

# New Jersey NJSLA Grade 8 Science Practice

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STUDENT NAME \_\_\_\_\_  
(please print)

Grade

8

# New Jersey Student Learning Assessment—Science (NJSLA—S) Practice Test

FORM  
A

Grade 8



# Unit 1 Practice Test

**Directions:**

Today you will take Unit 1 of the Grade 8 New Jersey Student Learning Assessment - Science (NJSLA-S) Test.

Follow the directions to answer each question. Mark your answers by completely filling in the circles in your answer document. **Only answers you provide in your answer document will be scored.** Do not make any pencil marks outside the circles in your answer document. If you need to change an answer, be sure to erase your first answer completely.

If a question asks you to show or explain your work, you must do so to receive full credit. Write your response in the space provided in your answer document. Only responses written within the provided space will be scored.

If you do not know the answer to a question, you may go on to the next question. If you finish early, you may review your answers and any questions you did not answer in this unit **ONLY**. Do not go past the stop sign.



1. Students observe a worm creeping along the edge of a sidewalk at a very slow pace. One student claims that movement in multicellular organisms requires the interaction of body systems. Explain this claim.

Complete the sentences by choosing the correct answer from each box.

Nervous tissues **Y** different parts of the body. As a result, muscular tissues **Z**, causing the worm to move.

**Box Y**

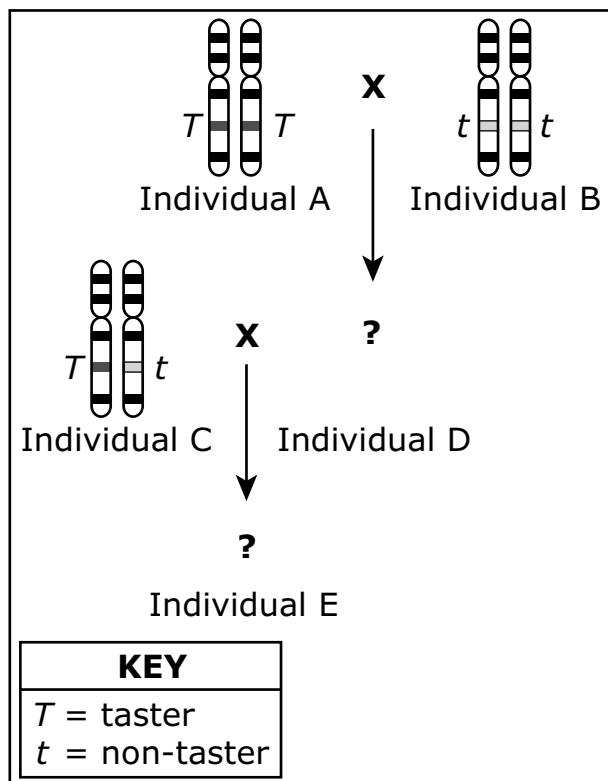
- A. extend and contract
- B. remove wastes from
- C. send messages to
- D. pump blood to

**Box Z**

- A. extend and contract
- B. remove wastes
- C. send messages
- D. pump blood

Use the information below to answer questions 2–4.

Some people are able to taste a certain bitter chemical, and others are not. Figure 1 shows the alleles that different individuals have for this dominantly inherited trait.

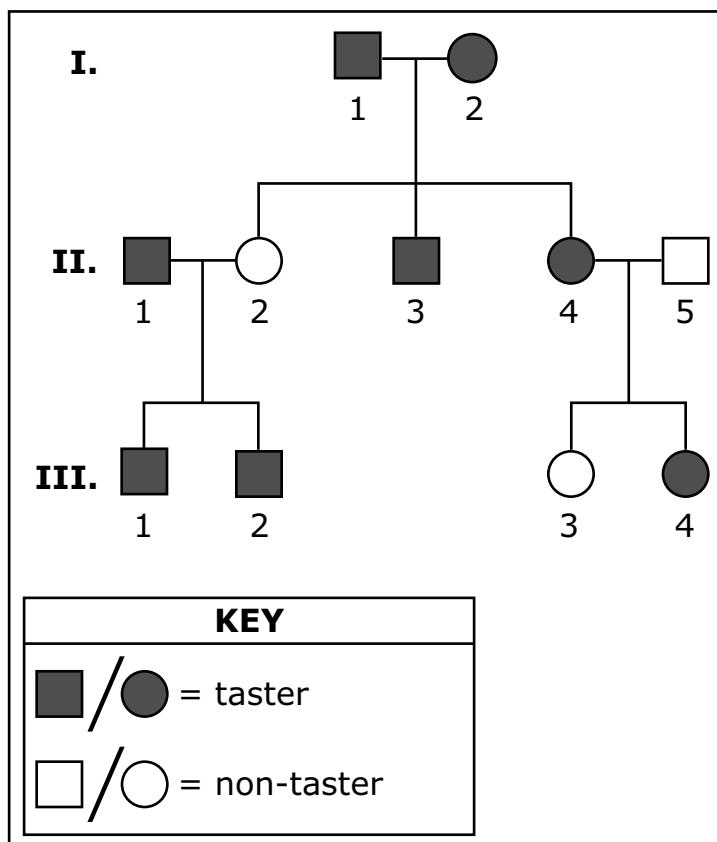


**Figure 1. Bitter-Taste Alleles in One Family**

Individuals A and B are the parents of Individual D. Individuals C and D are the parents of Individual E.

- 2.** Based on Figure 1, what is the probability of Individual E being able to taste the bitter chemical?
- A.** 0%
- B.** 25%
- C.** 50%
- D.** 75%

3. Figure 2 shows whether the members of a second family are able to taste the bitter chemical. Which family members are definitely heterozygous<sup>1</sup> for the ability to taste the bitter chemical?



**Figure 2. Inheritance of the Bitter-Taste Trait in a Second Family**

<sup>1</sup>heterozygous—having different alleles for a trait

(Item 3 continued)

Select **six** of the eight options.

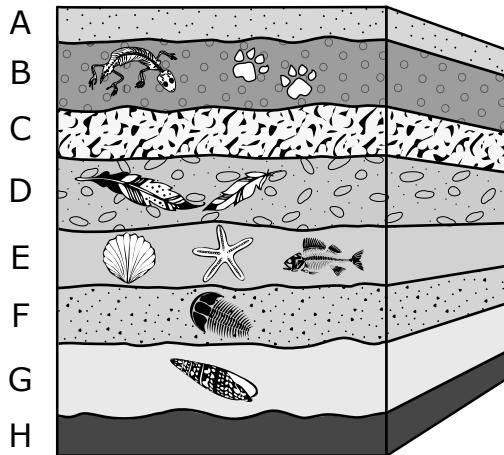
- A. Individual I-1
  - B. Individual I-2
  - C. Individual II-1
  - D. Individual II-3
  - E. Individual II-4
  - F. Individual III-1
  - G. Individual III-2
  - H. Individual III-4
4. A student writes an explanation about the bitter-taste alleles and proteins found in the individuals represented in Figure 1. However, the student makes a couple of mistakes. Which statements contain the student's mistakes?

Select **two** of the six statements.

- A. Individual A and Individual B each have only one copy of the bitter-taste gene.
- B. Individual A and Individual B each make only one form of the protein encoded by the bitter-taste gene.
- C. Because Individual A and Individual B make different forms of the protein, one of them tastes the bitter chemical and the other does not.
- D. However, Individual C has a different allele for the bitter-taste gene on each chromosome.
- E. This causes Individual C's body to make two different forms of the bitter-taste protein.
- F. The protein made from the *t* allele is what causes Individual C to taste the bitter chemical.

Use the information below to answer questions 5–7.

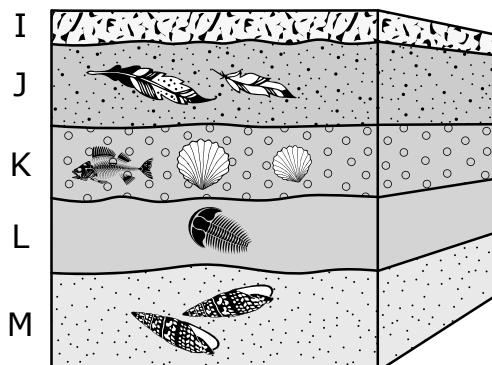
Figure 1 shows the rock layers and fossils found in a particular outcropping.<sup>1</sup>



**Figure 1. Outcropping 1**

<sup>1</sup>outcropping.—a rock formation that is visible from Earth's surface

5. Figure 2 shows the rock layers and fossils in a second outcropping.



**Figure 2. Outcropping 2**

Explain the similarities and differences you see in the samples.

Complete the sentences by choosing the correct answer from each box.

Layer **W** and Layer **X** are the same age. Each layer contains the same type of **Y** because they formed during **Z** time periods.

**Box W**

- A.** B
- B.** D

**Box X**

- A.** J
- B.** L

**Box Y**

- A.** fossils
- B.** rocks

**Box Z**

- A.** different
- B.** similar

6. For each of the rock layers from Figure 1 that are listed, determine whether the evidence shows that the land was covered by water during its formation, whether the evidence shows that the land was exposed to air during its formation, or whether there is not enough evidence to support either claim.

Choose the correct answer for each layer.

**Layer B**

- A. Supports that the land was covered by water
- B. Supports that the land was exposed to air
- C. Not enough evidence to support either claim

**Layer C**

- A. Supports that the land was covered by water
- B. Supports that the land was exposed to air
- C. Not enough evidence to support either claim

**Layer D**

- A. Supports that the land was covered by water
- B. Supports that the land was exposed to air
- C. Not enough evidence to support either claim

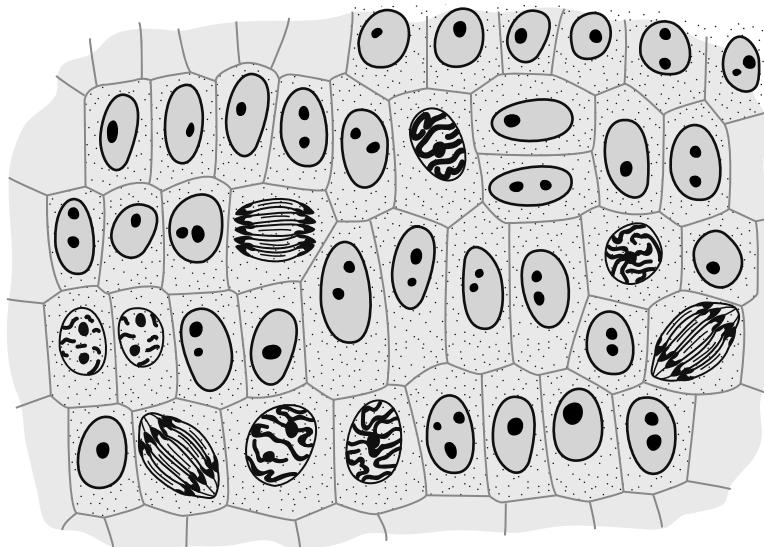
**Layer E**

- A. Supports that the land was covered by water
- B. Supports that the land was exposed to air
- C. Not enough evidence to support either claim

7. Which list correctly arranges the given rock layers from the oldest layer to the youngest layer?

- A. Layer B (oldest) → Layer D → Layer E → Layer G (youngest)
- B. Layer G (oldest) → Layer D → Layer E → Layer B (youngest)
- C. Layer B (oldest) → Layer E → Layer D → Layer G (youngest)
- D. Layer G (oldest) → Layer E → Layer D → Layer B (youngest)

8. A student claims that onions are not living things. The student places a small section of onion root on a microscope slide to view it at a larger magnification. Using the microscope, the student is able to see details of the onion root that are not visible to the naked eye as shown in Figure 1.



**Figure 1. Onion Root Cells**

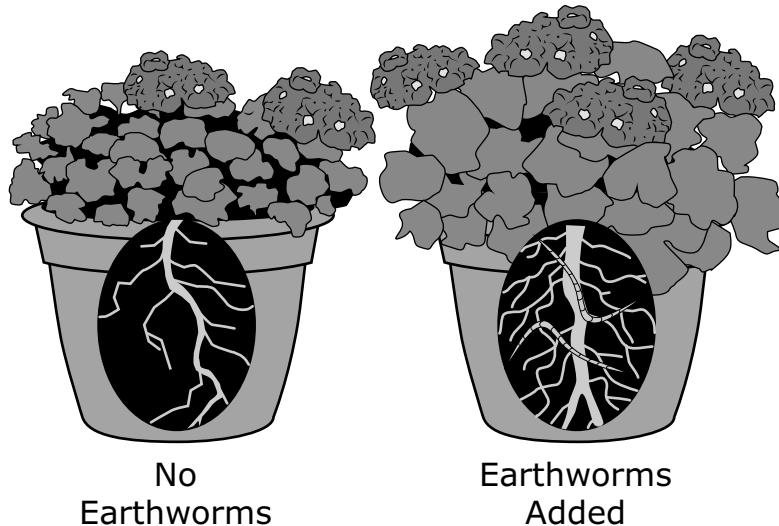
Based on the microscope slide, which statements disprove the student's claim?

Select **two** of the five statements.

- A. Onion cells use energy.
- B. Onions respond to stimuli.
- C. Onion roots are made up of cells.
- D. Onions engage in movement.
- E. Onion cells are able to reproduce.

**Use the information below to answer questions 9 and 10.**

As some students are planting flowers, they notice several earthworms in the soil. One student wonders if earthworms are beneficial to the growth of plants. The student decides to test this by performing an investigation. The student plants identical flowering plants in two containers with potting soil. The treatment for the plants is the same, except that six earthworms are added to one container. Figure 1 shows the plants after 65 days of growth.

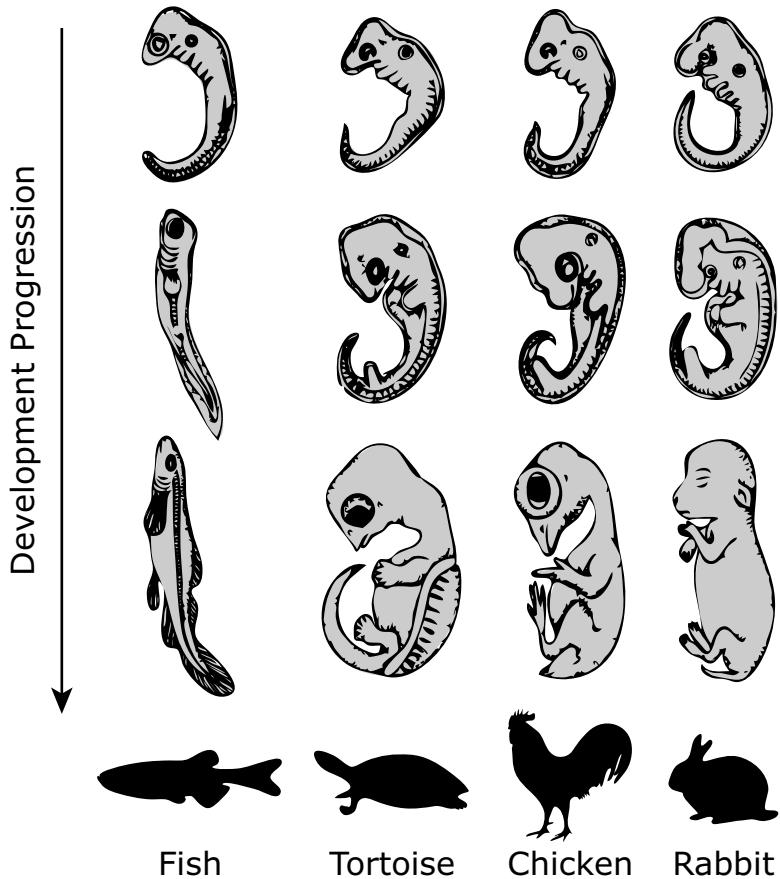
**Figure 1. Plants after 65 Days**

The plant in the pot with earthworms appears to be healthier. The student describes it as having larger leaves, a thicker stem, a more upright stem, more root hairs, and longer roots than the plant in the container without the earthworms.

9. Based on the investigation, the student group decides to add a large number of earthworms to their flower garden. Which statement **best** explains whether these data are being applied correctly?
- A. The garden is a less stable system, and the results can be easily duplicated.
  - B. The garden is a more stable system, and the results cannot be easily duplicated.
  - C. The variables are similar, and you can expect the same results in the potted plant and the flower garden without collecting more data.
  - D. The variables are different, so you cannot expect the same results in the potted plant and the flower garden without collecting more data.
10. Based on the observations regarding matter and energy flow in the containers, the student describes the role of the earthworm in the ecosystem created in the investigation. Which description **best** explains the role of earthworms in the ecosystem?
- A. consumers, because they eat organisms that would compete with plants for beneficial nutrients
  - B. producers, because they use energy from the Sun to produce nutrients that are needed by plants
  - C. decomposers, because they break down substances in the soil that provide nutrients for plants
  - D. scavengers, because they can survive in soils that have very few nutrients and still remain healthy

Use the information below to answer questions 11 and 12.

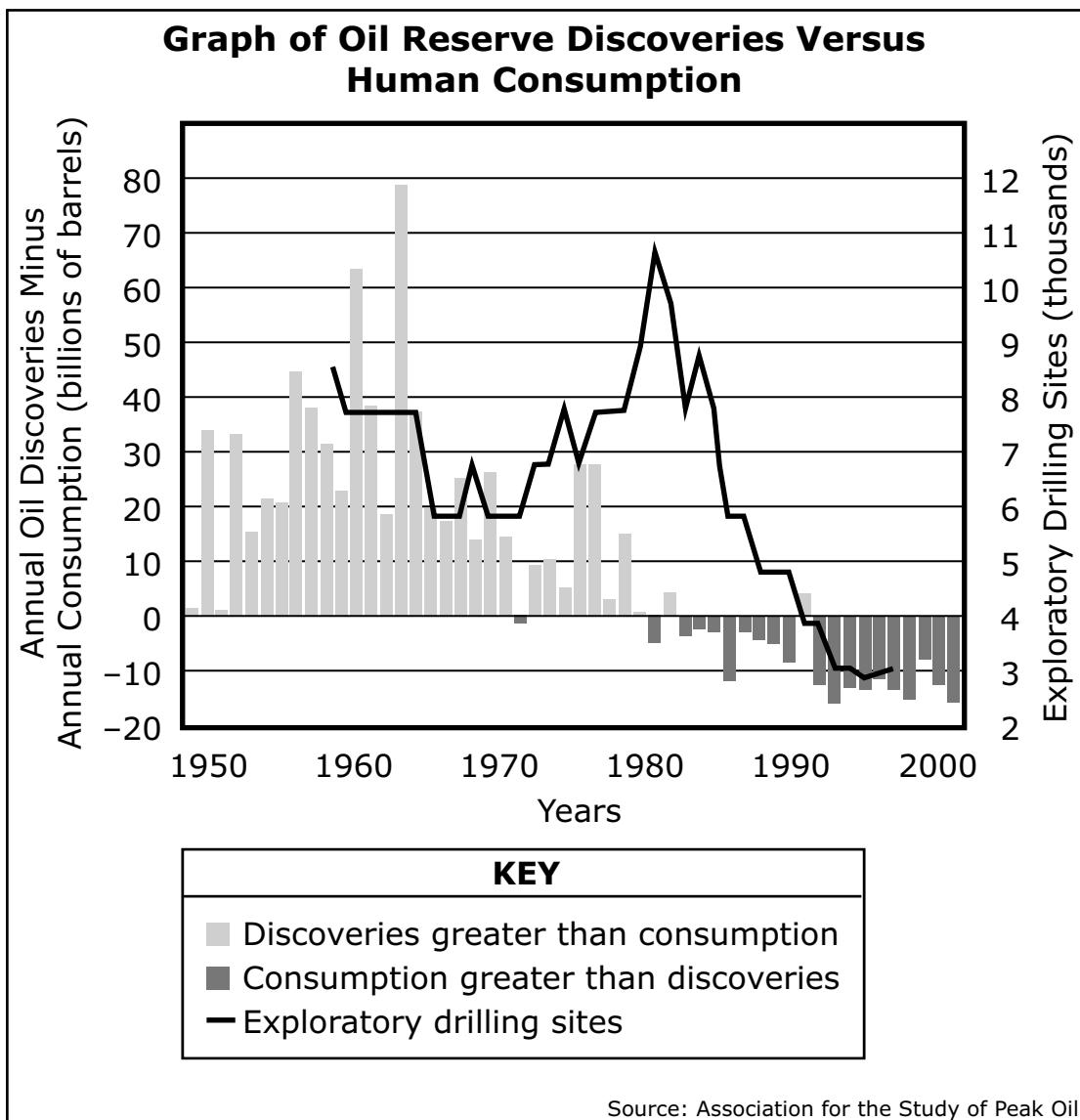
Figure 1 shows embryo development for four organisms.



**Figure 1. Embryo Development**

- 11.** Which statement can **best** be supported by Figure 1?
- A. Chickens are more closely related to tortoises than rabbits are.
  - B. Rabbits, chickens, tortoises, and fish are equally related to each other.
  - C. Fish do not share a common ancestor with other vertebrates.
  - D. Fish and chickens are the least closely related.
- 12.** Which question can **best** be answered by the data in Figure 1?
- A. How long does it take different organisms to develop into adults?
  - B. Do diverse organisms follow a similar progression of development?
  - C. Do modern organisms follow the same development progression as ancient organisms?
  - D. Which characteristics at each developmental stage increase an organism's chance of survival?

13. Figure 1 shows the relationship between the discovery of new oil reserves and human consumption of oil.



**Figure 1.**

Construct an explanation of the change in oil reserves beyond the year 2000 using the data in Figure 1.

Complete the sentences by choosing the correct answer from each box.

(Item 13 continued)

Based on the data in the graph, discoveries of new oil reserves beyond the year 2000 **X**. Oil is a **Y** resource, which means the supply replenishes **Z** than human demand.

**Box X**

- A.** decrease
- B.** increase

**Box Y**

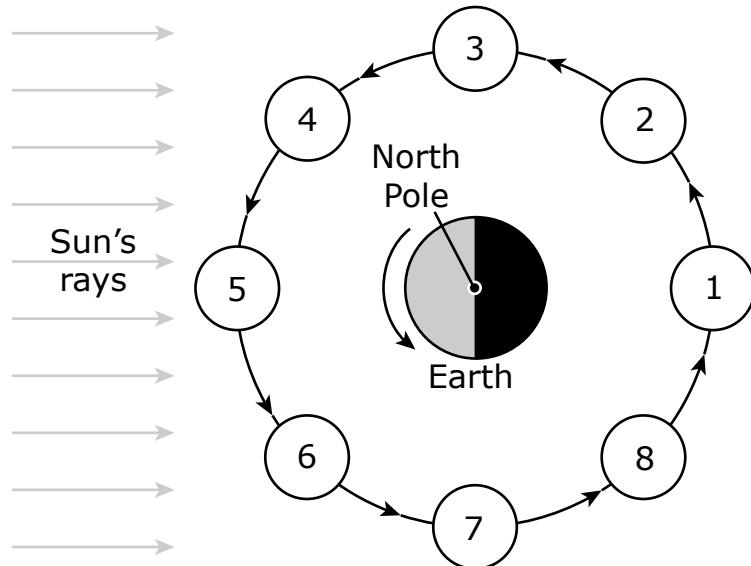
- A.** renewable
- B.** nonrenewable

**Box Z**

- A.** more quickly
- B.** more slowly

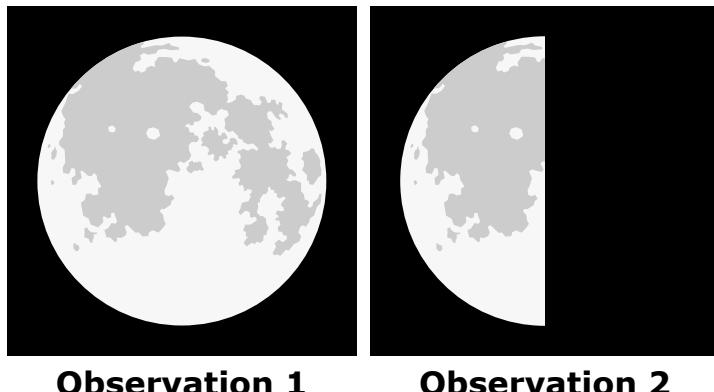
Use the information below to answer questions 14–16.

Figure 1 shows a model of the Sun, Earth, and Moon system.



**Figure 1. Sun, Earth, and Moon System**

- 14.** Students observed the phases of the Moon on two nights during a month. Their observations are shown in Figure 2.

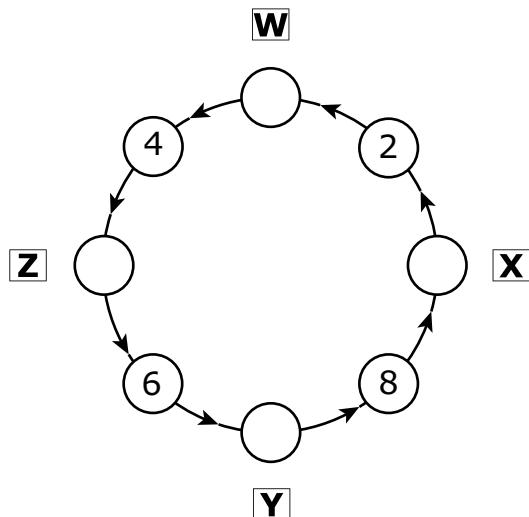


**Figure 2. Observations of the Moon  
on Different Nights in the Same Month**

Which statement uses the model in Figure 1 to correctly explain the change that occurred between Observation 1 and Observation 2 in Figure 2?

- A.** Earth rotated, so the dark side of the planet was facing Position 3 rather than Position 1.
- B.** Earth rotated, so the dark side of the planet was facing Position 7 rather than Position 1.
- C.** The Moon moved from Position 1 to Position 3, which caused the Sun to shine on parts of the Moon that people on Earth cannot see.
- D.** The Moon moved from Position 1 to Position 7, which caused Earth to block the sunlight and make the Moon appear dark.

15. Based on the position of the Sun and Earth in Figure 1, determine where the full, new, first-quarter, and third-quarter moons are located in Figure 3.



**Figure 3. Moon Phases**

Complete the diagram by choosing the correct answer from each box.

**Box W**

- A. new moon
- B. full moon
- C. first-quarter moon
- D. third-quarter moon

**Box X**

- A. new moon
- B. full moon
- C. first-quarter moon
- D. third-quarter moon

(Item 15 continued)

**Box Y**

- A. new moon
- B. full moon
- C. first-quarter moon
- D. third-quarter moon

**Box Z**

- A. new moon
- B. full moon
- C. first-quarter moon
- D. third-quarter moon

16. A student observes the Moon when it is in Position 2 of Figure 1. Help the student create a table that shows the position the Moon will be in after the specified number of days have passed.

Number of Days Passed	Moon's Position
8	X
22	Y
36	Z

Complete the table by choosing the correct answer from each box.

**Box X**

- A. Position 3
- B. Position 4
- C. Position 5
- D. Position 6

**Box Y**

- A. Position 6
- B. Position 7
- C. Position 8
- D. Position 1

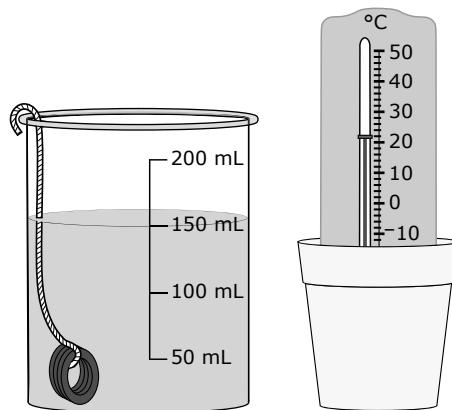
**Box Z**

- A. Position 1
- B. Position 2
- C. Position 3
- D. Position 4

**Use the information below to answer questions 17–20.**

A student observed that the outside of a cup got warmer when it was filled with a hot beverage. The student then performed an investigation to observe the effect a hot object would have on room-temperature water.

- The student started by placing a thermometer and 30 milliliters (mL) of water inside a cup.
- The student also boiled 150 mL of water in a beaker and then removed the beaker from the heat source.
- The student then tied metal washers to a string and took their temperature to ensure they were at room temperature by placing a thermometer on the metal washers.
- The student then lowered the washers into the beaker of water as shown in Figure 1.



**Figure 1. Investigation Setup**

The student left the washers in the beaker of water for 15 minutes and then carefully removed them. The student placed a thermometer on the metal to take the temperature before adding them to the cup of water. The student lowered the washers into the water in the cup.

- 17.** Based on the experiment in the passage, select the statement that accurately describes the increase or decrease of the kinetic energy of the particles.
- A.** The kinetic energy of the particles will increase in the washers after being placed in the cup of water.
  - B.** The kinetic energy of the particles will increase in the water that is in the beaker as it is being heated.
  - C.** The kinetic energy of the particles will decrease in the washers after being placed in the beaker of water.
  - D.** The kinetic energy of the particles will remain the same in the water that is in the beaker as it is being heated.

- 18.** The molecules that make up the different materials in the passage have different kinetic energies.

Select the answer that provides the correct order of the samples from greatest kinetic energy of the molecules at the top of the list to least kinetic energy at the bottom.

- A.** water in the beaker after it comes to a boil  
water in the cup after the washer is added  
water in the cup before the washer is added
- B.** water in the cup after the washer is added  
water in the beaker after it comes to a boil  
water in the cup before the washer is added
- C.** water in the cup before the washer is added  
water in the beaker after it comes to a boil  
water in the cup after the washer is added
- D.** water in the cup after the washer is added  
water in the cup before the washer is added  
water in the beaker after it comes to a boil

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19. This item has two parts. First, answer Part A. Then answer Part B.

The student used Table 1 to record the temperatures of the washers and of the water in the cup after the washers were placed in the cup. However, the student forgot to label the table.

**Part A**

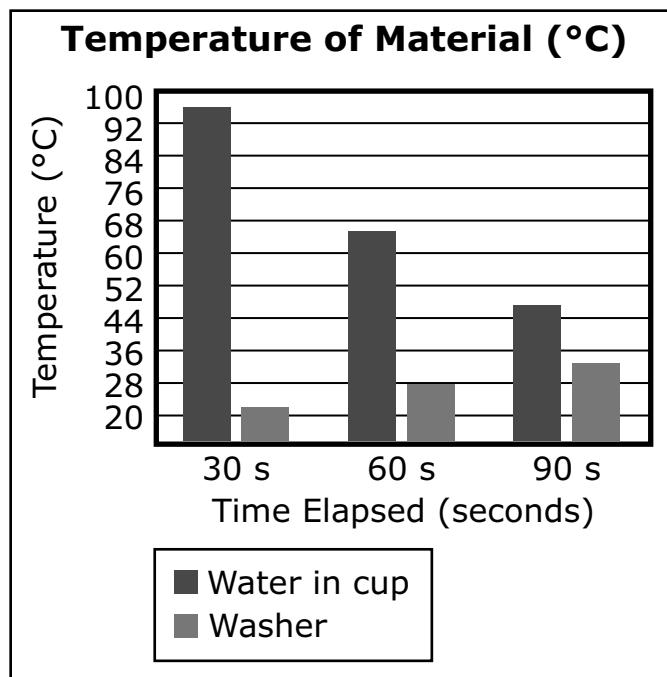
Select the bar graph that correctly shows the temperatures that represent each material in Table 1.

**Table 1. Temperature Data**

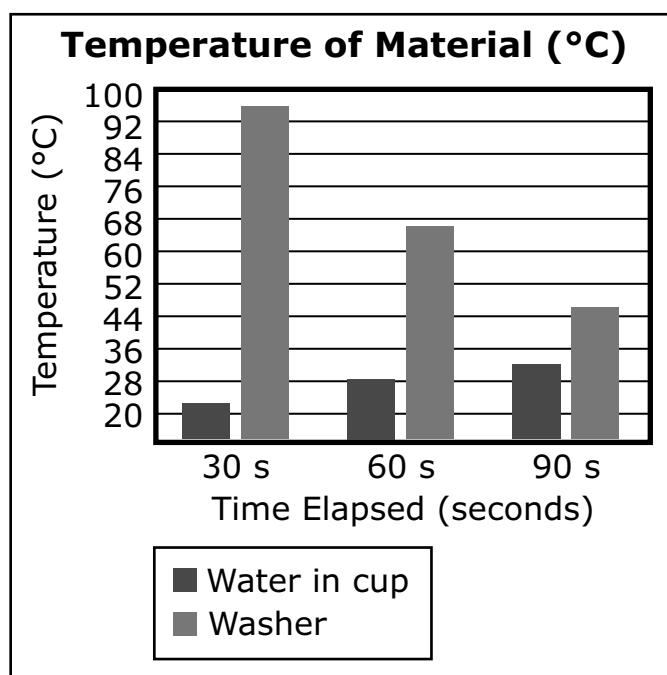
<b>Material</b>	<b>Temperature (°C)</b>		
	<b>30 s</b>	<b>60 s</b>	<b>90 s</b>
?	96	66	46
?	22	28	32

(Item 19 continued)

A.

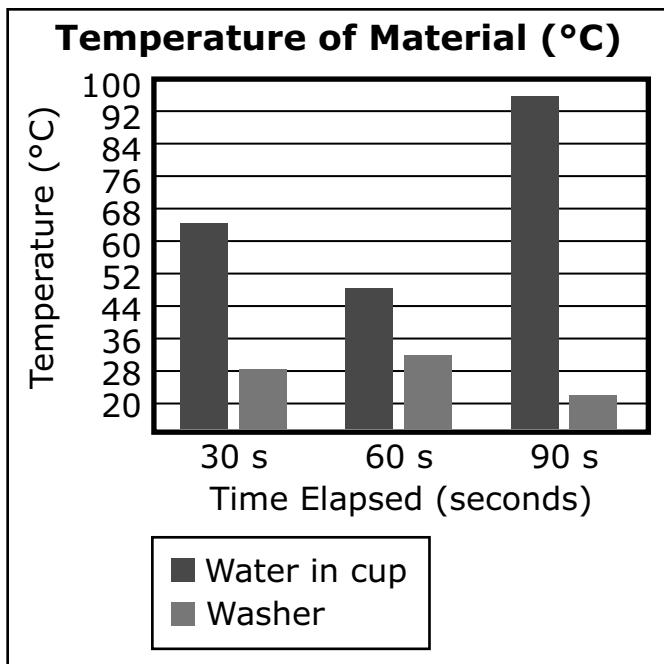


B.

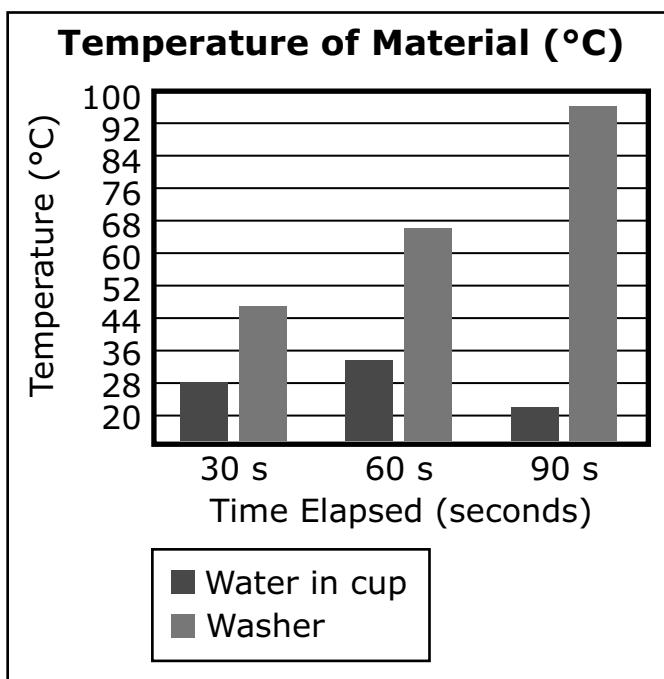


(Item 19 continued)

C.



D.



(Item 19 continued)

### Part B

Using the information provided, determine what will happen as the experiment goes longer than 90 seconds.

Complete the sentences by choosing the correct answer from each box.

As the experiment goes longer than 90 seconds, the temperature of the water in the cup will **X**, and the temperature of the washers will **Y**. This will continue **Z**.

#### Box X

- A. increase
- B. decrease
- C. stay the same

#### Box Y

- A. increase
- B. decrease
- C. stay the same

#### Box Z

- A. until the temperatures are the same
- B. but the temperatures will never be equal

**20.** The student repeats the experiment but fills the cup with 60 mL of water instead of 30 mL.

- Predict what will happen in the experiment.
- Explain why the predicted result would likely occur.

Be sure to discuss the motion of molecules and the transfer of energy.

**Enter your response in your answer document. Support your answer with evidence from the data.**



# Unit 2 Practice Test

**Directions:**

Today you will take Unit 2 of the Grade 8 New Jersey Student Learning Assessment - Science (NJSLA-S) Test.

Follow the directions to answer each question. Mark your answers by completely filling in the circles in your answer document. **Only answers you provide in your answer document will be scored.** Do not make any pencil marks outside the circles in your answer document. If you need to change an answer, be sure to erase your first answer completely.

If a question asks you to show or explain your work, you must do so to receive full credit. Write your response in the space provided in your answer document. Only responses written within the provided space will be scored.

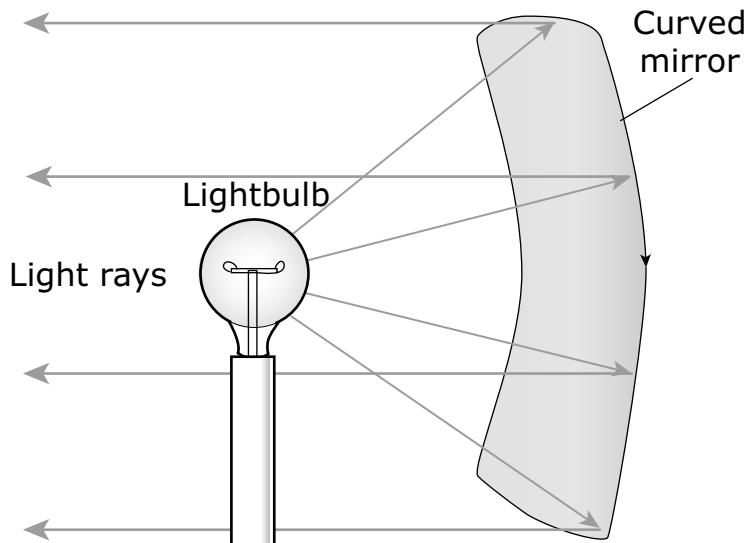
If you do not know the answer to a question, you may go on to the next question. If you finish early, you may review your answers and any questions you did not answer in this unit **ONLY**. Do not go past the stop sign.



Use the information below to answer questions 1–3.

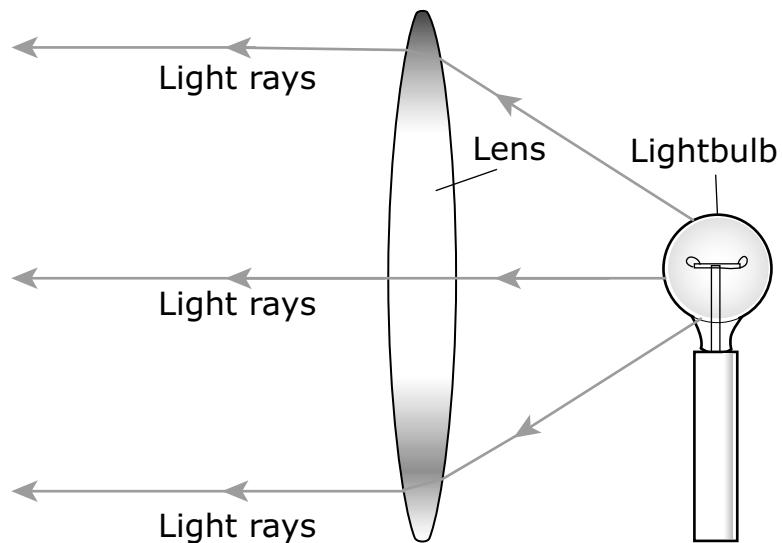
Lighthouses provide light to ships navigating the ocean.

Lighthouse technology in the late 1800s included curved mirrors, as shown in Figure 1, to direct light toward ships at sea.



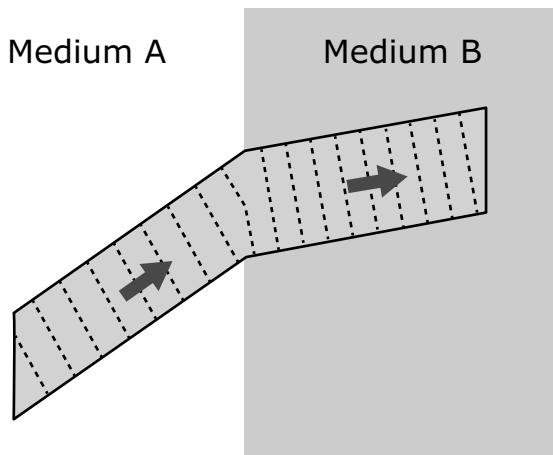
**Figure 1. Lighthouse Projection Method  
Used in the Late 1800s**

Modern lighthouse technology projects light by using lenses like the one shown in Figure 2.



**Figure 2. Modern Lighthouse Projection Method**

When a ray of light passes from one medium to another, as shown in Figure 3, it undergoes some changes.



**Figure 3. Path of Light**

1. Figure 1 demonstrates how lighthouses in the 1800s directed bright light toward ships.

Complete the sentence by choosing the correct answer from each box.

In the projection method shown in Figure 1, light waves travel **X** until they **Y** the surface of the **Z**.

**Box X**

- A.** through a vacuum
- B.** in straight lines

**Box Y**

- A.** bend upon entering
- B.** reflect off
- C.** are absorbed by

**Box Z**

- A.** lightbulb
- B.** air
- C.** mirror

2. Figure 2 shows one model of light projection.

The answer to which question **most accurately** clarifies the role of the lens in Figure 2?

- A.** Does the lens transmit or reflect light waves?
- B.** Does the lens change the color of the light waves?
- C.** How far out at sea can light waves be seen using lenses?
- D.** How does the lens transfer matter from one side to the other?

3. Foghorns are another method of warning ships that they are close to the shore. Foghorns emit low-pitched sound waves in all directions that can be heard on ships when visibility is low. Low-pitched waves have longer wavelengths that are less likely to be blocked by barriers such as rocks.

Compare the warning signals emitted by a lighthouse with those emitted by a foghorn.

Select all the correct answers. You may select more than one answer for each scenario.

**Lighthouse:**

- A. The signal is transmitted by compression and expansion of air particles.
- B. The signal system is designed to focus the wave in a specific direction.
- C. The signal transmits energy.

**Foghorn:**

- A. The signal is transmitted by compression and expansion of air particles.
- B. The signal system is designed to focus the wave in a specific direction.
- C. The signal transmits energy.

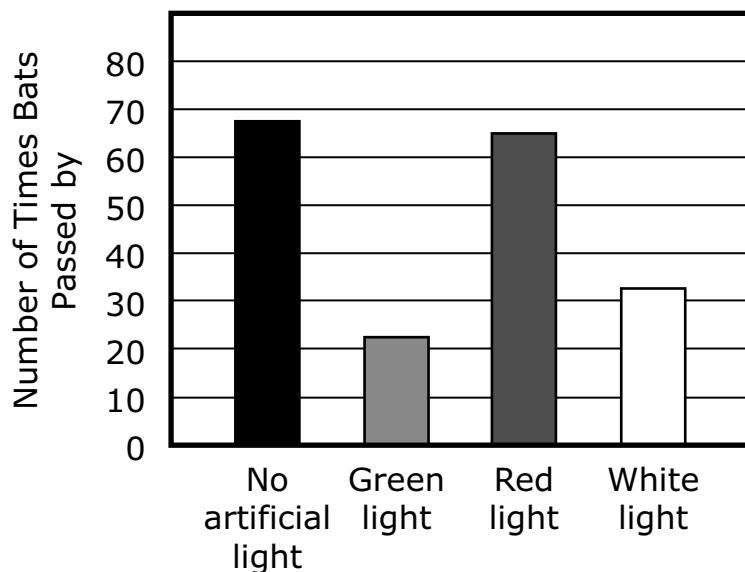
**Use the information below to answer questions 4–7.**

Bat activity can be affected by artificial lighting.

Because bats often rest during the day and hunt at night, they use their sense of hearing to help locate prey in the dark.

A hunting bat emits high-pitched sound waves that reflect off insects. The external structure of the bat's ear, which is composed of cartilage, funnels the reflected sound waves to the inner ear. The bat's brain then identifies the location of an insect based on the amount of time it takes for the reflected sound waves to reach the bat's ears.

A group of researchers set up a study using white, green, and red lights in an otherwise dark natural habitat. The researchers measured the activity of two types of bats by recording the number of times a bat passed by. The researchers took measurements for five days in both early summer and late summer for four years. Their results are shown in the graph.

**Effect of Colored Lights on Bat Activity****Figure 1.**

Based on the information about bats, two students construct claims about the body systems a bat uses when it hunts.

**Student 1:** A bat's nervous system tells the bat where its prey is located. Then the bat's muscular system allows the bat to fly and catch the prey.

**Student 2:** A bat uses its respiratory system to produce sounds. Then the bat's nervous system tells the bat where the prey is located.

4. Which question can **best** be answered by analyzing the data in Figure 1?
- A. Why are bats not attracted by green light?
  - B. Can bats distinguish a green grasshopper from a red ant at night?
  - C. Are bats likely to be affected by green lights and red lights shining together?
  - D. What color light should be used to observe bat activity without affecting their behavior?
5. Identify the independent variable in this investigation and the body system that would be **most** affected by this factor.

Complete the sentences by choosing the correct answer from each box.

The independent variable in this investigation is the **Y**. The investigation provided evidence that the bats' **Z** is reacting to a stimulus and affecting the behavior of the bats.

**Box Y**

- A. type of bat
- B. observed activity
- C. color of light

**Box Z**

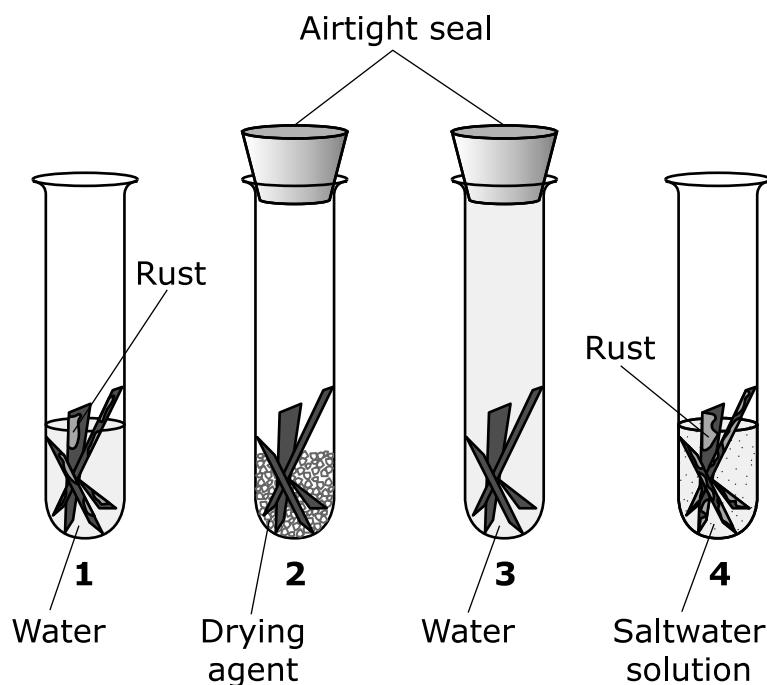
- A. muscular system
- B. nervous system
- C. circulatory system

6. Which statement **best** compares the claims of the two students?
- A. Student 2's claim explains how ears send information to the brain, and Student 1's claim explains how the brain sends messages to the muscles for immediate action.
  - B. Student 2's claim explains how the brain is not needed to process information, and Student 1's claim explains how muscle memory is used to capture prey.
  - C. Student 1's claim explains how the brain stores memories, and Student 2's claim explains how these memories are used to locate prey.
  - D. Student 1's claim explains how the brain reacts to sounds, and Student 2's claim explains how these sounds are stored as memories.
7. A city council proposes adding light fixtures that produce white light to roads and parking lots in one area of a community. A student claims that the action will result in an increase in the population of insects in the area. Which scientific reasoning **best** supports the student's claim?
- A. Bats will be more visible in white light, allowing insects to evade them.
  - B. Insects will be likely to hide from white light, preventing bats from preying on them.
  - C. Bats will travel to different areas to avoid the white lights, so the bats will eat fewer insects in the area.
  - D. Larger prey will be more visible in the white lights than insects will, which will lead bats to change their diet.

**Use the information below to answer questions 8–12.**

A student is investigating why some parts of a bicycle rusted when left outside. The student learned that the rusted parts of the bike were made of iron.

In the investigation, the student places small pieces of iron into four test tubes, each test tube having different variables. Figure 1 shows variables and observations after 10 days.



**Figure 1. Rust Investigation**

To better understand the process of rusting, the student researched the characteristics of samples of iron and rust. The information is shown in Table 1.

**Table 1. Characteristics of Iron and Rust**

Characteristic	Iron	Rust
<b>Physical state at room temperature</b>	Solid	Solid
<b>Density (g/cm<sup>3</sup>)<sup>1</sup></b>	7.87	5.24
<b>Mass of sample (g)</b>	250	167
<b>Melting point (°C)</b>	1,535	1,539

<sup>1</sup>g/cm<sup>3</sup>—grams per cubic centimeter

8. Based on Figure 1, which data is the student trying to produce by conducting the investigation?
- A. the components that produce rust
  - B. the types of metal that rust the fastest
  - C. the amount of rust that forms every 10 days
  - D. the amount of mass lost during the rusting process
9. Based on Figure 1, identify which test tubes show evidence of a chemical reaction.

Complete the sentence by choosing the correct answer from each box.

Evidence of a chemical reaction is shown in **Y** because the iron pieces **Z**.

**Box Y**

- A. test tube 1 only
- B. test tube 4 only
- C. both test tubes 1 and 4

**Box Z**

- A. formed a new shape
- B. changed in temperature
- C. formed a new substance

- 10.** The elements Iron (Fe) and Oxygen (O) are found in a molecule of rust. Based on Figure 1, describe the atoms and molecules in the reactants and product of the rust reaction.

Complete the sentences by choosing the correct answer from each box.

The types of atoms found in the reactants and products are **X**. During the reaction, the atoms form **Y** molecules. The number of atoms in the reactants will be **Z** the number of atoms in the product.

**Box X**

- A.** the same
- B.** different

**Box Y**

- A.** identical
- B.** different

**Box Z**

- A.** equal to
- B.** less than
- C.** greater than

- 11.** Two groups of students made claims about why the iron parts of a bicycle would rust when left outdoors near the ocean. Based on Figure 1, identify which student group was correct for each claim.

Select one option for each claim.

**Claim A**

- A.** Group 1: A bicycle will rust only when the air is salty.
- B.** Group 2: A bicycle will rust more quickly when the air is salty.

**Claim B**

- A.** Group 1: A bicycle will rust outdoors because water and oxygen are in the atmosphere.
- B.** Group 2: A bicycle will rust outdoors because only oxygen is in the atmosphere.

12. Based on Table 1, identify the properties that provide evidence that iron and rust are not the same substance.

Complete the table by choosing the correct answer from each box.

Properties	Evidence or Not Evidence
Physical state at room temperature	W
Density	X
Mass	Y
Melting point	Z

**Box W**

A. Evidence

B. Not Evidence

**Box X**

A. Evidence

B. Not Evidence

**Box Y**

A. Evidence

B. Not Evidence

**Box Z**

A. Evidence

B. Not Evidence

**Use the information below to answer questions 13–16.**

The number of diamondback terrapin nests is dropping in Jamaica Bay on Long Island, New York.



© Apwan/Shutterstock.com

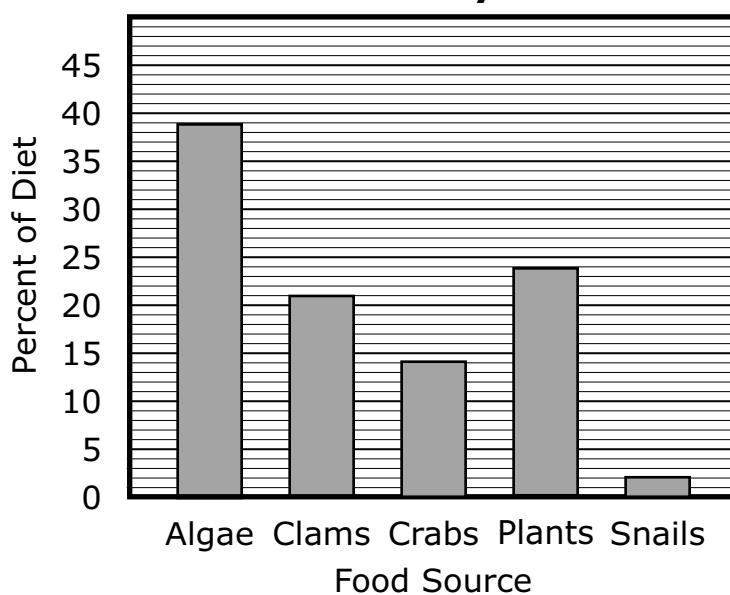
**Figure 1. Diamondback Terrapin**

Diamondback terrapins, shown in Figure 1, are a species of turtle that are part of the Jamaica Bay ecosystem. Terrapins use their hind legs to dig a hole in the sand, deposit their eggs, and cover them up again to make a nest. Researchers following the same group of 1,200 female terrapins observed that the number of nests has dropped by 50% over the last 10 years.

The loss of marshland in Jamaica Bay and increased pollution from human activities have led to high levels of nitrogen in the water. This increase in nitrogen promotes the growth of algae. The terrapins eat the algae instead of their normal diet of aquatic plants, snails, clams, and crabs. Algae is lower in protein and difficult for the terrapins to digest.

Researchers analyzed terrapin feces to determine what the terrapins in Jamaica Bay ate. Figure 2 shows the frequency of prey items in the feces of Jamaica Bay diamondback terrapins.

**Diet of Diamondback Terrapins in Jamaica Bay**



**Figure 2.**

13. This item has two parts. First, answer Part A. Then answer Part B.

**Part A**

Scientists also studied a population of diamondback terrapins that live in Oyster Bay, about forty miles north of Jamaica Bay. Table 1 lists the items in the terrapins' diet in approximately one month.

**Table 1. Diet of Terrapins in Oyster Bay**

Item	Amount in Diet (g)
Algae	24
Clams	19
Crabs	20
Plants	28
Snails	29
Total	120

Based on Figure 2 and Table 1, what is the difference between the percentage of algae in the diet of Jamaica Bay terrapins and the percentage of algae in the diet of Oyster Bay terrapins?

- A. 5%
- B. 15%
- C. 19%
- D. 20%

(Item 13 continued)

### Part B

What conclusion about the two ecosystems can be drawn based on this information?

Complete the sentences by choosing the correct answer from each box.

The percentage of algae in the diet of Oyster Bay terrapins is **Y** than the percentage of algae in the diet of Jamaica Bay terrapins. This suggests that the Oyster Bay ecosystem **Z** than the Jamaica Bay ecosystem.

#### Box Y

A. less

B. greater

#### Box Z

A. has a larger area

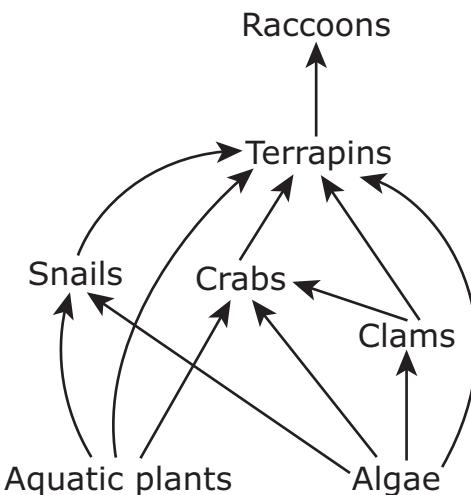
B. contains more pollution

C. is healthier for terrapins

**14.** Which statement **best** explains why the number of terrapin nests decreased in Jamaica Bay?

- A. The algae reduced the amount of sunlight that reaches terrapins, so the terrapins have less energy for reproduction.
- B. The increased proportion of algae in the terrapins' diet does not provide as much of the nutrients needed for reproduction.
- C. Decreased amounts of nutrients in the ecosystem have meant that there are fewer female terrapins to carry out reproduction.
- D. Reproduction remained the same, but the increased presence of algae caused the terrapins to move their nests to the marshland.

15. Figure 3 shows a partial food web for Jamaica Bay.



**Figure 3. Partial Food Web for Jamaica Bay**

Which statements **best** predict the effects on the Jamaica Bay food web if nothing is done to stop pollution from entering the Jamaica Bay ecosystem?

Select **two** of the five statements.

- A. Raccoons will become extinct.
- B. Clam and crab populations will need to find other food sources.
- C. The snail population will increase due to more available resources.
- D. The terrapin population will decrease due to a lack of appropriate resources.
- E. The diversity of aquatic plants will increase due to a change in the health of the ecosystem.

- 16.** Researchers suggest introducing a non-native algae consumer to the Jamaica Bay ecosystem. Which statements represent benefits associated with the introduction of this non-native species?

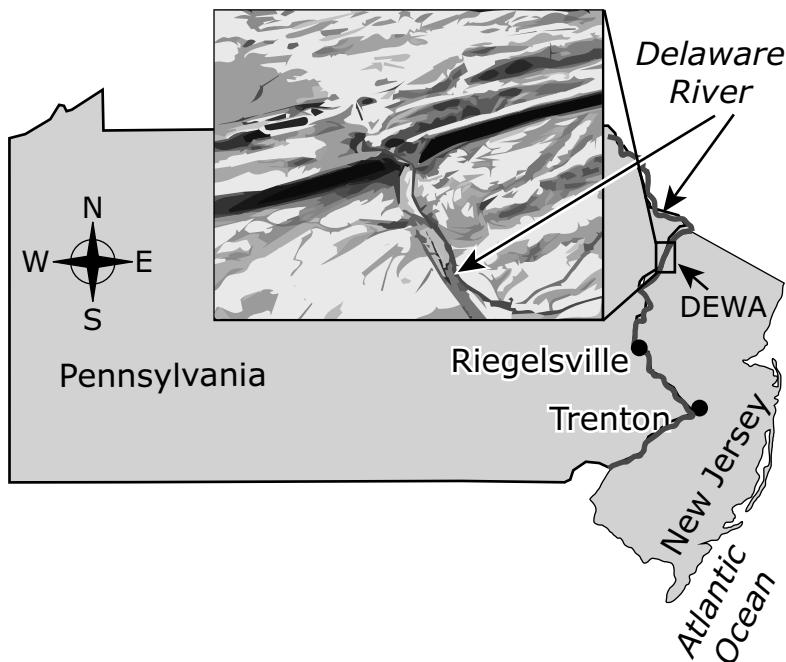
Select **three** of the five statements.

- A.** The new consumer will eat the same prey as terrapins.
- B.** The new consumer will attract new predators to the ecosystem.
- C.** The new consumer will reduce the amount of algae in Jamaica Bay.
- D.** The new consumer will force terrapins to eat more clams, crabs, plants, and snails.
- E.** The new consumer will improve water clarity and allow aquatic plants to receive more sunlight.

Use the information below to answer questions 17–20.

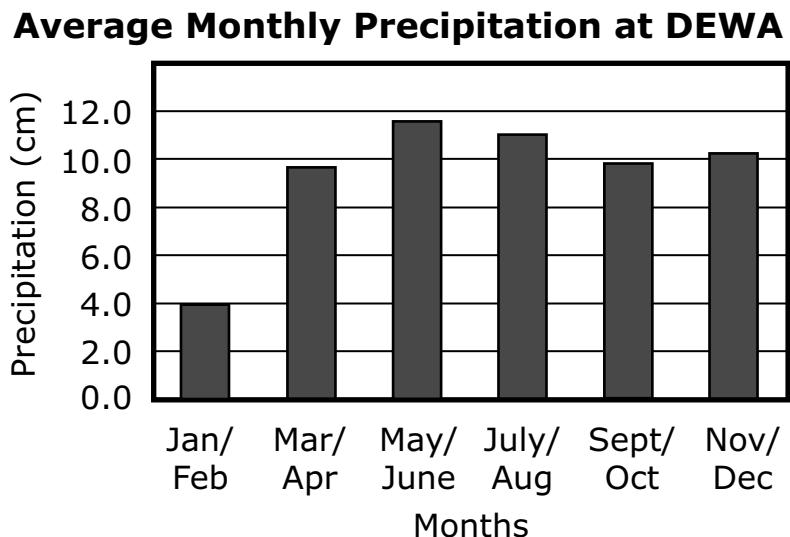
The water cycle affects the composition of soil.

A student and family plan a trip to the Delaware Water Gap National Recreation Area (DEWA). Before leaving on the trip, the student researches DEWA and finds that a “water gap” refers to an area where a river cuts through a mountain. The location of the recreation area with a cut-away image of the Delaware Water Gap is shown in Figure 1.



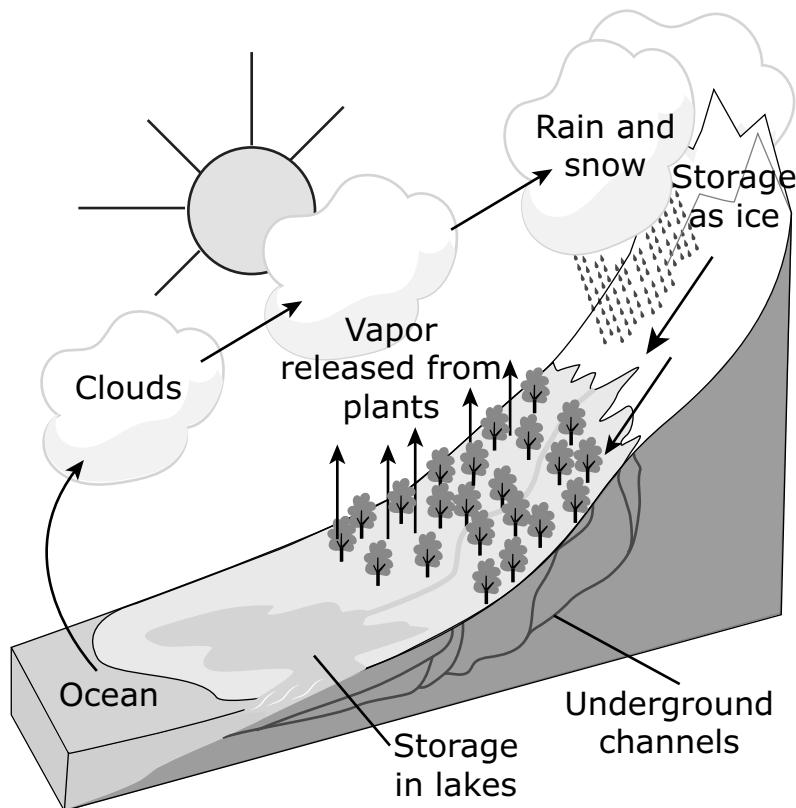
**Figure 1. Delaware Water Gap National Recreation Area and Water Gap**

Figure 2 shows annual amounts of precipitation at DEWA.



**Figure 2.**

The student constructed the model in Figure 3 to demonstrate the effects of temperature on the water cycle.



**Figure 3. Water Cycle Model**

- 17.** Identify the type of data shown in Figure 2 and predict when the amount of weathering and erosion at DEWA would be expected to be the highest.

Complete the sentences by choosing the correct answer from each box.

The data shown in Figure 2 are an example of **X** data. The amount of weathering and erosion at DEWA would be expected to be highest in **Y**. This is because precipitation causes **Z** in the rate of weathering and erosion.

**Box X**

- A.** qualitative
- B.** quantitative

**Box Y**

- A.** Jan/Feb
- B.** May/June
- C.** July/Aug

**Box Z**

- A.** an increase
- B.** a decrease
- C.** no change

- 18.** Use Figure 3 to describe the water cycle.

Complete the sentences by choosing the correct answer from each box.

Figure 3 shows that, at sea level, where air temperatures are the highest, **X** of water occurs. Figure 3 also shows that freezing temperatures can cause **Y**, which with gravity, often leads to water falling to the ground as solid precipitation. Then as **Z**, the water moves across the surface, eventually flowing into the lake and the ocean.

**Box X**

- A.** condensation
- B.** evaporation
- C.** runoff

**Box Y**

- A.** crystallization
- B.** runoff
- C.** transpiration

**Box Z**

- A.** condensation
- B.** crystallization
- C.** runoff

- 19.** Table 1 shows the percentages of the minerals quartz and gypsum in samples from five collection sites. Site 1 is north of the DEWA. Sites 2–5 are south of the DEWA, with Sites 4 and 5 being located near the city of Trenton.

**Table 1. Percentages of Minerals**

Site	Quartz (%)	Gypsum (%)
1	0.00	0.00
2	8.56	0.67
3	35.08	1.01
4 and 5 Average	45.16	1.33

Based on this information, the student claims that the results of erosion caused by the Delaware River will be greatest near Trenton. Which **two** pieces of evidence best support the student's claim?

Select **two** of the five statements.

- A.** Sites 1–3 had lower percentages of gypsum than of quartz.
- B.** Trenton is closer to the Delaware Water Gap than the other sites.
- C.** Trenton is a larger city than the other sites, which may cause a greater amount of erosion.
- D.** The data show higher percentages of gypsum and quartz the closer the samples are to Trenton.
- E.** Trenton lies downstream of the DEWA, where sediments from erosion may exist in greater amounts.

20. Scientists collected erosion and weathering data from three collection sites in the Delaware River. The average of the total suspended rock and soil sediments is a measure of erosion, and the total dissolved solids is a measure of weathering. The data are shown in Table 2.

**Table 2. Erosion and Weathering Data**

Collection Station	Average Total Suspended Rock and Soil Sediments (tons/km <sup>2</sup> /year)	Average Total Dissolved Solids (tons/km <sup>2</sup> /year)
DEWA	11.47	16.94
Riegelsville	30.24	77.99
Trenton	41.71	86.34

Use Figure 1 to explain the data shown in Table 2. In your response, be sure to do the following:

- describe the trend in the data shown in Table 2.
- explain one factor that could be the cause of the trend in the data.

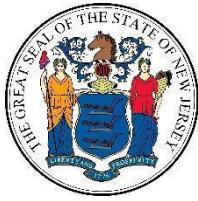
**Enter your response in your answer document. Support your answer with evidence from the data.**

Use Figure 1 to explain the data shown in Table 2. In your response, be sure to do the following:

- identify what information is needed to determine if this factor explains the trend in the data.
- explain how this information would be interpreted.

**Enter your response in your answer document. Support your answer with evidence from the data.**





## NJSLA-S Practice Test Answer and Alignment Document

### Science: Grade 8 – Unit 1

#### Item 1

**Domain:** Life Science

**Phenomenon:** Movement in earthworms (multicellular organisms) requires interaction between the nervous system and the muscular system.

#### Item 1

**UIN:** 818053<sup>1</sup>

**Item Type:** Technology Enhanced

**Standards Alignment:** DCI: LS1.A; SEP: CEDS; CCC: S & SM

**Screen Reader (SR)/Assistive Technology (AT)/Paper Key:** Box Y: C; Box Z: A

**Key:** A correct response will look like this:

Nerve cells send messages to different parts of the body. As a result, muscular tissues extend and contract, causing the worm to move.

**Rationale:** The nervous system, which consists of nerve cells, is responsible for coordinating all the actions of an organism by sending signals to all its body systems, including the muscular system.

#### Items 2–4

**Domain:** Life Science

**Phenomenon:** An individual's chance of expressing an inherited trait is dependent on the alleles passed on from its parents.

#### Item 2

**UIN:** 818103\_01

**Item Type:** Technology Enhanced

**Standards Alignment:** DCI: LS3.A; SEP: UMCT; CCC: S, P, and Q

**SR/AT/Paper Key:** D

**Key:** A correct response will look like this:

The probability of Individual E being able to taste the bitter chemical is 75%.

**Rationale:** Based on the genotypes of Individuals A and B, Individual D will have the *Tt* genotype. Therefore, both parents of Individual E will have the *Tt* genotype. This means that Individual E has a three of four chance of inheriting at least one *T* allele, which would cause Individual E to have the bitter-taste trait.

<sup>1</sup> The UIN (Unique Identification Number) can be used to find an item in the New Jersey Digital Item Library (<https://nj.digitalitemlibrary.com/>)

### Item 3

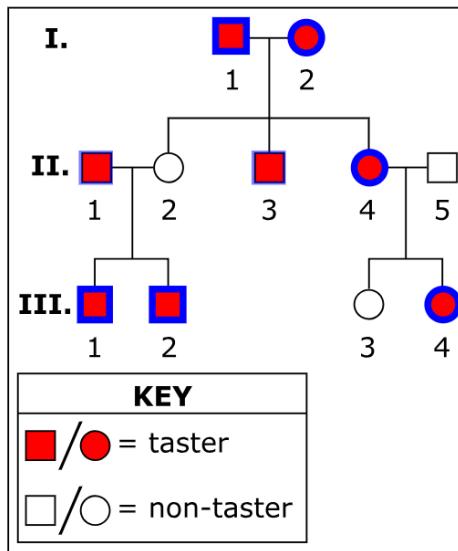
UIN: 818103\_02

Item Type: Technology Enhanced

Standards Alignment: DCI: LS3.A; SEP: AID; CCC: PAT

SR/AT/Paper Key: A, B, E, F, G, and H

Key: Individuals I-1, I-2, II-4, III-1, III-2, and III-4 should be selected. A correct response will look like this:



**Figure 2. Inheritance of the Bitter-Taste Trait in a Second Family**

**Rationale:** The ability to taste the bitter chemical is a dominant trait, so non-tasters must inherit two copies of the non-tasting allele from their parents. Individuals I-1, I-2, and II-4 are all tasters who have at least one child who is a non-taster. That means each of these individuals must carry a copy of the recessive allele that they passed on to their children. Individuals III-1, III-2, and III-4 are tasters who have one parent who is a non-taster. That means that each of these individuals must have inherited a copy of the recessive non-tasting allele from the non-taster parent.

### Item 4

UIN: 818103\_03

Item Type: Technology Enhanced

Standards Alignment: DCI: LS3.A; SEP: CEDS; CCC: SF

SR/AT/Paper Key: A and F

Key: The student should select the following two sentences:

Individual A and Individual B each have only one copy  
of the bitter-taste gene.

The protein made from the *t* allele is what causes  
Individual C to taste the bitter chemical.

**Rationale:** Individuals A and B each have two copies of the bitter-taste gene: Individual A has two copies of the tasting allele, and Individual B has two copies of the non-tasting allele. Individual C is able to taste the bitter chemical because of the dominant *T* allele.

## Items 5–7

**Domain:** Earth and Space Science

**Phenomenon:** Fossils in rock strata can be used to compare the geologic age of two or more areas.

### Item 5

**UIN:** 818026\_01

**Item Type:** Technology Enhanced

**Standards Alignment:** DCI: ESS1.C; SEP: CEDS; CCC: PAT

**SR/AT/Paper Key:** Box W: B; Box X: A; Box Y: A; Box Z: B

**Key:** A correct response will look like this:

Layer **D** and Layer **J** are the same age. Each layer contains the same type of **fossils** because they formed during **similar** time periods.

**Rationale:** The rock strata show that Layer D and Layer J have similar soil and fossils from the same types of organisms, which indicates that they formed during similar time periods. Layers formed during different time periods show more significant soil differences and fossils from different organisms.

### Item 6

**UIN:** 818026\_02

**Item Type:** Technology Enhanced

**Standards Alignment:** DCI: ESS1.C; SEP: DUM; CCC: SC

**SR/AT/Paper Key:** Layer B: B; Layer C: C; Layer D: B; Layer E: A

**Key:** A correct response will look like this:

Layer	Supports That the Land Was Covered by Water	Supports That the Land Was Exposed to Air	Not Enough Evidence to Support Either Claim
B	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>
C	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>
D	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>
E	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>

**Rationale:** The presence of terrestrial animal fossils in Layer B supports the presence of an atmosphere during formation. The formation of Layer C is inconclusive because of a lack of fossils. The presence of fossilized feathers in Layer D supports an environment exposed to air. Fossils of aquatic dwellers in Layer E support the presence of an aquatic environment.

## Item 7

**UIN:** 818026\_03

**Item Type:** Technology Enhanced

**Standards Alignment:** DCI: ESS1.C; SEP: AID; CCC: PAT

**SR/AT/Paper Key:** D

**Key:** A correct response will look like this:

Oldest	→	→	Youngest
Layer G	Layer E	Layer D	Layer B

**Rationale:** The law of superposition can be used to classify the relative ages of layers in this undisturbed section of rock. Because they were created first, older layers are located below younger layers. Of the layers listed, Layer B is the youngest and Layer G is the oldest because of their positions.

## Item 8

**Domain:** Life Science

**Phenomenon:** Onions are living and made of cells.

## Item 8

**UIN:** 818051

**Item Type:** Technology Enhanced

**Standards Alignment:** DCI: LS1.A; SEP: EAE; CCC: S, P, and Q

**Key:** C, E

**Rationale:** The onion root under a microscope clearly shows that it is made up of many cells (C) and shows many of its cells in various stages of reproduction (E). All living things have these traits and they can be detected on the microscope slide.

Answers A, B, and D are invalid because the characteristics they describe are not verifiable in the microscope slide.

## Items 9–10

**Domain:** Life Science

**Phenomenon:** Earthworms help plants grow.

## Item 9

**UIN:** 818054\_01

**Item Type:** Multiple Choice

**Standards Alignment:** DCI: LS2.A; SEP: PACI; CCC: SC

**Key:** D

**Rationale:** Even small changes to one part of a system can cause large changes elsewhere, and testing two plants does not provide conclusive evidence to support such a change.

Answer A is invalid because although the garden is likely a less stable system, the two systems (potted plants vs. garden) have different variables. The fact that the garden is a less stable system is a major difference.

Answer B is invalid because a system's stability does not prevent changes from taking hold in the system, and each potted plant does represent a stable system.

Answer C is invalid because the variables are not similar.

## **Item 10**

**UIN:** 818054\_02

**Item Type:** Multiple Choice

**Standards Alignment:** DCI: LS2.B; SEP: CEDS; CCC: E&M

**Key:** C

**Rationale:** The improved growth of plants exposed to earthworms suggests that the plants received additional nutrients. Decomposers enrich soil with materials useful to producers.

Answer A is invalid because only other plants compete with plants for nutrients, and the plants exposed to earthworms were all similar and all flourished.

Answer B is invalid because earthworms are not capable of carrying out photosynthesis.

Answer D is invalid because there is no evidence that the potting soil included the decaying biomass needed by scavengers.

## **Item 11–12**

**Domain:** Life Science

**Phenomenon:** Similarities in embryos indicate a relationship between organisms.

### **Item 11**

**UIN:** 818106\_01

**Item Type:** Multiple Choice

**Standards Alignment:** DCI: LS4.A; SEP: AID; CCC: PAT

**Key:** A

**Rationale:** The third row in the progression diagram shows more similarities between the tortoise and the chicken than between the tortoise and the rabbit.

Answer B is invalid because only the first row in the progression diagram supports this assertion. The third row in the progression diagram shows that differences exist.

Answer C is invalid because the first row in the progression diagram shows common characteristics, such as gill slits and the presence of a tail, which support common ancestry.

Answer D is invalid because the third row in the progression diagram shows more differences between the fish and the rabbit than between the fish and the chicken.

### **Item 12**

**UIN:** 818106\_02

**Item Type:** Multiple Choice

**Standards Alignment:** DCI: LS4.A; SEP: AQDP; CCC: PAT

**Key:** B

**Rationale:** Figure 1 shows distinctive similarities and differences in the development progression of diverse organisms.

Answer A is invalid because there are no time references in the figure.

Answer C is invalid because there is no reference for differentiating ancient organisms from modern organisms, and the organisms listed could all be considered modern.

Answer D is invalid because there are no structures presented in the figure that are diverse enough to support the assertion.

### **Item 13**

**Domain:** Earth and Space Science

**Phenomenon:** The discovery of new oil reserves impacts the amount of oil available for human consumption.

### **Item 13**

**UIN:** 818075

**Item Type:** Technology Enhanced

**Standards Alignment:** DCI: ESS3.A; SEP: CEDS; CCC: SC

**SR/AT/Paper Key:** Box X: A; Box Y: B; Box Z: B

**Key:** A correct response will look like this:

Based upon the data in the graph, discoveries of new oil reserves beyond the year 2000 decrease. Oil is a nonrenewable resource, which means the supply replenishes more slowly than human demand.

**Rationale:** Based on the trends in the graph, the number of exploratory drilling sites for oil has been decreasing. This will lead to an overall decrease in the amount of available oil because oil is a non-renewable resource that requires such a long time to produce that its supply can be considered finite.

### **Items 14–16**

**Domain:** Earth and Space Science

**Phenomenon:** Moon shapes are repeated each month.

### **Item 14**

**UIN:** 818021\_01

**Item Type:** Multiple Choice

**Standards Alignment:** DCI: ESS1.A; SEP: DUM; CCC: C and E

**Key:** C

**Rationale:** The Moon changes positions as it revolves around Earth. The portion of the Moon that is illuminated by the Sun and visible from Earth changes in each position. The Moon appears full during Observation 1, indicating that it is in Position 1. Only the side of the Moon that is closest to the Sun is illuminated by the Sun in Observation 2, indicating that the Moon has moved to Position 3.

Answers A and B are invalid because it is the Moon's position relative to Earth, not Earth's rotation, that determines the Moon's phase.

Answer D is invalid because, in that position, the opposite side of the Moon would be illuminated by the Sun.

### Item 15

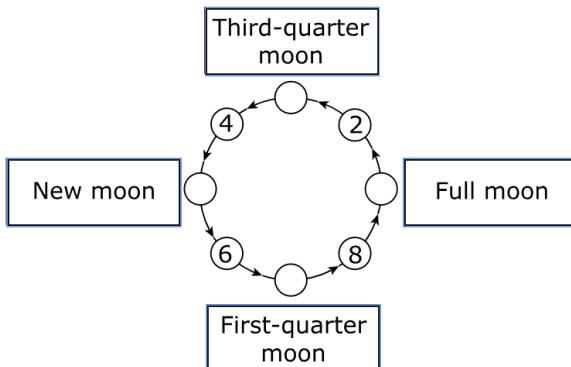
UIN: 818021\_02

Item Type: Technology Enhanced

Standards Alignment: DCI: ESS1.A; SEP: DUM; CCC: PAT

SR/AT/Paper Key: Box W: D; Box X: B; Box Y: C; Box Z: A

Key: A correct response will look like this:



**Figure 3. Moon Phases**

**Rationale:** Half of the Moon's surface is always illuminated by the Sun. A new moon occurs when the entire side of the Moon illuminated by the Sun faces away from Earth. The first-quarter moon occurs between the new moon and the full moon. The full moon occurs when the entire side of the Moon illuminated by the Sun faces Earth. The third-quarter moon occurs between the full moon and the new moon.

### Item 16

UIN: 818021\_03

Item Type: Technology Enhanced

Standards Alignment: DCI: ESS1.A; SEP: UMCT; CCC: S, P, and Q

SR/AT/Paper Key: Box X: B; Box Y: C; Box Z: D

Key: A correct response will look like this:

Number of Days Passed	Moon's Position
8	Position 4 ▾
22	Position 8 ▾
36	Position 4 ▾

**Rationale:** It takes the Moon a little more than 27 days to revolve around Earth once. That means that every two positions shown in Figure 1 represent a span of about 1 week ( $27/8 =$  about 3.5 days per position). From a starting point of Position 2, 8 days (about 1 week) involves moving two positions to Position 4. Position 8 is about 3 weeks (22 days) from Position 2, and 36 days (about 5 weeks) from Position 4.

## Items 17–20

**Domain:** Physical Science

**Phenomenon:** Heat transfers from objects of warmer temperature to objects of cooler temperatures.

### Item 17

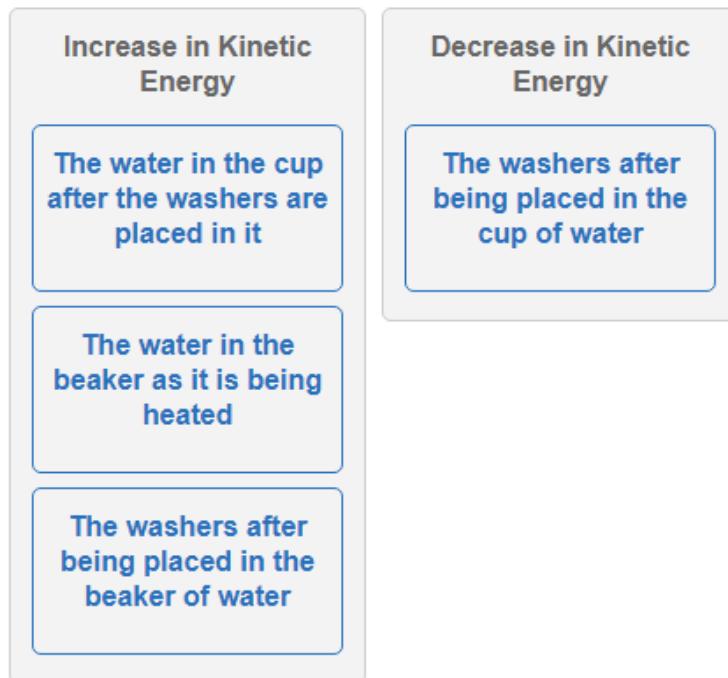
**UIN:** 818011\_01a

**Item Type:** Technology Enhanced

**Standards Alignment:** DCI: PS3.A; SEP: CEDS; CCC: C and E

**SR/AT/Paper Key:** B

**Key:** A correct response will look like this:



**Rationale:** Thermal energy flows from warmer regions to cooler regions. As the particles within a region gain heat, they begin to move more quickly and gain kinetic energy. The opposite happens to particles within a region that loses heat. Therefore, the kinetic energy of the particles increases in each of the following materials:

- The water in the cup after the washers are placed in it
- The water in the beaker as it is being heated
- The washers after being placed in the beaker of water

The kinetic energy of the particles decreases in the following material:

- The washers after being placed in the cup of water

**Item 18**

UIN: 818011\_03a

**Item Type:** Technology Enhanced**Standards Alignment:** DCI: PS3.A; SEP: CEDS; CCC: E&M**SR/AT/Paper Key:** A**Key:** A correct response will look like this:**Water in the beaker after it comes to a boil****Water in the cup after the washers are added****Water in the cup before the washers are added**

**Rationale:** The kinetic energy of a given material increases as the speed of the material's individual particles increases, and the hotter a material is, the faster its particles move. Therefore, arranging the options from warmest temperature to coolest temperature orders them by decreasing kinetic energy. Based on the heat transfers that occur during the investigation, the boiling water in the beaker has the greatest amount of kinetic energy, while the water in the cup before the washers are added has the least amount of kinetic energy.

## Item 19

UIN: 818011\_04a

Item Type: Technology Enhanced

Standards Alignment: DCI: PS3.A; SEP: AID; CCC: PAT

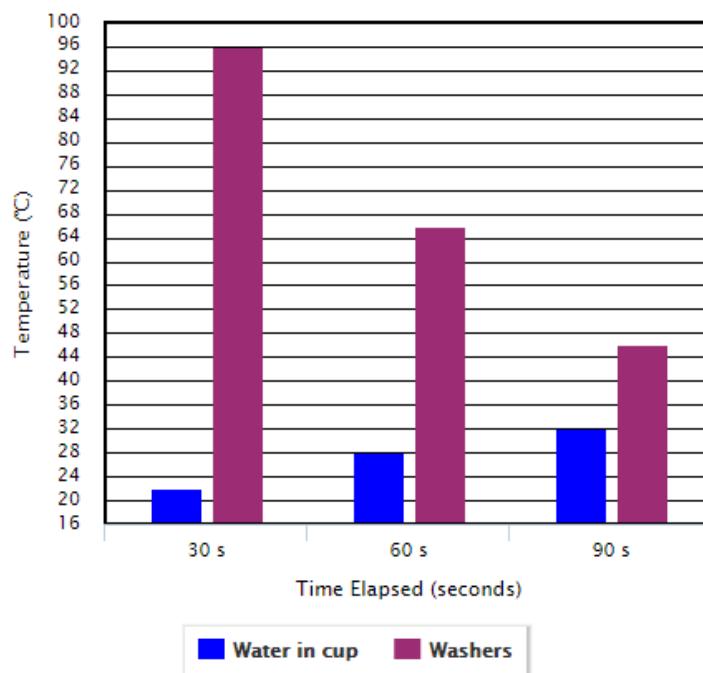
SR/AT/Paper Key: Part A: B; Part B: Box X: A; Box Y: B; Box Z: A

Key:

### Part A

From left to right, the values for the bars that represent the water in the cup should be 22, 28, 32, and the values for the bars that represent the washers should be 96, 66, 46. A correct response will look like this:

Temperature of Material (°C)



### Part B

As the experiment goes longer than 90 seconds, the temperature of the water in the cup will  , and the temperature of the washers will

. This will continue

.

**Rationale:** Thermal energy is transferred from warmer objects to cooler objects. In this investigation, the washers are initially much warmer than the water in the cup. Therefore, the data in the first row of the table that show decreasing temperatures over time represent the washers, and the data in the second row that show increasing temperatures represent the water in the cup. Applying these data to the bar graph, the water in the cup should be 22°C at 30 s, 28°C at 60 s, and 32°C at 90 s. The washers should be 96°C at 30 s, 66°C at 60 s, and 46°C at 90 s. Thermal energy will continue to be transferred from the warmer washers to the cooler water in the cup until the temperature of the washers is the same as the temperature of the water in the cup.

## Item 20

**UIN:** 818011\_04b

**Item Type:** Constructed Response

**Standards Alignment:** DCI: PS3.A; SEP: CEDS; CCC: C and E

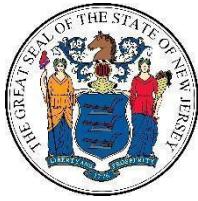
**Sample student response:**

When the washers are placed in the cup, thermal energy is transferred from the washers to the water. This causes the water molecules to move faster and causes the temperature of the water to increase. If twice as much water was in the cup, the washers would still transfer thermal energy to the water, but it wouldn't have as much of an effect on the molecules in the water, because there are twice as many. The water molecules would start moving faster, and the temperature would increase—but not as quickly as in the original experiment.

**Key:** This item has 4 quality points:

- 1 point for explaining increased speed/kinetic energy after the washers are inserted.
- 1 point for explaining transfer of heat energy.
- 1 point for explaining increase in temperature.
- 1 point for recognizing that temperature change is less because of larger volume of water.

**Rationale:** The student needs to recognize that thermal energy would still be transferred from the warmer object (the washers) to the cooler object (the water in the cup), causing the water molecules to move faster and the molecules within the washers to move more slowly. However, since the temperature of an object reflects the average kinetic energy of all the molecules in the object, the increase in the volume of water means that it would take a greater input of energy to increase the temperature of the water as much as in the original investigation.



## NJSLA-S Online Practice Test Answer and Alignment Document Science: Grade 8 – Unit 2

### Items 1-3

**Domain:** Physical Science

**Phenomenon:** Lighthouses provide light to ships navigating the ocean.

#### Item 1

**UIN:** 1908M016\_02<sup>1</sup>

**Item Type:** Technology Enhanced

**Standards Alignment:** DCI: PS4.B; SEP: DUM; CCC: S and SM

**Screen Reader (SR)/Assistive Technology (AT)/Paper Key:** Box X: B; Box Y: B; Box Z: C

**Key:** A correct response will look like this:

In the projection method shown in Figure 1, light waves travel  
in straight lines ▼ until they reflect off ▼ the surface of  
the mirror ▼ .

**Rationale:** All light waves travel in straight lines until they encounter another medium where they are either reflected, absorbed, or transmitted. In Figure 1, the light waves travel in straight lines until they meet the surface of the mirror. Because the mirror is curved, all the light waves reflect off the surface of the mirror in paths that are parallel to one another.

#### Item 2

**UIN:** 1908M016\_01

**Item Type:** Multiple Choice

**Standards Alignment:** DCI: PS4.B; SEP: AQDP; CCC: C and E

**Key:** A

**Rationale:** Figure 2 shows that the light waves that reach the lens pass through the lens, so the light waves are transmitted through the lens and not reflected by the lens.

Answer B is invalid because the lens does not affect the color of the light waves.

Answer C is invalid because the lens does not affect the distance the light waves travel.

Answer D is invalid because the lens does not actively transfer matter from one side to the other.

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<sup>1</sup> The UIN (Unique Identification Number) can be used to find an item in the New Jersey Digital Item Library (<https://nj.digitalitemlibrary.com/>)

### Item 3

**UIN:** 1908M016\_05

**Item Type:** Technology Enhanced

**Standards Alignment:** DCI: PS4.A; SEP: OECI; CCC: SF

**SR/AT/Paper Key:** Lighthouse: B, C; Foghorn: A, C

**Key:** A correct response will look like this:

	Lighthouse	Foghorn
The signal is transmitted by compression and expansion of air particles.	<input type="checkbox"/>	<input checked="" type="checkbox"/>
The signal system is designed to focus the wave in a specific direction.	<input checked="" type="checkbox"/>	<input type="checkbox"/>
The signal transmits energy.	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>

**Rationale:** Row 1: Light waves consist of electromagnetic radiation and do not require a medium through which to travel. The foghorn uses sound waves that require a medium through which to travel. In this case, the sound waves are transmitted by the compression and expansion of air particles. Row 2: Figure 1 and Figure 2 show that the signal system used by lighthouses is designed to focus light waves in a specific direction. However, sound waves are emitted by the foghorn in all directions. Row 3: Light is a form of energy. The signal system used by a foghorn emits sound, which is also a form of energy.

### Items 4-7

**Domain:** Life Science

**Phenomenon:** Bat activity can be affected by artificial lighting.

#### Item 4

**UIN:** 1908M022\_01

**Item Type:** Multiple Choice

**Standards Alignment:** DCI: LS2.C; SEP: AQDP; CCC: C and E

**Key:** D

**Rationale:** The data show that, of the colors tested, red light has the least effect on the bats' behavior compared with when no artificial light is present.

Answer A is invalid because the data in Figure 1 show that green light affects bat activity but do not explain why this happens.

Answer B is invalid because Figure 1 shows data on the number of times bats passed by different colored lights and does not include data on how bats can distinguish green and red insects.

Answer C is invalid because the data in Figure 1 do not provide information about how the combination of green and red light affects bat activity.

## **Item 5**

**UIN:** 1908M022\_02

**Item Type:** Technology Enhanced

**Standards Alignment:** DCI: LS1.D; SEP: PACI; CCC: C and E

**SR/AT/Paper Key:** Box Y: C; Box Z: B

**Key:** A correct response will look like this:

The independent variable in this investigation is the  .

The investigation provided evidence that the bats'  is reacting to a stimulus and affecting the behavior of the bats.

**Rationale:** The independent variable is the color of light, which the researchers manipulate and is indicated on the x-axis of Figure 1. Light acts as a stimulus to the bats' nervous system, which coordinates the behavioral response of the bats to the light.

## **Item 6**

**UIN:** 1908M022\_03

**Item Type:** Multiple Choice

**Standards Alignment:** DCI: LS1.D; SEP: EAE; CCC: S and SM

**Key:** A

**Rationale:** Student 1's claim explains how the nervous system coordinates a response to a stimulus by sending messages to the muscular system. Student 2's claim explains how a bat's ears sense sounds and send this information to the brain.

Answer B is invalid because the brain is needed to process information about sounds and muscle memory does not occur when the nervous system sends messages to the muscles for immediate action.

Answer C is invalid because neither students' claim explains how the brain stores memories nor how memories may be useful in locating prey.

Answer D is invalid because Student 1's claim does not discuss the role of sounds and Student 2's claim does not explain the storage of memories.

## **Item 7**

**UIN:** 1908M022\_06

**Item Type:** Multiple Choice

**Standards Alignment:** DCI: LS2.C; SEP: CEDS; CCC: SC

**Key:** C

**Rationale:** Figure 1 shows that white light decreased the number of times bats passed by. Since bats will avoid the white light, the bats will eat fewer insects in the area with light. So, the number of insects will increase in the area with white light.

Answers A and B are invalid because the study did not investigate the effect of light on the activity of insects.

Answer D is invalid because the study did not investigate the effect of light on the ability of bats to see different sizes of prey.

## Items 8-12

**Domain:** Physical Science

**Phenomenon:** Only some parts of a bicycle rusted when left outside.

### Item 8

**UIN:** 2208M516\_01

**Item Type:** Multiple Choice

**Standards Alignment:** DCI: PS1.B; SEP: PACI; CCC: C and E

**Key:** A

**Rationale:** Figure 1 shows an investigation with metal exposed to different conditions. Since the metal only rusts when certain conditions/components are present, the investigation is trying to identify what components produce rust.

Answer B is invalid because the investigation did not test different types of metals.

Answer C is invalid because the investigation did not measure the amount of rust in 10 day increments, simply the presence and relative amount of rust after 10 days under different conditions.

Answer D is invalid because the investigation did not measure changes in mass across the samples.

### Item 9

**UIN:** 2208M516\_02

**Item Type:** Technology Enhanced

**Standards Alignment:** DCI: PS1.B; SEP: CEDS; CCC: SC

**SR/AT/Paper Key:** Box Y: C; Box Z: C

**Key:** A correct response will look like this:

Evidence of a chemical reaction is shown in both test tubes 1 and 4  
because the iron pieces formed a new substance .

**Rationale:** The formation of rust is a chemical reaction since the molecules reorganize to form a new substance, which is shown in only test tubes 1 and 4.

### Item 10

**UIN:** 2208M516\_06

**Item Type:** Technology Enhanced

**Standards Alignment:** DCI: PS1.B; SEP: CEDS; CCC: S,P, and Q

**SR/AT/Paper Key:** Box X: A; Box Y: B; Box Z: A

**Key:** A correct response will look like this:

The types of atoms found in the reactants and products are the same . During the reaction, the atoms form different molecules. The number of atoms in the reactants will be equal to the number of atoms in the product.

**Rationale:**

When a chemical reaction takes place, different molecules are formed due to the rearrangement of atoms. Since matter is conserved when a chemical reaction occurs, the same number and types of atoms should be present in both the reactants and the products.

## Item 11

**UIN:** 2208M516\_04

**Item Type:** Technology Enhanced

**Standards Alignment:** DCI: PS1.B; SEP: EAE; CCC: C and E

**SR/AT/Paper Key:** Box Y: B; Box Z: A

**Key:** A correct response will look like this:

### Claim A

Group 1: A bicycle will only rust when the air is salty.

Group 2: A bicycle will rust faster when the air is salty.

### Claim B

Group 1: A bicycle will rust outdoors because water and oxygen are in the atmosphere.

Group 2: A bicycle will rust outdoors because only oxygen is in the atmosphere.

#### Rationale:

Rust is created when iron is exposed to oxygen and moisture. For claim A, only oxygen and water are required to form rust, as shown by test tube 1. When salt is present, the formation of rust is sped up, but it is not a requirement. For claim B, if only oxygen is present, the chemical reaction that produces rust will not occur and rust will not form. Water must be present for rust to form, as seen by the fact that test tube 2 does not show any rust.

## Item 12

**UIN:** 2208M516\_05

**Item Type:** Technology Enhanced

**Standards Alignment:** DCI: PS1.B; SEP: OECI; CCC: SF

**SR/AT/Paper Key:** Box W: B; Box X: A; Box Y: B; Box Z: A

**Key:** A correct response will look like this:

Properties	Evidence	Not Evidence
Physical state at room temperature	<input type="radio"/>	<input checked="" type="radio"/>
Density	<input checked="" type="radio"/>	<input type="radio"/>
Mass	<input type="radio"/>	<input checked="" type="radio"/>
Melting Point	<input checked="" type="radio"/>	<input type="radio"/>

#### Rationale:

Since iron and rust are solids at room temperature, their physical state at room temperature does not provide evidence that iron and rust are not the same substance. The density of a substance is dependent upon the atoms that make up the substance, therefore if two substances with the same phase have different densities then they are made of different atoms, which makes them different substances. Therefore, since the density of iron is different from the density of rust, this is evidence that they are different substances. The mass of a substance does not provide evidence that a substance is not the same as another substance, it just shows that one sample is smaller than the other. The melting point of a substance is dependent upon the strength of the bonds between the atoms in the substance, therefore if their melting points are different then they are different substances. Since iron and rust have different melting points, this is evidence that they are different substances.

## Items 13-16

**Domain:** Life Science

**Phenomenon:** The number of diamondback terrapin nests is dropping in Jamaica Bay on Long Island, New York.

### Item 13

**UIN:** 1908M008\_03

**Item Type:** Technology Enhanced

**Standards Alignment:** DCI: LS2.C; SEP: UMCT; CCC: PAT

**SR/AT/Paper Key:** Box Y: B; Box Z: C

**Key:** A correct response will look like this:

#### Part A

19 %

#### Part B

The percentage of algae in the diet of Oyster Bay terrapins is

less than the percentage of algae in the diet of Jamaica Bay

terrapins. This suggests that the Oyster Bay ecosystem

is healthier for terrapins than the Jamaica Bay ecosystem.

**Rationale:** From Table 1, the percentage of algae in the diet of terrapins in Oyster Bay is 20% ( $24/120 \times 100\%$ ). From Figure 2, the percentage of algae in the diet of terrapins in Jamaica Bay is 39%. Therefore, the difference is 19% (39% - 20%). The percentage of algae in the diet of Oyster Bay terrapins is less than the percentage of algae in the diet of Jamaica Bay terrapins. Algae is lower in protein and difficult for the terrapins to digest. Since there is less algae present in the diet of Oyster Bay terrapins, this suggests that the Oyster Bay ecosystem is healthier for terrapins than the Jamaica Bay ecosystem.

### Item 14

**UIN:** 1908M008\_01

**Item Type:** Multiple Choice

**Standards Alignment:** DCI: LS2.A; SEP: CEDS; CCC: E and M

**Key:** B

**Rationale:** Terrapins require nutrients to reproduce. The data show that algae makeup 39% of the diet of diamondback terrapins in Jamaica Bay. Algae is lower in protein and difficult for the terrapins to digest. Therefore, the increased proportion of algae in the terrapins' diet does not provide as much of the nutrients needed for the terrapins to reproduce.

Answer A is invalid because terrapins are consumers and not producers.

Answer C is invalid because the number of female terrapins in the research study remained the same.

Answer D is invalid because there was a 50% drop in the number of nests (indicating that the rate of reproduction decreased) and the amount of marshland decreased.

## Item 15

**UIN:** 1908M008\_04

**Item Type:** Technology Enhanced

**Standards Alignment:** DCI: LS2.C; SEP: CEDS; CCC: SC

**Key:** C, D

**Rationale:** An increase in algae will provide more nutrients to snails for reproduction (C) but will provide fewer nutrients that the terrapins need to reproduce (D).

Answer A is invalid because a change in the ecosystem may cause raccoons to leave the ecosystem but will not make the raccoons go extinct.

Answer B is invalid because an increase in algae will increase the resources available for clams and crabs.

Answer E is invalid because the ecosystem is not as healthy due to excess algae, which tends to decrease the diversity of organisms in the ecosystem.

## Item 16

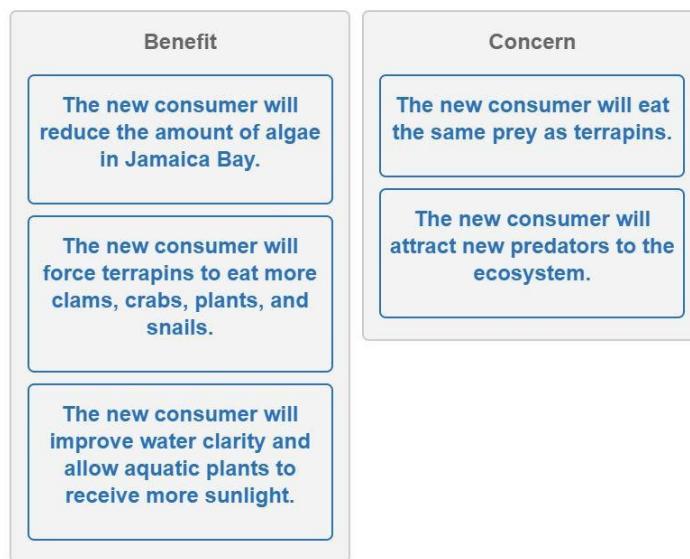
**UIN:** 1908M008\_06

**Item Type:** Technology Enhanced

**Standards Alignment:** DCI: LS2.C; SEP: EAE; CCC: SC

**SR/AT/Paper Key:** C, D, E

**Key:** A correct response will look like this:



**Rationale:** The introduction of a non-native algae consumer should help decrease the number of algae present in the Jamaica Bay ecosystem. This is a benefit because increased amounts of algae are linked to a decrease in terrapin reproduction. The new consumer will compete with terrapins for algae as a food source. This is a benefit because it will force the terrapins to eat more clams, crabs, plants, and snails, which have more of the nutrients the terrapins need. A reduction in the number of algae should improve water clarity. This is a benefit because aquatic plants will be exposed to more sunlight and, as producers, be able to provide more energy for the consumers. The new consumer and terrapins both eat algae. This is a concern because the terrapins will have to compete with the new consumer for resources. The new consumer will attract new predators to the ecosystem. This is a concern because these predators may also harm organisms that are native to the Jamaica Bay ecosystem.

## Items 17-20

**Domain:** Earth and Space Science

**Phenomenon:** Because of density differences, the sinking of cold water and the movement of warm water set up a massive convection current in the oceans.

### Item 17

**UIN:** 818000\_03a

**Item Type:** Technology Enhanced

**Standards Alignment:** DCI: ESS2.C; SEP: UMCT; CCC: C and E

**SR/AT/Paper Key:** Box X: B; Box Y: B; Box Z: A

**Key:** A correct response will look like this:

The data shown in Figure 2 are an example of quantitative data.

The amount of weathering and erosion at DEWA would be expected to be highest in May/June. This is because precipitation causes

an increase in the rate of weathering and erosion.

**Rationale:** The data in figure 2 are data that can be measured and are quantitative. Weathering and erosion increase when precipitation increases, so the weathering and erosion will be greatest in May/June.

### Item 18

**UIN:** 818000\_01b

**Item Type:** Technology Enhanced

**Standards Alignment:** DCI: ESS2.C; SEP: DUM; CCC: C and E

**SR/AT/Paper Key:** Box X: B; Box Y: A; Box Z: C

**Key:** A correct response will look like this:

Figure 3 shows that, at sea level, where air temperatures are the highest, evaporation of water occurs. Figure 3 also shows that freezing

temperatures can cause crystallization, which with gravity, often

leads to water falling to the ground as solid precipitation. Then as

runoff, the water moves across the surface, eventually

flowing into the lake and the ocean.

**Rationale:** When temperatures are high, water will change from the liquid state to the gaseous state, so evaporation will occur. Freezing temperatures cause water to change from the gaseous state to the solid state, so crystallization will occur. Once the water falls to the ground, it will move as runoff and flow to lakes and oceans.

## **Item 19**

**UIN:** 818000\_02a

**Item Type:** Technology Enhanced

**Standards Alignment:** DCI: ESS2.C; SEP: EAE; CCC: SC

**Key:** D, E

**Rationale:** Table 1 shows that a location's position downstream indicates a higher level of physical erosion.

Table 1 also shows that gypsum and quartz sediment levels are higher in Trenton.

Answer A is invalid because comparing data from sites 1-3 does not support the student's explanation.

Answer B is invalid because Trenton's position is not close to the gap and the other sites upstream must be closer.

Answer C is invalid because physical erosion along the Delaware River is not a function of the size of a nearby city.

## **Item 20**

**UIN:** 818000\_04a

**Item Type:** Constructed Response

**Standards Alignment:** DCI: ESS2.C; SEP: CEDS; CCC: PAT

**Sample student response:**

The data in the table show that both weathering and erosion measurements are greater at Riegelsville than at DEWA and even greater at Trenton. To find out the cause of the increase, an investigation needs to determine what variables change between DEWA, Riegelsville, and Trenton. The investigation could study what kind of rock or soil is found upstream of each site. It could also study how far it is between the sites, and which sites are farther down the river than the others, or if any are near urban areas, or any other regional occurrences that would cause additional run off such as using deicer on the roads. Also, if there are elevation changes that could affect the deposition of sediments with a sloped area having smaller values than a broad flat area. If one or more of these variables changes in a similar pattern to the pattern shown in the table, those variables probably help explain the pattern.

**Key:** This item has 4 quality points:

- Identifying the pattern of increasing sediments and solids
- Explaining the need to determine what varies between the sites
- Describing one or more suggestions of variables to investigate
- Describing a means of interpreting the results of the investigation

**Rationale:** The student needs to recognize that the rate and extent of weathering and erosion varies by location. The factors that can affect the rate can include rock or soil type, proximity to a river, and human changes to the environment. An investigation into some of these variables can show students if there is a pattern similar to the pattern in the table. If there is, the variables will help explain the pattern.