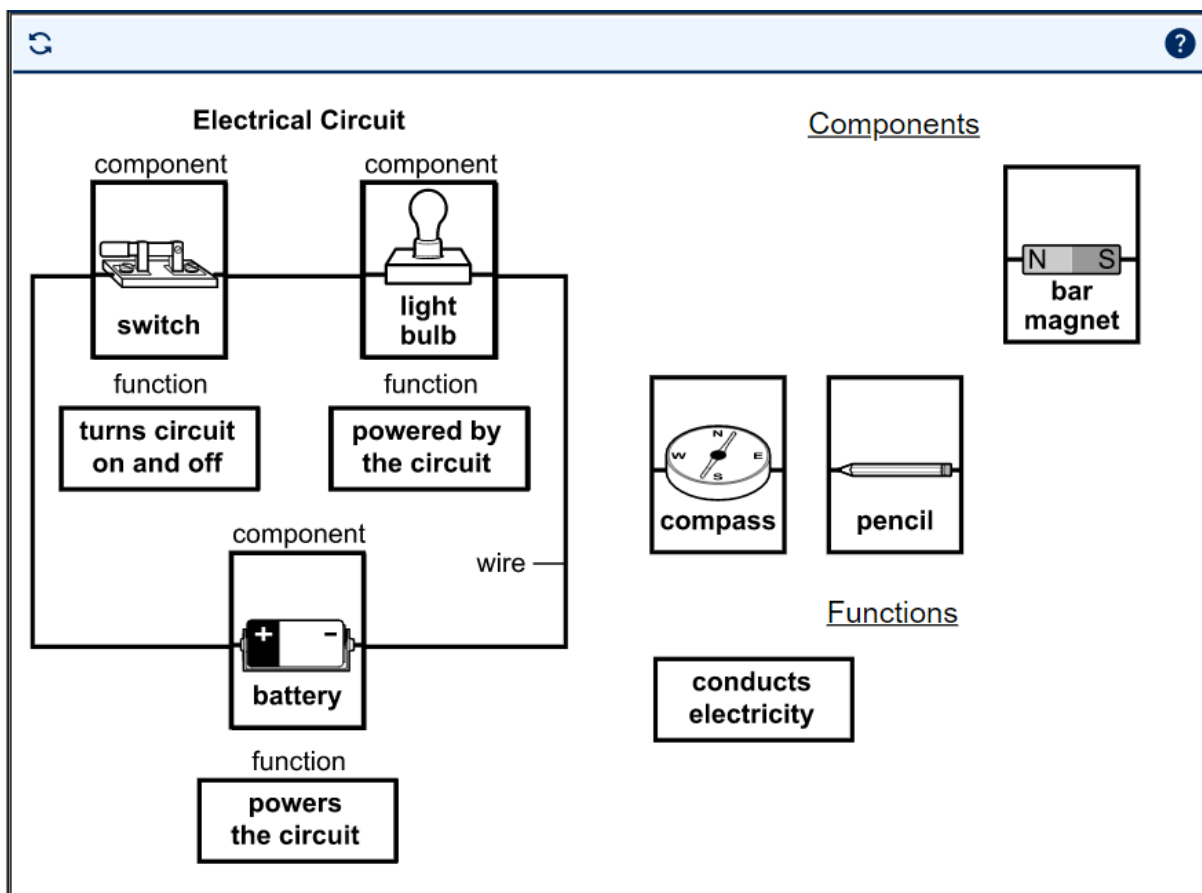
Item 13

Scoring Rubric

| Points | Description |
|--------|---|
| 2 | The student correct fills in all three components in any order, with the correct function also filled in with each component. |
| 1 | The student fills in all three correct components in any order, but with one or more errors in associated functions, OR the student correctly fills in two components in any order and with their correct function filled in. |
| 0 | The student gives a response that does not meet the criteria to receive 1 or 2 points. |

Exemplar Response

A correct response is shown below.



The correct components are shown. They can be placed in any order, but to achieve full credit for the item, each must be accompanied by the correct function. These are correct because a battery, light bulb, and switch will make a complete circuit. The function of the battery is powering the circuit, the function of the light bulb is that it is powered by the circuit, and the function of the switch is turning the circuit on and off. The other components shown will not make a functioning circuit.

Item 15**Scoring Rubric**

| Points | Description |
|--------|---|
| 1 | The student correctly selects all three drop-down menu options. |
| 0 | The student does not correctly select all three drop-down menu options. |

Exemplar Response

The correct response is shown below.

step 2: Replace the 5 mm thick cardboard sheet with the 5 mm thick iron sheet and repeat step 1. The marbles follow the magnetic wand because the magnetic field .

The option “5 mm thick iron sheet” is the correct response for the first drop-down menu because iron is a different material, not a different thickness of the same material. “Will not” is the correct response for the second drop-down menu, and “will be blocked by magnetic materials” is the correct response for the third drop-down menu. The magnetic field of the magnetic wand will not penetrate an iron sheet because the iron is a magnetic material, so the marbles will no longer follow the magnetic wand.

Item 18

Scoring Rubric

| Points | Description |
|--------|--|
| 2 | The student correctly answers both Part A and Part B. |
| 1 | The student correctly answers either Part A OR Part B. |
| 0 | The student does not correctly answer either part. |

Exemplar Response

Part A

The correct response is shown below.

| Procedure | |
|-----------|--|
| step 1 | Place 10 iron thumbtacks close together on a table. |
| step 2 | Wrap a piece of clear plastic wrap around the magnet and hold it in place with a rubber band. |
| step 3 | Tie a string around the magnet. |
| step 4 | Slowly lower the magnet toward the thumbtacks until they start being picked up by the magnet. |
| step 5 | Count the number of iron thumbtacks attracted by the magnet and record the data. |
| step 6 | Repeat steps 1–5 using cotton fabric, notebook paper, and aluminum foil. |

This is the correct response because any other order will not successfully complete the experiment. Any other order in Part A will receive 0 points.

Go on to the next page to finish item 18.

Item 18

Part B

| Expected Results | |
|------------------|---|
| Material | Amount of Thumbtacks Picked Up Compared to Plastic Wrap |
| cotton fabric | no change |
| notebook paper | no change |
| aluminum foil | no change |

more
fewer
no change

This is the correct response because these materials will not affect the function of the magnet that they are wrapped around, because they do not block a magnetic field. Any other selection in Part B will receive 0 points.

Chemical and Physical Change

In this physical science section, you will explain the difference between chemical and physical changes. You will conduct basic experiments and determine whether matter has changed physically by separating mixtures or chemically by observing changes in the properties of substances before, during, and after a chemical reaction.

KEY CONCEPTS

Physical properties are any properties that are measurable and can be seen. Physical properties can be determined without changing the chemical properties of an object. Color, hardness, area, length, strength, and temperature are some examples of physical properties. (S5P1a)

Chemical properties are any properties that can be measured only by chemically changing an object. Paper starts to burn at around 450°F. At this temperature, the paper combines with oxygen in the air and new substances are formed. (S5P1c)

A **physical change** happens when matter has a change in its physical properties but not its chemical properties. For example, salt can be dissolved in water, but, if the water evaporates, the salt is still there. (S5P1a)

A **chemical change** happens when matter breaks down into two or more substances or when more than one substance is combined to form a new substance. Hydrogen peroxide forming bubbles on its own is an example of matter breaking down into two substances. Vinegar and baking soda turning into bubbling foam is an example of two substances combining to create other substances. (S5P1c)

A **chemical reaction** is a process where one or more substances change chemically to one or more different substances. When iron is combined with air, the iron is slowly converted into rust. (S5P1c)


A **mixture** is something that contains two or more substances that are not combined chemically. Salted popcorn is an example of a mixture. (S5P1a)

Something is a mixture if you can physically **separate** the mixture into the substances that made up the mixture. You can tell that salt water is a mixture because you can evaporate the water and all that will be left is salt. (S5P1a)

States of matter are the different forms in which matter can be found. Water is a **liquid**, the state of matter that has a definite volume but no fixed shape. When water is ice, it is a **solid**. Solids have a definite shape and volume. Their shape and volume cannot be easily changed. When water is steam, or water vapor, it is a **gas**. Gases have no definite shape and take the shape of their container. (S5P1b)

Matter is anything that has mass and is in one of the states of matter. (S5P1a)

Important Tip

 Determining if a physical or chemical change has occurred can be hard to figure out. Two good questions to ask are the following: Does the matter still look the same? Could you change the matter back to what it was before the change? A physical change is something that can be reversed. You can tear a piece of paper, but you still have a piece of paper because only the dimensions of the paper change. A chemical change is something that cannot easily be reversed and usually means there is a different form of matter. If you took the torn piece of paper and burned it, you would have some ash. Is that ash the same as the paper, and could you change the ash back to paper? The answer is no. (S5P1a, c)

SAMPLE ITEMS

Item 19

Selected-Response

A student is investigating chemical changes by using different materials.

Which investigation would provide evidence of a chemical change and why?

- A. Melting a solid with fire would provide evidence of a chemical change because the solid would change shape.
- B. Cutting cardboard into many smaller pieces would provide evidence of a chemical change because the pieces cannot be put back together.
- C. Placing a solid into hot water and stirring while the solid dissolves would provide evidence of a chemical change because the dissolved material is lost.
- D. Combining two liquids that give off heat and gas would provide evidence of a chemical change because the particles react to make a new material with different properties.

Item 20

Selected-Response

Which investigation would provide evidence of a chemical change?

- A. Spray perfume into the air, and when the air and perfume mix, observe the change in odor that happens as they mix.
- B. Put an antacid tablet in water, and when the antacid and water mix, observe the bubbles that form as a new substance is created.
- C. Heat water in a pan on a stove, and observe the steam that forms as the state of matter of the water changes.
- D. Blow air through a wand filled with soap solution, and observe the bubbles that form as the air becomes trapped.

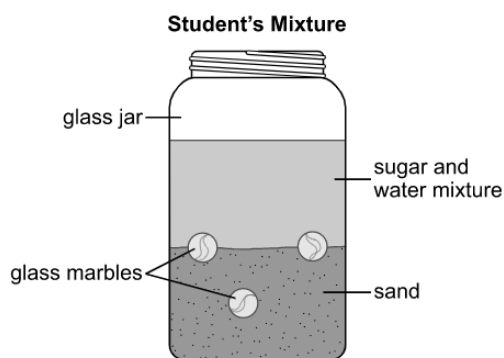
Item 21

Drop-Down Technology-Enhanced

A teacher gives a student the materials listed in the box.

- glass marbles
- sand
- sugar
- water

The student creates a mixture by placing all the materials in a glass jar and stirring. The student then leaves the glass jar on a desktop for one hour. After one hour, the jar and contents look like the picture.



The teacher asks the student to carry out a procedure to separate all the materials in the mixture.

Use the drop-down menus to BEST complete the steps in the procedure to separate the parts of the mixture back into the original materials.

Procedure

step 1. Separate the glass marbles from the mixture by removing them with a fork.

step 2. Separate the from the mixture by

step 3. Separate the from the mixture by

- ➡ Use a mouse, touchpad, or touchscreen to click the arrow beside each of the four blank boxes. When you click the arrow, a drop-down menu will appear showing you all the possible options for that blank. Each drop-down menu with its options is shown on the next page.

Go on to the next page to finish item 21.

Item 21. Continued.

step 2. Separate the from the mixture by

step 3. Separate the from the mixture by

step 2. Separate the from the mixture by
using a magnet to lift it out
setting the jar in sunlight and letting the water evaporate
pouring the mixture through filter paper into a different container

step 3. Separate the from the mixture by

step 3. Separate the from the mixture by
using a magnet to lift it out
setting the jar in sunlight and letting the water evaporate
pouring the mixture through filter paper into a different container

Item 22**Drop-Down Technology-Enhanced**

A student fills a tray with water and places the tray in the freezer. Three hours later, the student removes the tray from the freezer and makes observations.

Student Observations

- The water is solid.
- The water does not flow.
- The water keeps its shape in any container.
- The color of the water has changed to white.

The student claims that changing the temperature of water causes a physical change that turns water into ice.

Use the drop-down menus to construct the argument that BEST supports the student's claim about a physical change.

Ice forms because heat is , causing the particles that make up the ice to move . This

.



Use a mouse, touchpad, or touchscreen to click the arrow beside each of the three blank boxes. When you click the arrow, a drop-down menu will appear showing you all the possible options for that blank. Each drop-down menu with its options is shown on the next page.

Go on to the next page to finish item 22.

Item 22. Continued.

Ice forms because heat is , causing the particles that make up the ice to move . This .

added
removed

Ice forms because heat is , causing the particles that make up the ice to move . This .

faster
slower

Ice forms because heat is , causing the particles that make up the ice to move . This .

makes the ice change shape
changes the water from a liquid to a solid
changes the color of the water from clear to white

Item 23**Multi-Select Technology-Enhanced**

Students are investigating chemical changes that occur in different materials.

Which TWO investigations would provide evidence of a chemical change?

- A. Placing a liquid in a freezer until the liquid becomes a solid would provide evidence of a chemical change because the state of matter changes.
- B. Using a saw to cut a solid into two different pieces would provide evidence of a chemical change because the pieces cannot be put back together.
- C. Using a hot plate to heat a solid until it changes color and releases an odor would provide evidence of a chemical change because the particles cannot be changed back.
- D. Placing two different liquids together in a beaker and observing that a solid forms when they mix would provide evidence of a chemical change because a new material is formed.
- E. Placing a mixture containing a solid and a liquid on a windowsill and letting the liquid evaporate would provide evidence of a chemical change because the evaporated material is lost.
- F. Using a magnet to remove a magnetic solid from a mixture that also contains nonmagnetic solids would provide evidence of a chemical change because the mixture cannot be mixed together again.

Item 24

Drag-and-Drop Technology-Enhanced

A student wants to investigate chemical changes by using different materials. The student creates the table of different experiments shown.

For each experiment that demonstrates a chemical change, move the evidence that shows that a chemical change has occurred into the second column of the table. Some evidence may be used more than once or not used at all.

↺
?

| Experiment | Evidence |
|---|----------|
| An antacid tablet is put into water, and bubbles form. | |
| A solid and a liquid are mixed, and a sour smell is detected. | |
| A pink liquid is heated, and the substance turns colorless. | |
| Two different cold liquids are poured into a container, and the container then feels warm to the touch. | |

A temperature change happens.

A new substance is produced.

A color change happens.

An odor is given off.

A gas is produced.

- ➡ Use a mouse, touchpad, or touchscreen to move the evidence sentences below the table into the boxes in the table. The evidence sentences may be used more than once or not at all.

SAMPLE ITEM KEYS

| Item | Standard/ Element | DOK Level | Correct Answer | Explanation |
|------|----------------------|--------------|-------------------|--|
| 19 | S5P1c | 2 | D | The correct answer is choice (D) Combining two liquids that give off heat and gas would provide evidence of a chemical change because the particles react to make a new material with different properties. Choice (A) is incorrect because the solid would retain its properties despite melting, so this is only a physical change. Choice (B) is incorrect because the cardboard retains its properties, so this is only a physical change. Choice (C) is incorrect because the solid can be regained by evaporation of the water so this is only a physical change. |
| 20 | S5P1c | 2 | B | The correct answer is choice (B) Put an antacid tablet in water, and when the antacid and water mix, observe the bubbles that form as a new substance is created. Choice (A) is incorrect because no chemical reaction takes place, and state of matter is a physical change. Choice (C) is incorrect because no chemical reaction takes place. Choice (D) is incorrect because no chemical reaction takes place. |
| 21 | S5P1a | 3 | N/A | See scoring rubric and exemplar response on page 56. |
| 22 | S5P1b | 2 | N/A | See scoring rubric and exemplar response on page 57. |
| 23 | S5P1c | 3 | C, D | The correct answers are choice (C) Using a hot plate to heat a solid until it changes color and releases an odor would provide evidence of a chemical change because the particles cannot be changed back and choice (D) Placing two different liquids together in a beaker and observing that a solid forms when they mix would provide evidence of a chemical change because a new material is formed. Choices (A) and (E) are incorrect because a change in the state of matter is a physical change. Choices (B) and (F) are incorrect because no chemical reaction takes place. |
| 24 | S5P1c | 3 | N/A | See scoring rubric and exemplar response on page 58. |

EXAMPLE SCORING RUBRICS AND EXEMPLAR RESPONSES

Item 21

Scoring Rubric

| Points | Description |
|--------|--|
| 2 | The student correctly selects both drop-down menu options for both steps 2 and 3. |
| 1 | The student correctly selects both drop-down menu options for step 2 OR step 3. |
| 0 | The student does not correctly select both drop-down menu options for either step. |

Exemplar Response

The correct response is shown below.

Procedure

step 1. Separate the glass marbles from the mixture by removing them with a fork.

step 2. Separate the from the mixture by .

step 3. Separate the from the mixture by .

For step 2, “sand” is the correct response for the first drop-down menu and “pouring the mixture into a different container through filter paper” is the correct response for the second drop-down menu. These are the correct responses because filter paper will trap the sand while the sugar and water mixture will pass through the filter paper, so the sand will be separated.

For step 3, “sugar” is the correct response for the third drop-down menu and “setting the container in sunlight and letting the water evaporate” is the correct response for the fourth drop-down menu. These are the correct responses because the sugar will be left behind when the water evaporates.

The two steps must be done in the correct order, sand first and then sugar, because letting water evaporate from the mixture in step 2 will leave the sugar mixed with the sand, and separating the sugar from the sand would have to be done by mixing the sugar/sand mixture with water again and doing the steps in the correct order.

Item 22**Scoring Rubric**

| Points | Description |
|--------|---|
| 1 | The student correctly selects all three drop-down menu options. |
| 0 | The student does not correctly select all three drop-down menu options. |

Exemplar Response

The correct response is shown below.

Ice forms because heat is , causing the particles that make up the ice to move . This .

“Removed” is the correct response for the first drop-down menu because removing heat causes ice to form. “Slower” is the correct response for the second drop-down menu because when heat is removed from a substance, the small particles that make up the substance move more slowly. “Changes the water from a liquid to a solid” is the correct response for the third drop-down menu because the change of state of water from liquid to solid is the important characteristic of the formation of water ice.

Item 24

Scoring Rubric

| Points | Description |
|--------|--|
| 2 | The student correctly fills in all boxes. |
| 1 | The student correctly fills in two or three boxes. |
| 0 | The student does not correctly fill in at least two boxes. |

Exemplar Response

The correct response is shown below.

↺
?

Chemical Change Experiments

| Experiment | Evidence |
|---|--------------------------------------|
| An antacid tablet is put into water, and bubbles form. | A gas is produced. |
| A solid and a liquid are mixed, and a sour smell is detected. | An odor is given off. |
| A pink liquid is heated, and the substance turns colorless. | A color change happens. |
| Two different cold liquids are poured into a container, and the container then feels warm to the touch. | A temperature change happens. |

A temperature change happens.

A new substance is produced.

A color change happens.

An odor is given off.

A gas is produced.

In addition, the option “A new substance is produced.” could be used as evidence in place of any other box where the experiment is a chemical change.

Earth and Space Science

In this section on earth and space science, you will identify surface features of Earth caused by constructive and destructive processes. These processes include, but are not limited to, volcanoes, earthquakes, erosion, and weathering. Students should also be able to relate the role of technology and human intervention to the control of constructive and destructive processes.

KEY CONCEPTS

Weathering is a destructive process where Earth materials such as rocks and soil are broken down into smaller parts. Weathering can also break down roads, buildings, and other materials humans make. (S5E1a, b)

Erosion is the movement of materials from one place to another by natural methods. Erosion can be a destructive process, such as when a landslide moves material from the top of a mountain. (S5E1a, b)

Deposition is a constructive process whereby soil and rock that are eroded from one location are deposited as sediment in another location. As the sediment from a river is deposited at the mouth of a river over time, new land is created, which is called a delta. An example is the Mississippi delta. (S5E1a, b)

The surface of Earth, including under the ocean, is made up of **tectonic plates**. These plates form sections of the surface of Earth, and some plates move toward or away from each other. Plates can also slide past each other. (S5E1a)

The area where two or more tectonic plates meet and show movement is called a **fault**. (S5E1a, b)

Trenches can be found where faults are located under the ocean. Much smaller trenches, called valleys and canyons, are also created by erosion. **Glaciers**, sheets of very old ice that are the size of states and that move along Earth's surface, also create valleys as they slowly grind along the surface. (S5E1a, b)

Ridges are formed when tectonic plates collide and both push up. This creates hills and mountains. Ridges and individual mountains can also be formed in areas where magma, molten rock from Earth's core, pushes up between or through tectonic plates. Stone Mountain may be one of these magma-created mountains. (S5E1a, b)

A **volcano** is a break in Earth's crust that lets magma come out from the mantle and onto Earth's surface. Volcanoes can be found in the deep ocean and on Earth's surface. They are the result of a constructive process. Volcanoes show up on Earth's surface where the magma can push through weakness in the crust. (S5E1a, b)

Magma is the molten rock below Earth's crust. When magma breaks the crust, it is called lava. Lava is thrown out by volcanoes. The islands of the state of Hawaii are **landforms** created by volcanoes. (S5E1a, b)

Tectonic plates move very slowly because they are pushing against each other with great force.


Earthquakes happen when tectonic plates suddenly slide around. The plates shake, and the energy from that creates waves that echo through Earth. (S5E1a, b)

Earthquakes and volcanoes can both happen underwater. When earthquakes happen underwater, they can cause **tsunamis**. This happens when the energy released by an earthquake is transferred to the column of water above it and creates waves that travel away from the area. Tsunamis happen where the ocean meets the shore. The water starts to rise as the waves from the earthquake push the water up. Tsunami waves are longer than regular water waves. As a tsunami wave hits the shore, it carries much more water and creates a lot of damage. (S5E1a, b)

Humans can affect constructive and destructive processes and may do so to protect people or landforms when the processes will result in undesirable results. Beach reclamation to reduce the effects of erosion on beaches can be accomplished by dredging sand from the ocean floor and depositing it back on the beach. **Floods** can be controlled by building dams to hold back floodwaters and to let the excess water move downstream more slowly or by building levees (earthen walls along riverbanks) to prevent rivers from going outside their banks onto surrounding land. Cities can also modify their storm drain systems or direct the drainage flows to retention ponds to slow the runoff of rainwater into streams and rivers to reduce the risk of flooding downstream. (S5E1c)

Seismic waves are vibrations that move through Earth. Scientists have a tool they can use to detect, measure, and record seismic waves. This tool is known as a **seismograph**. As an earthquake or volcanic eruption starts, a seismograph detects the increase in the strength and frequency of seismic waves. Earthquakes can trigger volcanic activity and tsunamis. Scientists can analyze the seismograph data to determine the likelihood of a tsunami forming. (S5E1c)

Important Tips

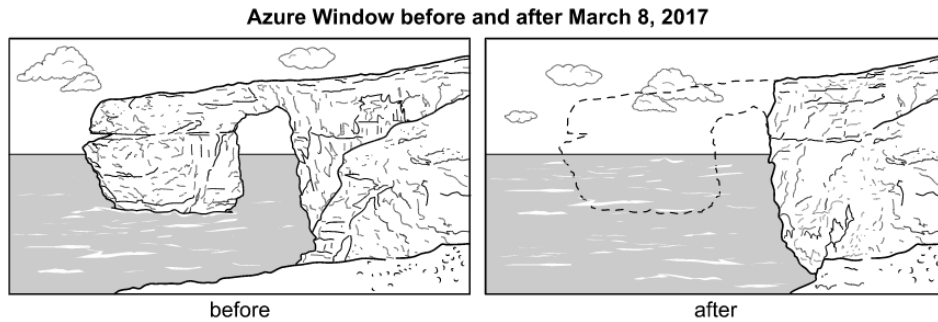
 Some areas of Earth have more weathering and erosion than other areas. There are many reasons for this. Weathering can break down rocks when water freezes, so areas that are often rainy and cold are more likely to see weathering. Windy areas also experience weathering because the wind wears down the surface of the rock. Erosion is more likely to occur in areas of moving water, such as rivers and streams. Because soil and rock move downhill, higher areas of Earth will always see more erosion than lower areas. (S5E1a, b)

SAMPLE ITEMS

Item 25

Drop-Down Technology-Enhanced

The picture shows the surface feature named the Azure Window as it looked before and after March 8, 2017.



Use the drop-down menus to complete the sentence that explains the changes in the Azure Window.

The changes in the Azure Window were caused by the process of .

- ➡ Use a mouse, touchpad, or touchscreen to click the arrow beside each of the two blank boxes. When you click the arrow, a drop-down menu will appear showing you all the possible options for that blank. Each drop-down menu with its options is shown below.

The changes in the Azure Window were caused by the process of .

destructive

constructive

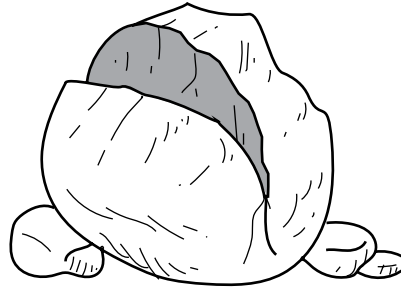
erosion

deposition

Item 26

Selected-Response

A student observes a large rock at the base of a volcano in a river valley that gets a lot of snow in the winter and floods in the spring. The student claims that the large crack in the rock was caused by a destructive process called weathering.



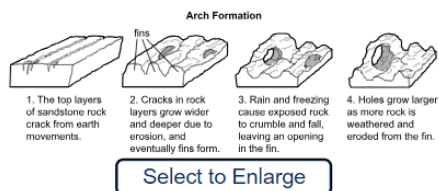
Which argument **BEST** describes the student's claim?

- A. The student's claim is correct because water fills small cracks in rocks, freezes, and expands, making the cracks larger over time.
- B. The student's claim is correct because the rock was carried from the top of the volcano to its base by a glacier, creating many cracks over time.
- C. The student's claim is not correct because the rock was picked up by moving water and rolled against other rocks, smoothing its surface and causing cracks in a short period of time.
- D. The student's claim is not correct because large cracks in rocks are caused when lava from a volcano covers the rock so its temperature rises and falls in a short period of time, causing it to break.

Item 27

Drop-Down Technology-Enhanced

A student wants to model how arches form in a desert. The student finds a diagram on a website.



The student designs a procedure to model the formation of an arch.

Procedure

- step 1: Mix sand, clay, and water in a shoebox and let it harden into a block.
- step 2: Drop the block on the ground to form cracks in the surface.
- step 3: Use a watering can to sprinkle 15 liters of water over the block every day until fins form from the cracks.
- step 4: ?
- step 5: ?

Use the drop-down menus to select the actions that should be used in steps 4 and 5 to BEST model the formation of a desert arch.

step 4:

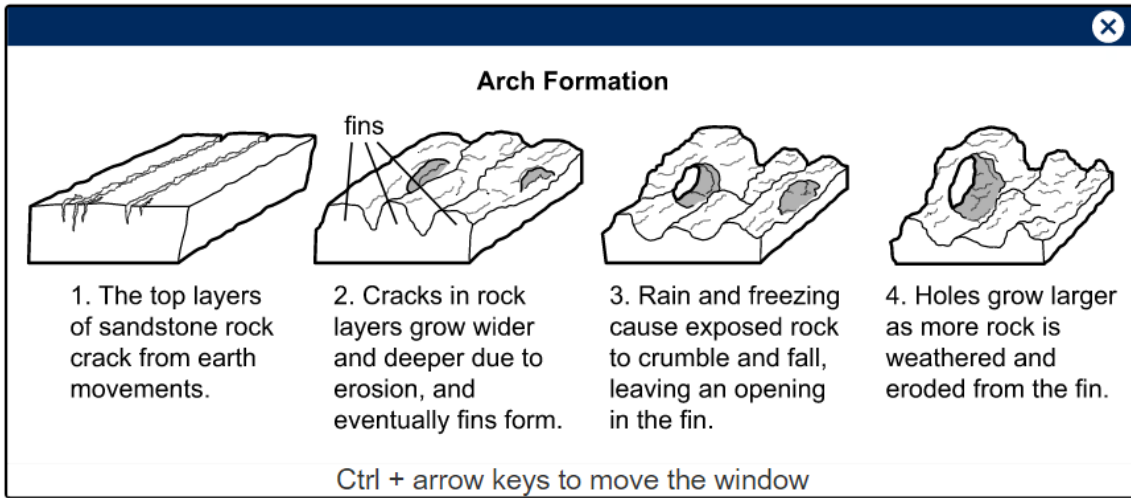
In the morning, place the block on a table and

step 5: Repeat step 4 every day until

- ➡ Due to the size of the graphic on the left side of the screen, the graphic has an “Enlarge” button. Clicking this button will bring up the graphic at full size. After you have studied the graphic, use a mouse, touchpad, or touchscreen to click the arrow beside each of the three blank boxes. When you click the arrow, a drop-down menu will appear showing you all the possible options for that blank. Each drop-down menu with its options is shown on the next page.

Go on to the next page to finish item 27.

Item 27. *Continued.*



Click on the red X at the top right to reduce the graphic again.

step 4:

▼

Place the block in an oven on low heat overnight
Sprinkle water over the block and place it in the freezer overnight

step 4:

▼

In the morning, place the block on a table and

▼

use a fan to blow air over the block during the day
let the sun shine on the block to thaw and dry the block

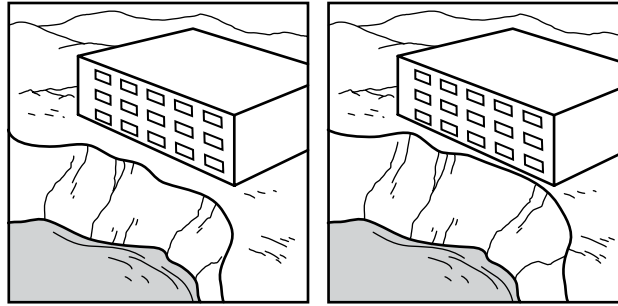
step 5: Repeat step 4 every day until

▼

an arch is formed
a hole forms and grows larger, forming an arch

Item 28**Selected-Response**

Some people who live in coastal areas along cliffs are using drones to take pictures of their neighborhoods. A drone is a flying vehicle without a pilot on board. The two pictures show changes in the cliff near a building on two days in December.



December 18

December 28

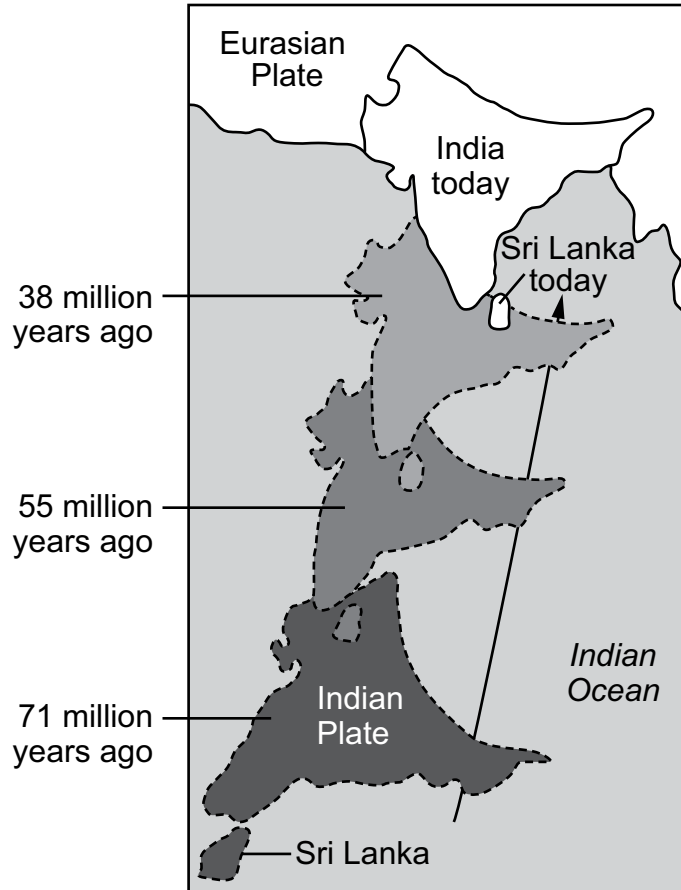
Which question can be studied by using a drone to observe recent changes in Earth's surface along coastal areas?

- A. How fast are the cliffs eroding?
- B. How many people live near cliffs?
- C. How old are rock layers at the bottom of the cliff?
- D. How can people stop the erosion of cliffs near the coast?

Item 29

Multi-Part Technology-Enhanced

A student is studying the formation of the Himalayas. The student finds a picture and learns that the mountain range formed when the Indian Plate collided with the Eurasian Plate. The student uses the picture to design a model that will show classmates how the Himalayas formed.



Go on to the next page to finish item 29.

Item 29. Continued.**Part A**

Based on the picture, which steps would produce the BEST model of how the Himalayas formed over time?

- A. step 1:** Label one cardboard box as the Eurasian Plate.
step 2: Label another cardboard box as the Indian Plate.
step 3: Slowly push both plates toward each other.
step 4: Observe and record how the sizes of both plates change when the edges push against each other.
- B. step 1:** Label one cardboard box as the Eurasian Plate.
step 2: Label another cardboard box as the Indian Plate.
step 3: Slowly push the Indian Plate toward the Eurasian Plate.
step 4: Observe and record how the size of the Indian Plate changes when it touches the edge of the Eurasian Plate.
- C. step 1:** Use light-colored clay to make the shape of the Eurasian Plate.
step 2: Use dark-colored clay to make the shape of the Indian Plate.
step 3: Slowly push the dark-colored plate toward the light-colored plate.
step 4: Observe and record how the shapes of both plates change when the edges push against each other.
- D. step 1:** Use light-colored clay to make the shape of the Eurasian Plate.
step 2: Use dark-colored clay to make the shape of the Indian Plate.
step 3: Slowly push the light-colored plate toward the dark-colored plate.
step 4: Observe and record how the shape of the Eurasian Plate changes when it touches the edge of the Indian Plate.

Part B

Which data could the student collect using the BEST model from part A?

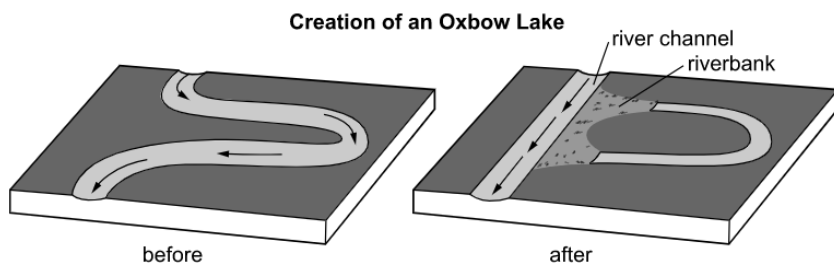
- A.** the changing distance between the two plates
- B.** the time it takes for the two plates to collide
- C.** the mass of the materials used to make the two plates
- D.** the changing height of the edge where the two plates collide

Item 30

Drag-and-Drop Multi-Part Technology-Enhanced

Part A

An oxbow lake is a lake that is usually located near a river. An oxbow lake is often shaped like the letter C. An oxbow lake forms when a curve of a river gets cut off from the main river channel.



Part A

A student decides to make a model of an oxbow lake in some sand in the yard. Move a statement into each blank space in the table to show the CORRECT order of steps to make the model.

Oxbow Lake Formation Procedure

| | |
|--------|--|
| step 1 | Make a curved path in the sand that water can flow through to represent a river channel. |
| step 2 | |
| step 3 | |
| step 4 | |

Put a water hose at one end of the curved path.
Turn the water from low to high to represent a flooded river.
Turn the water hose on low and let the water flow slowly to fill the curved river.

Select to Respond

➡ Due to the size of the response area, this item has a “Select to Respond” button on the screen. Clicking this button will bring up the response area at full size.

Go on to the next page to finish item 30.


Item 30. *Continued.*

| Oxbow Lake Formation Procedure | |
|---------------------------------------|--|
| step 1 | Make a curved path in the sand that water can flow through to represent a river channel. |
| step 2 | |
| step 3 | |
| step 4 | |

Put a water hose at one end of the curved path.

Turn the water from low to high to represent a flooded river.

Turn the water hose on low and let the water flow slowly to fill the curved river.

-  Use a mouse, touchpad, or touchscreen to move the steps below the table into the boxes in the table. Each step can be used once. After the response is entered and the OK button is clicked, Part B will appear on the screen.

Go on to the next page to finish item 30.

Item 30. *Continued.*

Part B

An oxbow lake is a lake that is usually located near a river. An oxbow lake is often shaped like the letter C. An oxbow lake forms when a curve of a river gets cut off from the main river channel.

Creation of an Oxbow Lake

before after

Part B

Move the words into the table that BEST describe the processes that form an oxbow lake. Some words may be used more than once or not used at all.

| Part of River | Process | Process Type |
|---------------|---------|--------------|
| channel | | |
| bank | | |

Process

erosion

deposition

Process Type

constructive

destructive

Select to Respond

➡ Due to the size of the response area, this item has a “Select to Respond” button on the screen. Clicking this button will bring up the response area at full size.

↻
?

| Part of River | Process | Process Type |
|---------------|---------|--------------|
| channel | | |
| bank | | |

Process

erosion

deposition

Process Type

constructive

destructive

➡ Use a mouse, touchpad, or touchscreen to move the words below the table into the boxes in the table. The words may be used more than once or may not be used at all.

SAMPLE ITEM KEYS

| Item | Standard/ Element | DOK Level | Correct Answer | Explanation |
|------|----------------------|--------------|-------------------|---|
| 25 | S5E1b | 1 | N/A | See scoring rubric and exemplar response on page 72. |
| 26 | S5E1a | 2 | A | The correct answer is choice (A) The student's claim is correct because water fills small cracks in rocks, freezes, and expands, making the cracks larger over time. Choice (B) is incorrect because movement of rock to another location is erosion not weathering. Choice (C) is incorrect because erosion in a river tends to smooth the surface of rocks not crack them as shown. Choice (D) is incorrect because the heating and cooling of rocks by lava is not an example of weathering. |
| 27 | S5E1b | 3 | N/A | See scoring rubric and exemplar response on page 73. |
| 28 | S5E1c | 2 | A | The correct answer is choice (A) How fast are the cliffs eroding? Choice (B) is incorrect because drones cannot see into the houses to count people. Choice (C) is incorrect because knowing the age of the rocks does not address the recent change in Earth's surface. Choice (D) is incorrect because drones can be used to document erosion but not to prevent it. |
| 29 | S5E1b | 3 | C, D | <p>Part A: The correct answer is choice (C) step 1: Use light-colored clay to make the shape of the Eurasian Plate. step 2: Use dark-colored clay to make the shape of the Indian Plate. step 3: Slowly push the dark-colored plate toward the light-colored plate. step 4: Observe and record how the shapes of both plates change when the edges push against each other.</p> <p>Choices (A) and (B) are incorrect because cardboard boxes are not going to change size when they are pushed together. Choice (D) is incorrect because the Indian Plate should move toward the Eurasian Plate.</p> <p>Part B: The correct answer is choice (D) the changing height of the edge where the two plates collide. Choice (A) is incorrect because measuring the distance between the two plates does not help the student understand how the Himalayas formed. Choice (B) is incorrect because the time it took to form the Himalayas is not being demonstrated by this model. Choice (C) is incorrect because the mass of the materials does not help the student to understand how the Himalayas formed.</p> |
| 30 | S5E1b | 3 | N/A | See scoring rubric and exemplar response beginning on page 74. |

EXAMPLE SCORING RUBRICS AND EXEMPLAR RESPONSES

Item 25

Scoring Rubric

| Points | Description |
|--------|--|
| 1 | The student correctly selects both drop-down menu options. |
| 0 | The student does not correctly select both drop-down menu options. |

Exemplar Response

The correct response is shown below.

The changes in the Azure Window were caused by the process of .

“Destructive” Is the correct response for the first drop-down menu because part of the formation was removed. “Erosion” is the correct response for the second drop-down menu because erosion is a destructive process.

Item 27

Scoring Rubric

| Points | Description |
|--------|---|
| 1 | The student correctly selects all three drop-down menu options. |
| 0 | The student does not correctly select all three drop-down menu options. |

Exemplar Response

The correct response is shown below.

step 4:

Sprinkle water over the block and place it in the freezer overnight ▾.

In the morning, place the block on a table and

let the sun shine on the block to thaw and dry the block ▾.

step 5: Repeat step 4 every day until

a hole forms and grows larger, forming an arch ▾.

“Sprinkle water over the block and place it in the freezer overnight” and “let the sun shine on the block to thaw and dry the block” are the correct responses for the first two drop-down menus because these steps will model frost wedging in nature. “A hole forms and grows larger, forming an arch” is the correct response for the third drop-down menu because it is a better description of the process.

Item 30

Scoring Rubric

| Points | Description |
|--------|--|
| 2 | The student correctly answers both Part A and Part B. |
| 1 | The student correctly answers either Part A OR Part B. |
| 0 | The student does not correctly answer either part. |

Exemplar Response

Part A

The correct response is shown below.

↻
?

Oxbow Lake Formation Procedure

| | |
|--------|---|
| step 1 | Make a curved path in the sand that water can flow through to represent a river channel. |
| step 2 | Put a water hose at one end of the curved path. |
| step 3 | Turn the water hose on low and let the water flow slowly to fill the curved river. |
| step 4 | Turn the water from low to high to represent a flooded river. |

This is the correct response because any other order will not successfully complete the experiment. Any other order in Part A will receive 0 points.

Go on to the next page to finish item 30.

Item 30

Part B

| Part of River | Process | Process Type |
|---------------|-------------------|---------------------|
| channel | erosion | destructive |
| bank | deposition | constructive |

| | |
|-------------------|---------------------|
| <u>Process</u> | <u>Process Type</u> |
| erosion | constructive |
| deposition | destructive |

This is the correct response because the channel is formed by erosion, which is a destructive process, and the bank is formed by deposition, which is a constructive process. Any other placement in Part B will receive 0 points.

Study/Resource Guide
for Students and Parents
Grade 5
Science

