



**pennsylvania**  
DEPARTMENT OF EDUCATION

# **The Pennsylvania System of School Assessment**

## **Science Item and Scoring Sampler**



**2019–2020  
Grade 8**

Pennsylvania Department of Education Bureau of Curriculum, Assessment and Instruction—September 2019

**SCIENCE TEST DIRECTIONS**

On the following pages are the Science questions. There are two types of questions.

**Multiple-Choice Questions:**

Some questions will ask you to select an answer from among four choices. These questions will be found in your test booklet.

For the multiple-choice questions:

- Read each question, and choose the best answer.
- Record your choice in the answer booklet.
- Only one of the answers provided is the correct response.

**Open-Ended Questions:**

Other questions will require you to write your response. These questions will be found in your answer booklet.

For the open-ended questions:

- Be sure to read the directions carefully.
- If the question asks you to do two tasks, be sure to complete both tasks.
- If the question asks you to compare, be sure to compare. Also, if the question asks you to explain, describe, or identify, be sure to explain, describe, or identify.

## GENERAL DESCRIPTION OF SCORING GUIDELINES FOR SCIENCE OPEN-ENDED ITEMS

**2 Points**

- The response demonstrates a *thorough* understanding of the scientific content, concepts, and procedures required by the task(s).
- The response provides a clear, complete, and correct response as required by the task(s). The response may contain a minor blemish or omission in work or explanation that does not detract from demonstrating a *thorough* understanding.

**1 Point**

- The response demonstrates a *partial* understanding of the scientific content, concepts, and procedures required by the task(s).
- The response is somewhat correct with *partial* understanding of the required scientific content, concepts, and/or procedures demonstrated and/or explained. The response may contain some work that is incomplete or unclear.

**0 Points**

- The response provides *insufficient* evidence to demonstrate any understanding of the scientific content, concepts, and procedures as required by the task(s) for that grade level.
- The response may show only information copied or rephrased from the question or *insufficient* correct information to receive a score of 1.

Special Categories within zero reported separately:

**Blank**.....Blank, entirely erased, entirely crossed out, or consists entirely of whitespace

**Refusal** .....Refusal to respond to the task

**Off Task**.....Makes no reference to the item but is not an intentional refusal

**Foreign Language** .....Written entirely in a language other than English

**Illegible**.....Illegible or incoherent

## MULTIPLE-CHOICE QUESTIONS

1. A student learns that pure water freezes at  $0^{\circ}\text{C}$ . The student wants to find out how much salt needs to be added to the water to lower the freezing temperature by two degrees. Which statement explains why this question can be answered through scientific inquiry?
- A. The question likely has more than one answer.
  - B. The question has already been answered by scientists.
  - C. The question can be investigated through a group of experiments.
  - D. The question can be answered through mathematical calculations.

Item Information	
Alignment	S8.A.1.1.2
Answer Key	C
Depth of Knowledge	2
p-value A	9%
p-value B	12%
p-value C	66% (correct answer)
p-value D	13%
Option Annotations	<p>A. Scientific inquiry is not required to determine the likelihood that the question has multiple answers.</p> <p>B. The results will vary based on the amount of water that is being tested.</p> <p>C. Key: The experiment should be repeated multiple times to increase the reliability of any answers or conclusions that are drawn.</p> <p>D. Mathematical calculations are helpful, but any influences due to experimental or environmental conditions need to be accounted for through scientific investigation.</p>

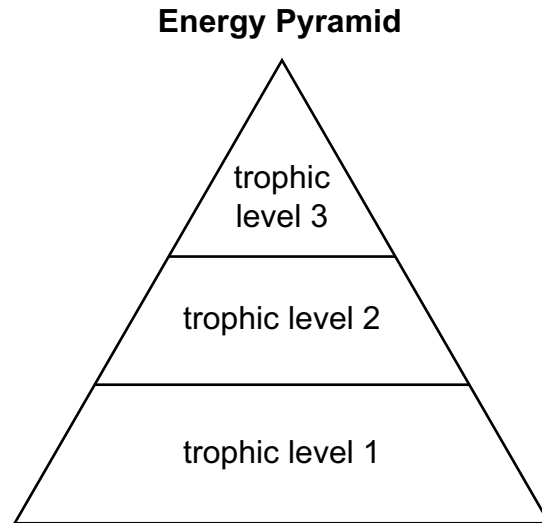
2. Scientists recently discovered that firing low-energy particles at potatoes keeps the potatoes from developing unwanted sprouts. They observed that these energy particles prevent cell division in the sprouts. This stops the potatoes from sprouting for up to 120 days. How will this development **most likely** affect the potato industry?
- A. by allowing food engineers to improve the ways potatoes can be prepared
  - B. by allowing potatoes to ripen over a longer period of time to improve flavor
  - C. by allowing potatoes to be stored longer so they can be sold during winter months
  - D. by allowing faster transportation to supermarkets so they never run out of potatoes

Item Information	
Alignment	S8.A.1.2.4
Answer Key	C
Depth of Knowledge	2
p-value A	19%
p-value B	23%
p-value C	51% (correct answer)
p-value D	7%
Option Annotations	<p>A. This technology does not affect the ways that potatoes can be prepared.</p> <p>B. Potatoes do not require ripening.</p> <p>C. Key: By preventing the potatoes from sprouting, this technology allows the potatoes to be stored and kept fresh over a longer period of time.</p> <p>D. This technology does not affect the amount of time it takes to transport the potatoes.</p>

3. A student predicts that a solution of ethanol ( $C_2H_5OH$ ) and water will have a lower density at room temperature than that of pure water. Which tools would **most** help the student test this prediction?
- A. a meterstick and a balance
  - B. a hot plate and a thermometer
  - C. a thermometer and a stopwatch
  - D. a balance and a graduated cylinder

Item Information	
Alignment	S8.A.2.2.1
Answer Key	D
Depth of Knowledge	2
p-value A	9%
p-value B	24%
p-value C	18%
p-value D	49% (correct answer)
Option Annotations	<p>A. A meterstick would not be useful in comparing the unknown densities of two liquids.</p> <p>B. The item states that measurements are being done at room temperature; therefore, a hot plate would not be a useful tool for this experiment.</p> <p>C. A stopwatch would not be useful in comparing the unknown densities of two liquids.</p> <p>D. Key: Density = mass/volume. A balance can be used to accurately determine the masses of the substances, and the graduated cylinder can be used to accurately determine the volumes of the liquids.</p>

4. Use the diagram below to answer the question.



Which statement explains why populations in upper trophic levels tend to have less total mass than populations in lower trophic levels?

- A. Populations in upper trophic levels are more complex than populations in lower trophic levels.
- B. Populations in upper trophic levels have less available habitat than populations in lower trophic levels.
- C. Populations in upper trophic levels have less available energy than populations in lower trophic levels.
- D. Populations in upper trophic levels have more nutrient requirements than populations in lower trophic levels.

Item Information	
Alignment	S8.A.3.1.2
Answer Key	C
Depth of Knowledge	2
p-value A	19%
p-value B	26%
p-value C	35% (correct answer)
p-value D	20%
Option Annotations	<p>A. The complexity of individual populations does not have a linear relationship going up an energy pyramid.</p> <p>B. Habitat is not determined by an energy pyramid.</p> <p>C. Key: Typically, the amount of food energy and biomass both decrease going up the trophic levels of an energy pyramid.</p> <p>D. Specific nutrient requirements are not determined by trophic levels.</p>

5. Which statement **best** explains why the carbon cycle is classified as a closed-loop system?
- A. Carbon levels are monitored and maintained by plants in a system.
  - B. The flow of carbon occurs only in nonliving components of a system.
  - C. Earth's atmosphere traps all carbon once it passes through living organisms in a system.
  - D. A fixed amount of carbon flows between the living and nonliving components of a system.

Item Information	
Alignment	S8.A.3.1.4
Answer Key	D
Depth of Knowledge	2
p-value A	20%
p-value B	13%
p-value C	29%
p-value D	38% (correct answer)
Option Annotations	<p>A. Carbon flows through plants from the atmosphere, but they do not monitor its flow. A large amount of atmospheric carbon dissolves into the ocean.</p> <p>B. All living things are composed of carbon.</p> <p>C. Large amounts of carbon also exist in ocean water and in the ground.</p> <p>D. Key: Carbon flows in a cycle that includes both living and nonliving parts of Earth.</p>



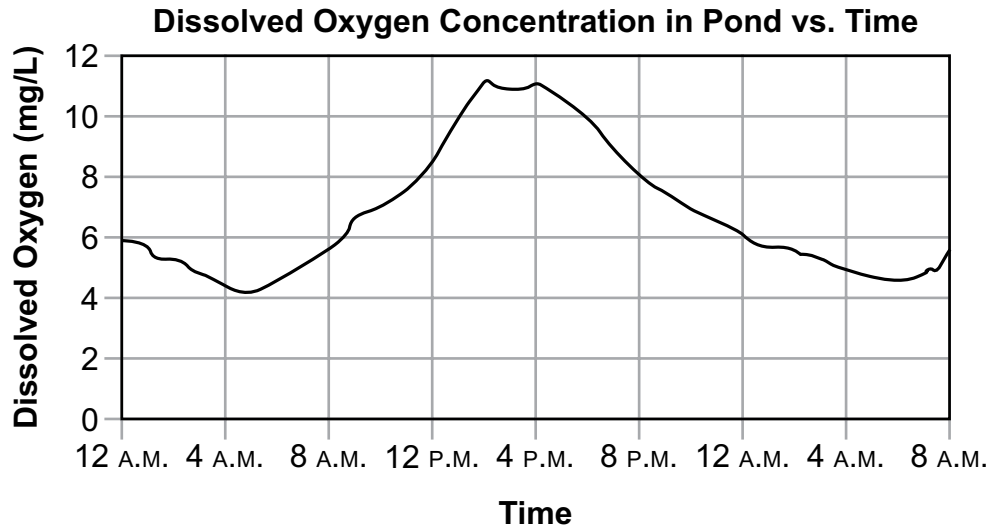
6. A mouse's habitat is a grassland containing rocks, soil, and grass. The mouse lives in a burrow underground. Based on this information, which statement **best** describes how the mouse interacts with its environment?
- A. The mouse uses soil for food and shelter.
  - B. The mouse gets energy from its predators.
  - C. The mouse changes its environment to create food.
  - D. The mouse gets energy and shelter from its environment.

Item Information	
Alignment	S8.A.3.1.5
Answer Key	D
Depth of Knowledge	2
p-value A	20%
p-value B	5%
p-value C	7%
p-value D	68% (correct answer)
Option Annotations	<p>A. The mouse may use the soil for shelter, but it needs the grass for food.</p> <p>B. The mouse would lose energy avoiding predators.</p> <p>C. The mouse is a consumer that requires other organisms as a source of food.</p> <p>D. Key: Based on the information provided, the mouse must interact with different parts of its environment for survival.</p>

7. Which relationship would a scientist **most likely** model using calculations based on the law of universal gravitation?
- A. the motion of planets within the solar system
  - B. the internal structure and position of the Moon
  - C. factors that affect Earth's atmosphere and climate
  - D. natural events that change the shape of Earth's surface

Item Information	
Alignment	S8.A.3.2.1
Answer Key	A
Depth of Knowledge	2
p-value A	64% (correct answer)
p-value B	12%
p-value C	14%
p-value D	10%
Option Annotations	<p>A. Key: The motions or orbits of the planets are mostly controlled by the gravitational pull of the Sun. Orbital models could be made using calculations based on the law of universal gravitation.</p> <p>B. Models of the internal structure of the Moon would most likely be based on geological and seismic information.</p> <p>C. Models of the atmosphere and climate are based on atmospheric patterns and historical data.</p> <p>D. Models of natural events that change the shape of Earth's surface are based on physical and geological data.</p>

8. Use the graph below to answer the question.



A scientist measured dissolved oxygen ( $O_2$ ) levels in a pond over time. A graph showing the results of the measurements is shown. Which statement is the **most** accurate description of the events occurring in the pond during the time shown?

- A. Aquatic plants consume  $O_2$  in the pond through respiration at a constant level.
- B. Aquatic plants consume  $O_2$  in the pond through respiration mostly during the early morning.
- C. Aquatic plants provide additional  $O_2$  for the pond through photosynthesis from late afternoon to early morning.
- D. Aquatic plants provide additional  $O_2$  for the pond through photosynthesis from early morning until late afternoon.

Item Information	
Alignment	S8.A.3.3.2
Answer Key	D
Depth of Knowledge	3
p-value A	8%
p-value B	19%
p-value C	29%
p-value D	44% (correct answer)
Option Annotations	<p>A. The graph does not indicate how much oxygen is being consumed by cellular respiration.</p> <p>B. The graph does not indicate how much oxygen is being consumed by cellular respiration.</p> <p>C. The graph indicates that oxygen levels are decreasing from late afternoon through the night until morning.</p> <p>D. Key: The graph indicates that oxygen levels are increasing from morning through the day until late afternoon.</p>

## 9. Use the chart below to answer the question.

## Diesel Fuels

Biodiesel	Traditional Diesel
<ul style="list-style-type: none"> <li>produced from vegetable oils, animal fats, or recycled cooking grease</li> <li>made at home or in commercial refineries</li> </ul>	<ul style="list-style-type: none"> <li>produced from oil</li> <li>made at large refineries</li> </ul>

Biodiesel is an alternative fuel to traditional diesel. Both produce the same amount of energy. Which statement **best** compares biodiesel to traditional diesel?

- A. Biodiesel produces no carbon dioxide, while traditional diesel produces large amounts of the gas.
- B. Biodiesel produces a small amount of hydrogen, while traditional diesel produces large amounts of the gas.
- C. Biodiesel is produced from a material that forms over a few months, while traditional diesel is produced from a material that forms over several million years.
- D. Biodiesel is produced from a material that forms over several decades, while traditional diesel is produced from a material that forms over a few thousand years.

Item Information	
Alignment	S8.C.2.2.2
Answer Key	C
Depth of Knowledge	2
p-value A	21%
p-value B	18%
p-value C	50% (correct answer)
p-value D	11%
Option Annotations	<p>A. Biodiesel produces carbon dioxide in similar amounts to traditional diesel fuel.</p> <p>B. Biodiesel produces hydrogen gas in similar amounts to traditional diesel fuel.</p> <p>C. Key: Biodiesel is produced from a renewable resource that may only take a few months to form, while traditional diesel is produced from non-renewable fossil fuels that can take millions of years to form.</p> <p>D. The source of biodiesel takes only a few months to form. The source for traditional diesel can take millions of years to form.</p>

10. Many people in Pennsylvania depend on groundwater for their water supply. Which action would **most likely** provide a greater amount of groundwater?
- A. an increase in the amount of infiltration
  - B. a decrease in the amount of condensation
  - C. an increase in the amount of developed land surface
  - D. a decrease in the amount of autumn and winter precipitation

Item Information	
Alignment	S8.D.1.3.1
Answer Key	A
Depth of Knowledge	2
p-value A	44% (correct answer)
p-value B	22%
p-value C	23%
p-value D	11%
Option Annotations	<p>A. Key: Water soaking into the ground from processes such as precipitation can help to recharge groundwater supplies.</p> <p>B. A decrease in condensation would result in less water available to reach groundwater supplies.</p> <p>C. An increase in the amount of developed land surface may result in more surface runoff and evaporation before water can reach groundwater supplies.</p> <p>D. A decrease in precipitation would not result in a greater amount of groundwater.</p>

11. Which statement **best** describes how thunderstorms form?

- A. Convection currents cause cirrus clouds to become wider, resulting in less energy in the clouds than in the surrounding air.
- B. Convection currents cause cumulus clouds to become taller, resulting in more energy in the clouds than in the surrounding air.
- C. Downdrafts resulting from evaporation cause cirrus clouds to become taller, resulting in more energy in the clouds than in the surrounding air.
- D. Downdrafts resulting from evaporation cause cumulus clouds to become wider, resulting in less energy in the clouds than in the surrounding air.

Item Information	
Alignment	S8.D.2.1.3
Answer Key	B
Depth of Knowledge	2
p-value A	12%
p-value B	47% (correct answer)
p-value C	23%
p-value D	18%
Option Annotations	<p>A. Cirrus clouds are thin, wispy clouds associated with fair weather. Also, an increase in energy within the clouds occurs.</p> <p>B. Key: Warm, moist air rises and cold air sinks, causing convection currents. As the moisture condenses, energy is released. As moisture condenses out of the lifting air, it is warmer than the surrounding air, causing cumulus clouds to get taller.</p> <p>C. Updrafts from condensation (rather than downdrafts from evaporation) cause cumulus (not cirrus) clouds to get taller.</p> <p>D. Updrafts from condensation (rather than downdrafts from evaporation) result in more energy and cause cumulus clouds to get taller.</p>

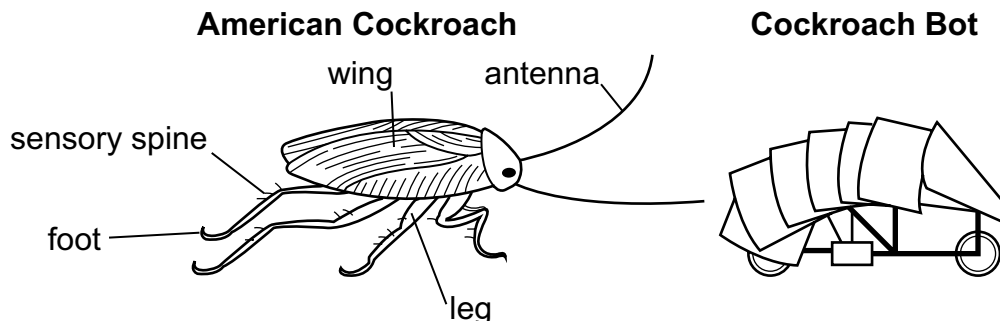
12. Which statement **best** explains how a planet affects the orbital path of a comet as the comet passes by the planet?
- A. The speed of the comet creates an area of low pressure as the comet passes by, pulling the planet toward the comet.
  - B. The magnetic fields of the comet and the planet produce similar charges, pushing the two objects apart as the comet passes by.
  - C. The planet has a stronger gravitational field than the comet has, and the comet is pulled slightly toward the planet as it passes by.
  - D. The gravitational field of the planet pulls the comet, which does not have a gravitational field, toward the planet as the comet passes by.

Item Information	
Alignment	S8.D.3.1.2
Answer Key	C
Depth of Knowledge	2
p-value A	8%
p-value B	14%
p-value C	55% (correct answer)
p-value D	23%
Option Annotations	<p>A. Comets are much lighter and smaller than planets. The gravitational force of the planet pulls on the comet.</p> <p>B. The magnetic fields between comets and planets are not strong enough to affect their orbits.</p> <p>C. Key: The gravitational force of a planet can pull a comet slightly towards the planet as a comet passes by because planets are so much more massive than comets.</p> <p>D. Gravity is a force instead of a field. Also, comets do have a gravitational force, it is just much smaller than a planet's gravitational force.</p>

**Directions: Use the information presented on page 18 to answer questions 13 through 16.**

## Robotic Roaches

Scientists and engineers regularly study nature to develop new technology. The development of robotic insects has involved the use of high-speed videography to study the motion of insect wings during flight. This same technology is also being used in other laboratories to study the movement of cockroaches.



Scientists have observed cockroaches flattening their bodies to move through cracks no thicker than two stacked pennies. Studying the video images, scientists observed the cockroaches using sensory spines on their legs to push against the floor instead of using their feet. Even more amazing, the cockroaches' speed remained nearly the same as when they were on their feet. Scientists also studied the cockroaches' jointed exoskeleton. It is made up of both hard plates and flexible membranes, which allow changes to the cockroaches' body shape. Their smooth wings also reduce resistance in tight spaces. All of these observations led to the development of a cockroach bot that can compress and squeeze through extremely small places.



13. Scientists have observed that the American cockroach can run up to 1.5 m/sec. The average body length of the American cockroach is around 38 mm. Which statement **best** describes its speed relative to its body length?
- A. The cockroach runs 10 times its body length per second.
  - B. The cockroach runs 40 times its body length per second.
  - C. The cockroach runs 10 times its body length per minute.
  - D. The cockroach runs 40 times its body length per minute.

Item Information	
Alignment	S8.A.2.1.1
Answer Key	B
Depth of Knowledge	2
p-value A	30%
p-value B	36% (correct answer)
p-value C	19%
p-value D	15%
Option Annotations	<p>A. The ratio is much greater than 10 times its body length per second.</p> <p>B. Key: <math>1.5 \text{ m/s} / 0.038 \text{ m} = 39.47</math> times (about 40 times)</p> <p>C. The ratio would be larger on a “per minute” scale. The units in the item are provided in meters per second, not meters per minute.</p> <p>D. The ratio would be larger on a “per minute” scale. The units in the item are provided in meters per second, not meters per minute.</p>

14. Using cockroaches as living models, what technology are engineers trying to improve?

- A. miniaturized robotics
- B. disease control methods
- C. alternative power sources
- D. audio and visual recording devices

Item Information	
Alignment	S8.A.3.2.2
Answer Key	A
Depth of Knowledge	2
p-value A	61% (correct answer)
p-value B	10%
p-value C	10%
p-value D	19%
Option Annotations	<p>A. Key: The scientists are trying to improve the technological design of tools or vehicles that require fast and efficient movements.</p> <p>B. The work of the scientists is not related to disease control.</p> <p>C. The scientists are not using the cockroaches as an energy or power source.</p> <p>D. The scientists are not testing out the effectiveness of their audio and visual recording devices.</p>

15. How do the sensory spines **most likely** help the cockroach survive in its environment?
- A. They improve the cockroach's vision so it can see predators sooner.
  - B. They allow the cockroach to change its body shape to confuse predators.
  - C. They reduce the friction along the top of the cockroach so it can move faster than predators.
  - D. They allow the cockroach to move through small spaces where it is unable to use its feet to escape predators.

Item Information	
Alignment	S8.B.2.1.1
Answer Key	D
Depth of Knowledge	2
p-value A	12%
p-value B	11%
p-value C	17%
p-value D	60% (correct answer)
Option Annotations	<p>A. The sensory spines do not provide the cockroach with improved vision.</p> <p>B. The sensory spines do not change the body shape of the cockroach.</p> <p>C. The sensory spines are located on the cockroach's legs. Their main purpose is not to reduce friction along the top of the cockroach.</p> <p>D. Key: The sensory spines provide extra surfaces on the cockroach to push or spring off of objects without using its feet.</p>

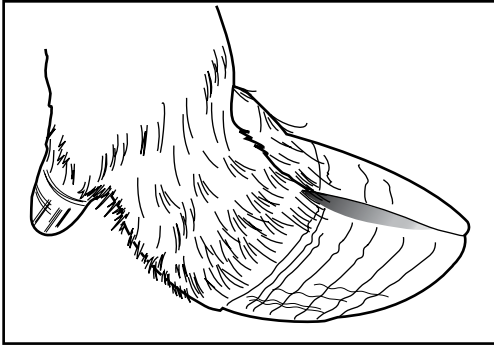
16. A scientist was studying cockroach movement through a small passage. The scientist attached sandpaper to the inside surfaces of the passage. Which variable was the scientist **most likely** trying to investigate?
- A. weight
  - B. friction
  - C. temperature
  - D. energy transfer

Item Information	
Alignment	S8.C.3.1.1
Answer Key	B
Depth of Knowledge	2
p-value A	8%
p-value B	75% (correct answer)
p-value C	6%
p-value D	11%
Option Annotations	<p>A. Attaching sandpaper inside the passage would not affect cockroach weight measurements.</p> <p>B. Key: Sandpaper has a coarse surface that would provide added friction against the cockroach's body.</p> <p>C. The sandpaper would have the same temperature as its surroundings.</p> <p>D. The presence of sandpaper inside the passage is not likely to help with tests on energy transfer.</p>

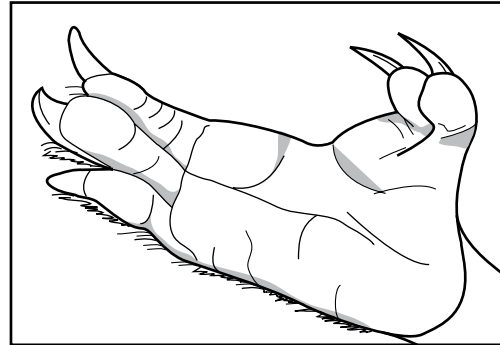
## OPEN-ENDED ITEM

17. The drawings below show the feet of two different animals.

Animal 1



Animal 2



Describe how the features of each animal's foot likely help the animal survive in its habitat.

**Animal 1:** \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

**Animal 2:** \_\_\_\_\_

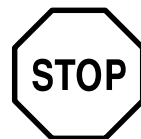
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\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

**AFTER YOU HAVE CHECKED YOUR WORK, CLOSE YOUR ANSWER BOOKLET AND TEST BOOKLET SO YOUR TEACHER WILL KNOW YOU ARE FINISHED.**



## Item-Specific Scoring Guideline

### #17 Item Information

Alignment	S8.B.1.1.1	Depth of Knowledge	3	Mean Score	1.27
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### Scoring Guide

Score	Description
2	<p>The response demonstrates a <i>thorough</i> understanding of how to describe the structures of living things that help them function effectively in specific ways (e.g., adaptations, characteristics) by</p> <ul style="list-style-type: none"> <li>describing how the features of <b>each</b> animal's foot likely help the animal survive in its habitat.</li> </ul> <p>The response is clear, complete, and correct.</p>
1	<p>The response demonstrates a <i>partial</i> understanding of how to describe the structures of living things that help them function effectively in specific ways (e.g., adaptations, characteristics) by</p> <ul style="list-style-type: none"> <li>describing how the features of <b>one</b> animal's foot likely help that animal survive in its habitat.</li> </ul> <p>The response may contain some work that is incomplete or unclear.</p>
0	<p>The response provides <i>insufficient</i> evidence to demonstrate any understanding of the concept being tested.</p>

**Note: No deductions should be taken for misspelled words or grammatical errors.**

**Responses that will receive credit (responses are not limited to these examples):**

#### Animal 1 (1 point):

- This type of foot, a hoof, helps the animal balance on uneven ground.
- This type of foot, a hoof, helps keep the animal from sinking into wet or muddy ground.

#### Animal 2 (1 point):

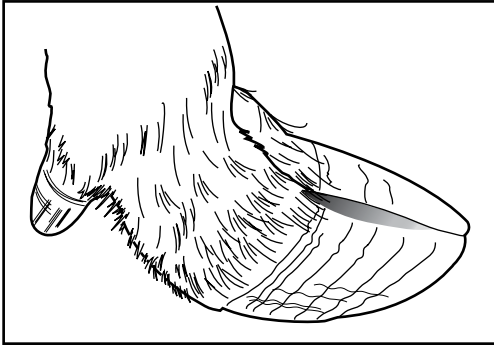
- This foot is designed for gripping with three digits in the front and two in the back.
- This foot has sharp claws that help with climbing.
- This foot has thick pads that help with protection and gripping while climbing.
- The two opposable thumbs on this foot help provide a secure grip on objects such as branches when climbing.

## STUDENT RESPONSE

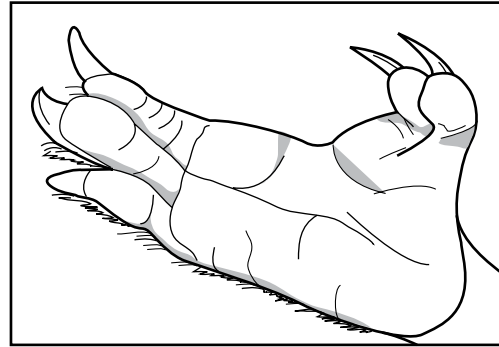
Response Score: 2 points

17. The drawings below show the feet of two different animals.

Animal 1



Animal 2



Describe how the features of each animal's foot likely help the animal survive in its habitat.

**Animal 1:** The hoof will help the animal dig into the ground and run. If the animal needs to get away fast it will be able to run without slipping over mud or rocks. The thick fur will help the animal keep warm during cold times.

**Animal 2:** This animal's hand-like feet will help it climb and run away quick. The sharp claws will also be used for protection against other predators. Its hand-like feet will also make it easier to gather food like leaves and wild berries & insects. The hair on the finger will also help the animal keep a little warm.

This response demonstrates a thorough understanding of how to describe the structures of living things that help them function effectively in specific ways. In Part A, the response provides several correct descriptions of how Animal 1's foot likely helps the animal survive in its habitat (*The hoof will help the animal dig into the ground, it will be able to run without slipping over mud or rocks, The thick fur will help the animal keep warm*). In Part B, the response provides several correct descriptions of how Animal 2's foot likely helps the animal survive in its habitat (*This animal's hand-like feet will help it climb, The sharp claws will also be used for protection against predators, The hair on the finger will also help the animal keep a little warm*). The response is clear, complete, and correct.

## STUDENT RESPONSE

Response Score: 1 point



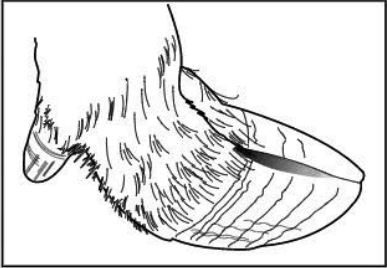
PART A

Question 17  
Page 1 of 2

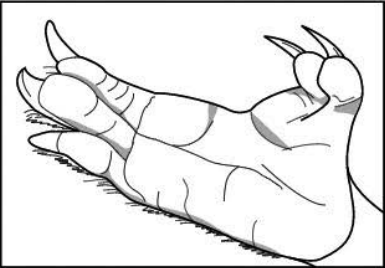
Item ID ?

The drawings below show the feet of two different animals.

**Animal 1**



**Animal 2**



Describe how the features of each animal's foot likely help the animal survive in its habitat.

**Animal 1:**

This animals foot may not help survive because it does not have any protection like claws.

90 / 1000

Review/End Test Pause Flag Options Next



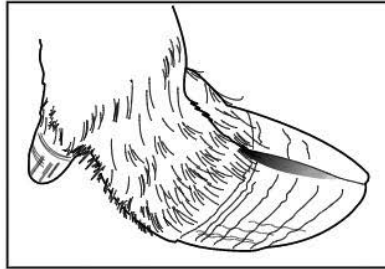
Question 17  
Page 2 of 2



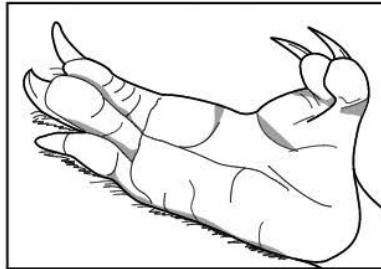
Item ID ?

The drawings below show the feet of two different animals.

**Animal 1**



**Animal 2**



Describe how the features of each animal's foot likely help the animal survive in its habitat.

**Animal 2:**

EQ

Claws can defend the animal. It may help catch it's prey and be a protection to fight of predators.

99 / 1000

Review/End Test

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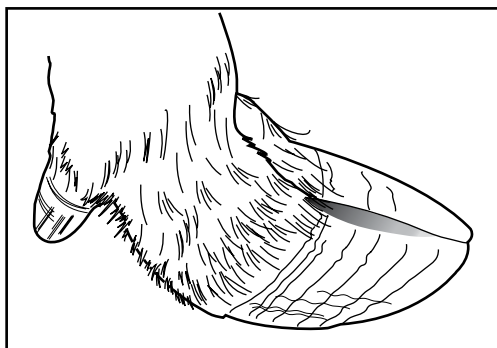
The response demonstrates a partial understanding of how to describe the structures of living things that help them function effectively in specific ways. In Part A, the response (*This animals foot may not help survive because it does not have any protection like claws*) does not describe how Animal 1's foot likely helps the animal survive in its habitat and receives no credit. In Part B, the response provides correct descriptions of how Animal 2's foot likely helps the animal survive in its habitat (*claws can defend the animal, [claws] may help catch it's prey and be a protection to fight of predators*).

## STUDENT RESPONSE

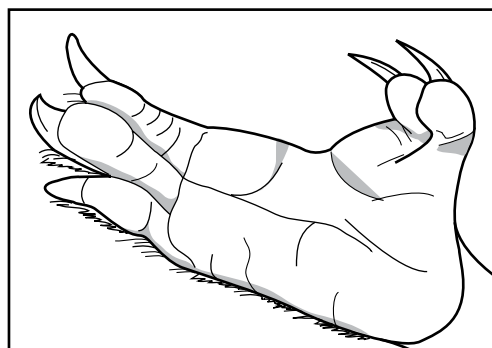
Response Score: 0 points

17. The drawings below show the feet of two different animals.

Animal 1



Animal 2



Describe how the features of each animal's foot likely help the animal survive in its habitat.

Animal 1: \_\_\_\_\_

If the animals foot has sharp claws they  
can climb.

Animal 2: \_\_\_\_\_

If they have a hard surfaced foot they  
might shake or draw out some prey just  
by walking.

The response provides insufficient evidence to demonstrate any understanding of how to describe the structures of living things that help them function effectively in specific ways. In Part A, the response (*If the animals foot has sharp claws they can climb*) does not describe how Animal 1's foot likely helps the animal survive in its habitat and receives no credit. In Part B, the response (*If they have a hard surfaced foot they might shake or draw out some prey just by walking*) does not describe how Animal 2's foot likely helps the animal survive in its habitat and receives no credit.

## OPEN-ENDED ITEM

18. Use the drawing below to answer the question.

Club Soda



**Ingredients**

- carbonated water
- sodium bicarbonate (salt)
- sodium chloride (salt)
- potassium sulfate (salt)

When club soda is made, carbon dioxide ( $\text{CO}_2$ ) is forced into the drink solution, making it carbonated, or fizzy. The drink solution contains water and salts. If the lid of the soda is not tightly closed, it loses its carbonation.

**Part A:** Identify club soda as an **element**, **compound**, or **mixture**.

---

**Part B:** Explain the classification of club soda identified in **Part A**.

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**AFTER YOU HAVE CHECKED YOUR WORK, CLOSE YOUR ANSWER BOOKLET AND TEST BOOKLET SO YOUR TEACHER WILL KNOW YOU ARE FINISHED.**



## Item-Specific Scoring Guideline

## #18 Item Information

Alignment	S8.C.1.1.1	Depth of Knowledge	3	Mean Score	0.78
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## Scoring Guide

Score	Description
2	<p>The response demonstrates a <i>thorough</i> understanding of the differences among elements, compounds, and mixtures by</p> <ul style="list-style-type: none"> <li>identifying club soda as an element, compound, or mixture</li> </ul> <p><b>and</b></p> <ul style="list-style-type: none"> <li>explaining the classification of club soda.</li> </ul> <p>The response is clear, complete, and correct.</p>
1	<p>The response demonstrates a <i>partial</i> understanding of the differences among elements, compounds, and mixtures by</p> <ul style="list-style-type: none"> <li>identifying club soda as an element, compound, or mixture</li> </ul> <p><b>or</b></p> <ul style="list-style-type: none"> <li>explaining the classification of club soda.</li> </ul> <p>The response may contain some work that is incomplete or unclear.</p>
0	<p>The response provides <i>insufficient</i> evidence to demonstrate any understanding of the concept being tested.</p>

**Note:** No deductions should be taken for misspelled words or grammatical errors.

## Responses that will receive credit:

## Part A (1 point):

- club soda is a mixture

## Part B (1 point):

- Club soda is a mixture because it is composed of different ingredients that are physically combined.
- Club soda is a mixture because it is composed of different ingredients that are not chemically combined.
- Club soda is a mixture because it can be physically separated into its different ingredients.
- Club soda is a mixture because each of the ingredients maintains its own properties.
- Club soda is a mixture because it is a combination of ingredients that does not produce a new substance with different properties.

**Scoring Note:** Students can describe an investigation that separates components by a physical means (e.g., evaporation, filtration) and receive credit for explaining their classification. The response must show a clear understanding that the process only physically separates the components and does not change the chemical properties.

## STUDENT RESPONSE

Response Score: 2 points




PART A

Question 18  
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Item ID ?

Use the drawing below to answer the question.

**Club Soda**



**Ingredients**

- carbonated water
- sodium bicarbonate (salt)
- sodium chloride (salt)
- potassium sulfate (salt)

When club soda is made, carbon dioxide ( $\text{CO}_2$ ) is forced into the drink solution, making it carbonated, or fizzy. The drink solution contains water and salts. If the lid of the soda is not tightly closed, it loses its carbonation.

**Part A:** Identify club soda as an **element**, **compound**, or **mixture**.

Club soda is a mixture.


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Question 18  
Page 2 of 2

Use the drawing below to answer the question.

**Club Soda**



**Ingredients**

- carbonated water
- sodium bicarbonate (salt)
- sodium chloride (salt)
- potassium sulfate (salt)

When club soda is made, carbon dioxide ( $\text{CO}_2$ ) is forced into the drink solution, making it carbonated, or fizzy. The drink solution contains water and salts. If the lid of the soda is not tightly closed, it loses its carbonation.

**Part B:** Explain the classification of club soda identified in **Part A**.

Although club soda contains many compounds such as  $\text{CO}_2$  and salts, it is a mixture because all of the ingredients are put together physically, not chemically.

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This response demonstrates a thorough understanding of the differences among elements, compounds, and mixtures. In Part A, the response correctly identifies club soda as a mixture (*Club soda is a mixture*). In Part B, the response explains the classification of club soda (*it is a mixture because all of the ingredients are put together physically, not chemically*). The response is clear, complete, and correct.

## STUDENT RESPONSE

Response Score: 1 point

18. Use the drawing below to answer the question.

Club Soda



## Ingredients

- carbonated water
- sodium bicarbonate (salt)
- sodium chloride (salt)
- potassium sulfate (salt)

When club soda is made, carbon dioxide ( $\text{CO}_2$ ) is forced into the drink solution, making it carbonated, or fizzy. The drink solution contains water and salts. If the lid of the soda is not tightly closed, it loses its carbonation.

**Part A:** Identify club soda as an **element**, **compound**, or **mixture**.

mixture

**Part B:** Explain the classification of club soda identified in **Part A**.

There are many ingredients mixed together to create the drink, which classifies it as a mixture. The ingredients could be separated if certain things are done.

This response demonstrates a partial understanding of the differences among elements, compounds, and mixtures. In Part A, the response correctly identifies club soda as a mixture (*mixture*). In Part B, the response (*The ingredients could be separated if certain things are done*) does not fully explain the classification of club soda. It does not specify a physical separation and receives no credit.

## STUDENT RESPONSE

Response Score: 0 points




PART A

Question 18  
Page 1 of 2

Item ID ?

Use the drawing below to answer the question.

**Club Soda**



**Ingredients**

- carbonated water
- sodium bicarbonate (salt)
- sodium chloride (salt)
- potassium sulfate (salt)

When club soda is made, carbon dioxide ( $\text{CO}_2$ ) is forced into the drink solution, making it carbonated, or fizzy. The drink solution contains water and salts. If the lid of the soda is not tightly closed, it loses its carbonation.

**Part A:** Identify club soda as an **element**, **compound**, or **mixture**.

compound

8/1000


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Question 18  
Page 2 of 2

Use the drawing below to answer the question.

**Club Soda**



**Ingredients**

- carbonated water
- sodium bicarbonate (salt)
- sodium chloride (salt)
- potassium sulfate (salt)

When club soda is made, carbon dioxide ( $\text{CO}_2$ ) is forced into the drink solution, making it carbonated, or fizzy. The drink solution contains water and salts. If the lid of the soda is not tightly closed, it loses its carbonation.

**Part B:** Explain the classification of club soda identified in **Part A**.

Club soda contains a bunch of elements combined together to make a new substance, therefore making it a compound.

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The response provides insufficient evidence to demonstrate any understanding of the differences among elements, compounds, and mixtures. In Part A, the response (*compound*) does not correctly identify club soda as a mixture and receives no credit. In Part B, the response (*Club soda contains a bunch of elements combined together*) does not correctly explain the classification of club soda and receives no credit.

## SAMPLE ITEM SUMMARY

## MULTIPLE-CHOICE

Sample Number	Alignment	Answer Key	Depth of Knowledge	p-values A	p-values B	p-values C	p-values D
1	S8.A.1.1.2	C	2	9%	12%	66%	13%
2	S8.A.1.2.4	C	2	19%	23%	51%	7%
3	S8.A.2.2.1	D	2	9%	24%	18%	49%
4	S8.A.3.1.2	C	2	19%	26%	35%	20%
5	S8.A.3.1.4	D	2	20%	13%	29%	38%
6	S8.A.3.1.5	D	2	20%	5%	7%	68%
7	S8.A.3.2.1	A	2	64%	12%	14%	10%
8	S8.A.3.3.2	D	3	8%	19%	29%	44%
9	S8.C.2.2.2	C	2	21%	18%	50%	11%
10	S8.D.1.3.1	A	2	44%	22%	23%	11%
11	S8.D.2.1.3	B	2	12%	47%	23%	18%
12	S8.D.3.1.2	C	2	8%	14%	55%	23%
13	S8.A.2.1.1	B	2	30%	36%	19%	15%
14	S8.A.3.2.2	A	2	61%	10%	10%	19%
15	S8.B.2.1.1	D	2	12%	11%	17%	60%
16	S8.C.3.1.1	B	2	8%	75%	6%	11%

## OPEN-ENDED

Sample Number	Alignment	Points	Depth of Knowledge	Mean Score
17	S8.B.1.1.1	2	3	1.27
18	S8.C.1.1.1	2	3	0.78