Colorado CMAS Grade 5 Science Practice

Exam Materials
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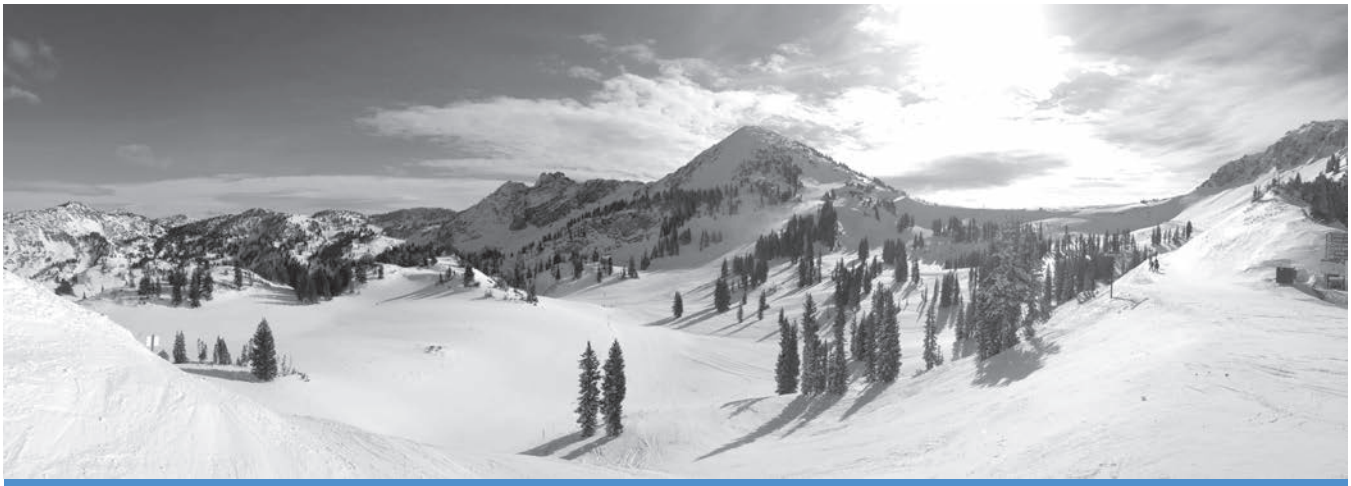
Colorado Measures of Academic Success



Grade 5

Science

Paper Practice Resource for Students

1. A student places two seeds on a wet sponge. The student adds water to the sponge each day. After three days, the student observes a root growing out of one seed.

Which claim does this evidence support?

Ⓐ Plants can grow if they have fertilizer and air.

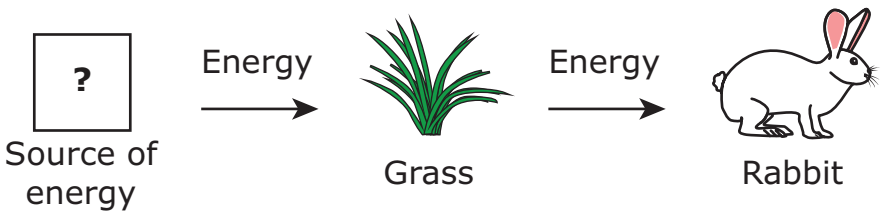
Ⓑ Plants can grow if they have air and water.

Ⓒ Plants need soil and fertilizer to grow.

Ⓓ Plants need soil and water to grow.

2. Rabbits eat grass. A teacher makes an incomplete model to show the transfer of energy in the rabbit's food.

Energy in a Rabbit's Food



To complete the model, show where the energy comes from. Your answer should include:

- what the student should put in the box to complete the model
- an explanation of how energy is transferred from the source in the box to the rabbit

Directions: Use the information to answer questions 3 through 7.

Students wonder why ocean water is salty. Figure 1 shows two rivers that flow from snowy mountains to the ocean.

Figure 1: Stages of Rivers

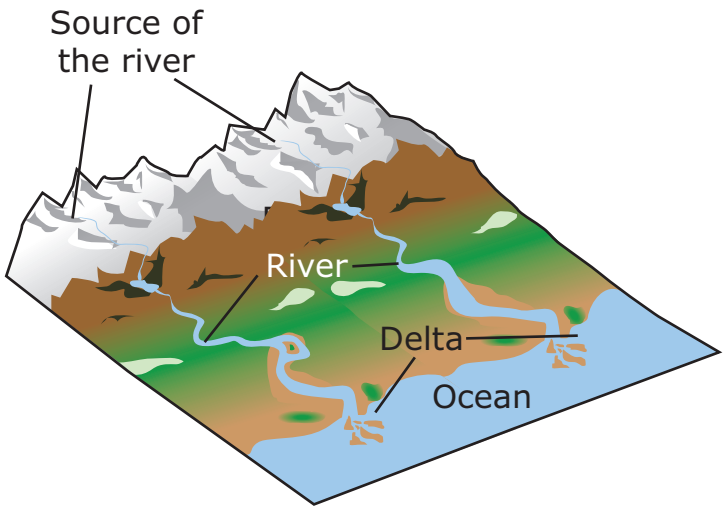
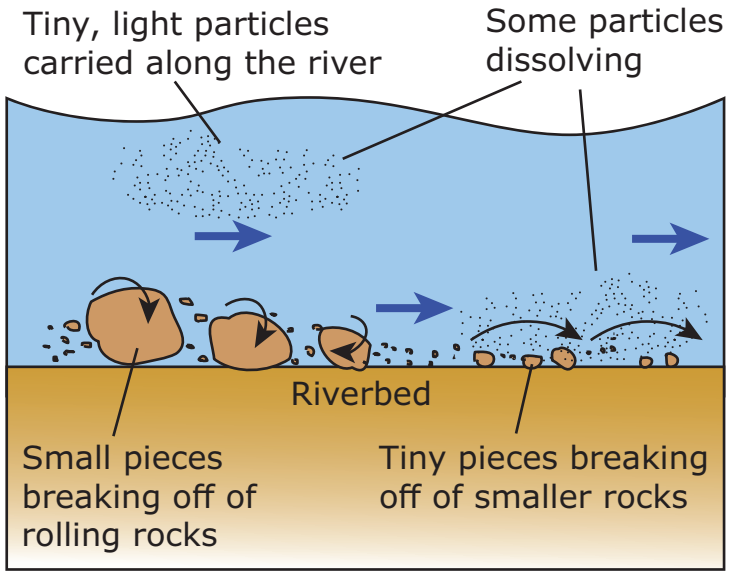


Figure 2 shows how rocks in a river release salt as the river flows toward the ocean.

Figure 2: Rocks Releasing Salt into the River



A small amount of salt dissolves in each of Earth’s rivers, but not enough to turn the rivers into salt water. The salt in all of Earth’s rivers collects in the ocean over time, so the oceans become salty while river water stays fresh.

The students also learn that humans use river water for drinking, watering crops, generating electricity, and transportation.

3. Based on the information provided, complete this explanation about the source of the two rivers.

Circle one correct response from each box to complete the sentences.

The source of the two rivers is a _____. This type of

glacier or ice cap
hot spring
waterfall

source is the _____ source of _____ on Earth.

biggest
smallest

groundwater
fresh water
salt water

4. A student claims that a force moves the water away from the source of the river. Based on the model in Figure 1, which statement describes the student's claim?

Ⓐ The claim is incorrect because forces do not affect the movement of the water.

Ⓑ The claim is correct because air pressure resists the movement of the water.

Ⓒ The claim is correct because the force of gravity pulls the water downward.

Ⓓ The claim is incorrect because the weight of the water pushes it upward.

5. Ocean water is considered to be salt water because ocean water has 3.5% salt.

Circle one correct response from each box to complete the sentences.

The amount of salt in the water at the source of the river is _____

more than
less than

the amount of salt in the water at the delta of the river. The source water is considered _____ because it has _____ salt.

fresh water
salt water

more than 3.5%
less than 3.5%

6. Rivers can carry trash just like they carry rocks in Figure 2. A planning committee wants to identify places where rivers might carry trash. Based on Figure 1, identify the places where rivers could carry trash.

Place a check mark (✔) in each row to identify the correct places. Select **one** box per row.

Place	Yes	No
Source of the rivers		
Delta		

7. A student wonders what force causes the water in the rivers to flow. Based on Figure 1, explain the force that helps the water travel from the source of the rivers toward the ocean. Your response should include:

- identification of the force that causes water to flow from the source of the rivers toward the ocean
- an explanation, based on Figure 1, of why this force affects the direction that the rivers take from their source to the ocean

Directions: Use the information to answer questions 8 through 13.

Part 1

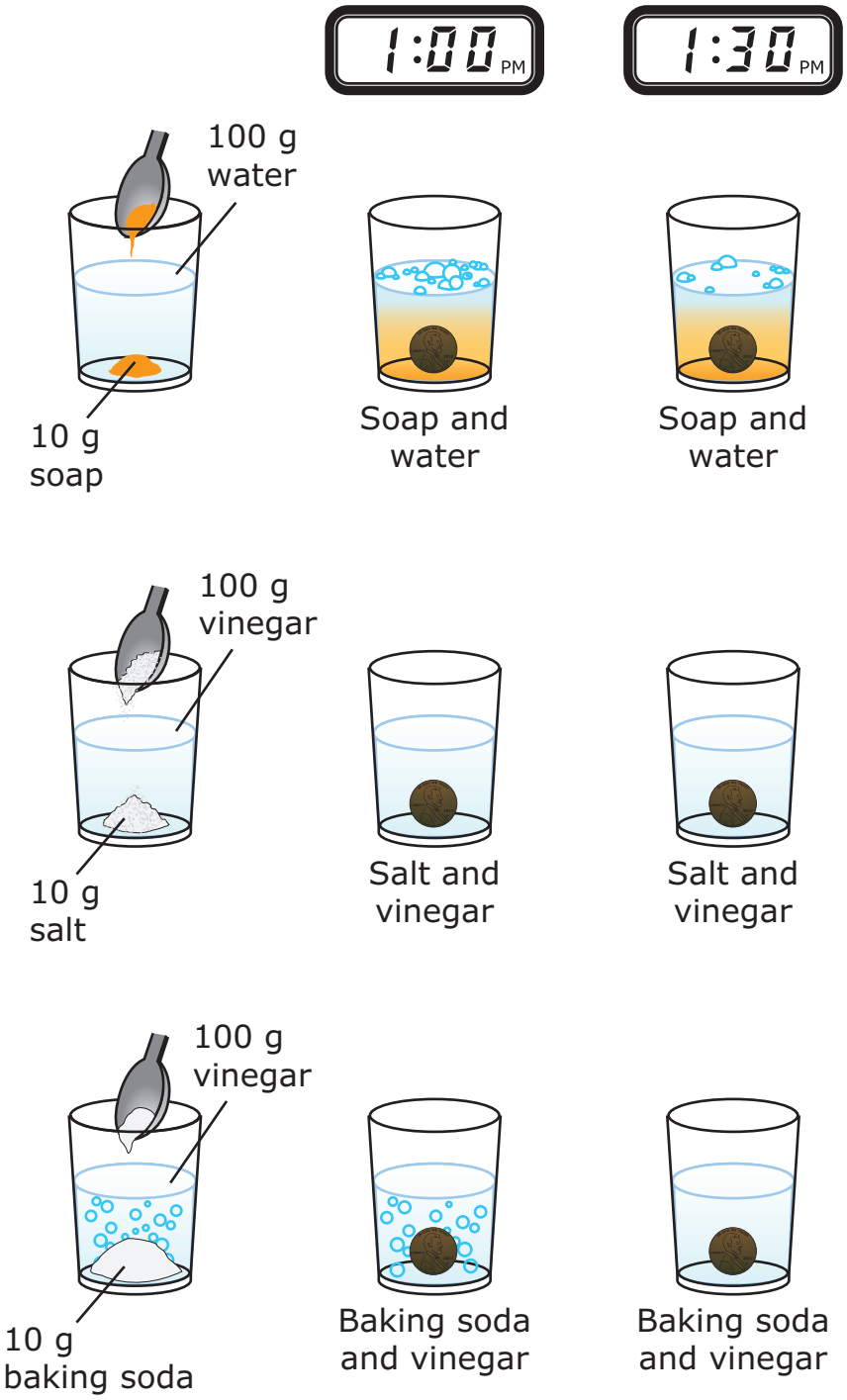
Students observe a crew cleaning a metal fountain. They are curious about how the metal of the fountain is cleaned.

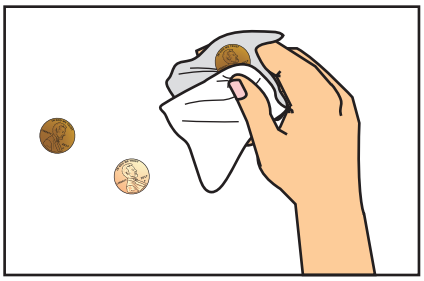
Crew Cleaning Metal Fountain

Part 2

The students gather products used in homemade cleaning solutions and test these solutions on dirty pennies. The mass of each substance is measured in grams (g). The investigation shows the effect these solutions have on the pennies after soaking them in each solution for 30 minutes and wiping down the pennies with a rag.

Investigation 1: Cleaning Pennies Test





Mixture	Before	After
Soap and water		
Salt and vinegar		
Baking soda and vinegar		

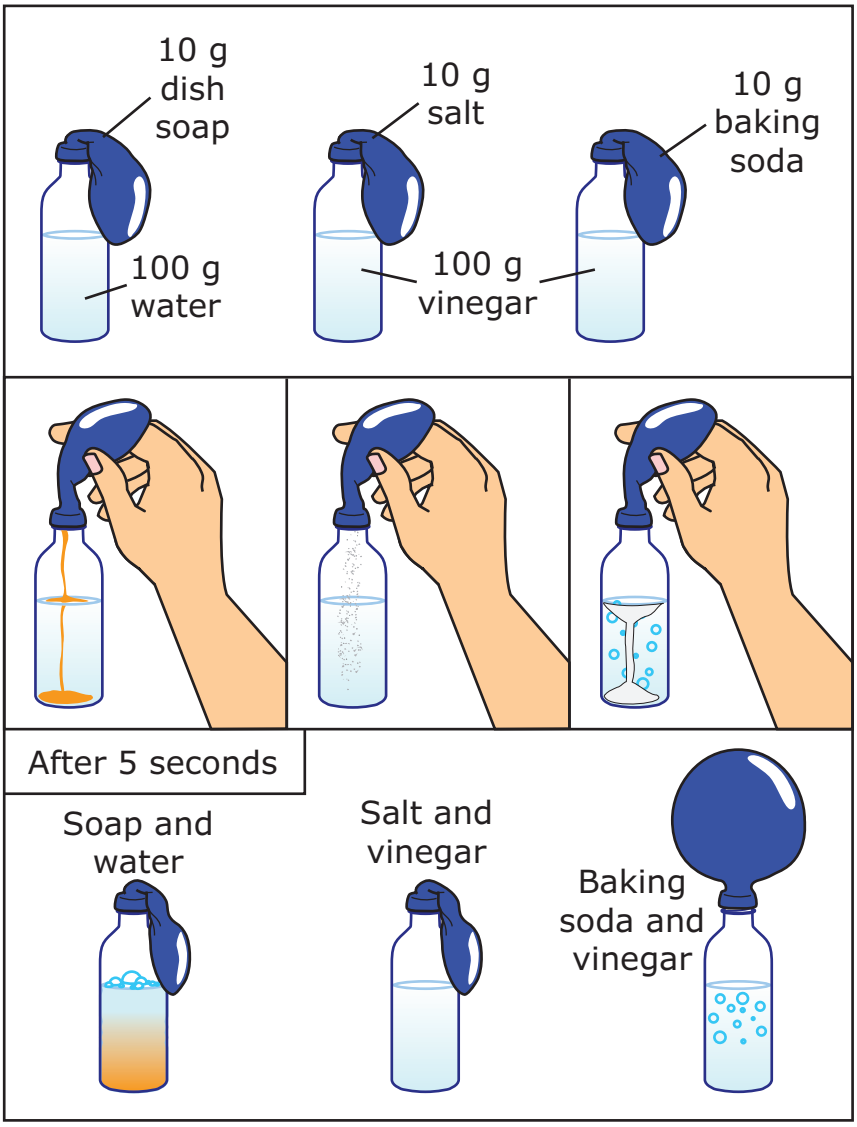
Observations of Penny Test

Mixture	Final Mass of Mixture	Observations	Penny Test
10 g soap + 100 g water	110 g	a few bubbles	penny a little cleaner
10 g salt + 100 g vinegar	110 g	no bubbles	penny completely clean
10 g baking soda + 100 g vinegar	105 g	many bubbles as soon as the substances touch	penny a little cleaner

Part 3

The students are surprised to observe that in one of the cleaning solutions, the final mass of the mixture is lower than the mass of the original mixture. They perform another investigation to study the reason for this change in mass. The figure and data table show the investigation.

Investigation 2: Balloon Test



Observations of the Balloon Test

Mixture	Final Mass of Mixture	Observations	Balloon Test
10 g soap + 100 g water	110 g	a few bubbles when stirred	balloon does not inflate
10 g salt + 100 g vinegar	110 g	no bubbles	balloon does not inflate
10 g baking soda + 100 g vinegar	110 g	many bubbles as soon as the substances touch	balloon inflates

8. A student claims that the force of gravity can be observed during the investigation. Based on the results in Part 2, which statement **best** provides evidence to support the student's claim?

Ⓐ The soap takes a different shape in the glass than it does in the spoon.

Ⓑ The baking soda and vinegar mixture produces bubbles.

Ⓒ The baking soda and vinegar mixture loses mass.

Ⓓ The soap sinks to the bottom of the glass.

9. A student claims that a new substance forms during the investigations. Based on the investigation, which observation **best** provides evidence that a new substance forms during the investigations?

Ⓐ The final mass of each mixture is the same as the total mass of the original substances.

Ⓑ The colored soap turns colorless because it was stirred in the water.

Ⓒ The balloon inflates because baking soda reacts with vinegar.

Ⓓ The penny becomes cleaner in each mixture.

10. A student wonders why the final mass of the baking soda and vinegar mixture changed in the table in Part 2.

Circle one correct response from each box to complete the sentences.

The mass in Part 2 seems to _____ g. But the student can

decrease by 5
increase by 5

use the results in Part 3 as evidence that mass _____ when

stays the same
decreases
increases

baking soda is added to vinegar.

11. The teacher provided the students with 100 g of vinegar and asked the students to add salt to the vinegar. Based on the results in Part 2, explain how the students could measure the amount of salt that was added if the final mass of the mixture is 120 g. Your response should include a description of:

- the likely amount of salt that was added to the vinegar
- the evidence from the investigation for the likely amount of salt added to the vinegar

12. A student claims that a new substance forms only with the mixture of baking soda and vinegar. Based on the results of Part 3, explain why the student's claim is correct. Your response should include:

- a description of the evidence from Part 3 that supports the student's claim
- an explanation of how this evidence supports the student's claim

13. A student has a sample of 10 g of cooking oil that looks similar to the soap in Part 2. Properties of cooking oil and soap are shown in the table.

Properties of Cooking Oil and Soap

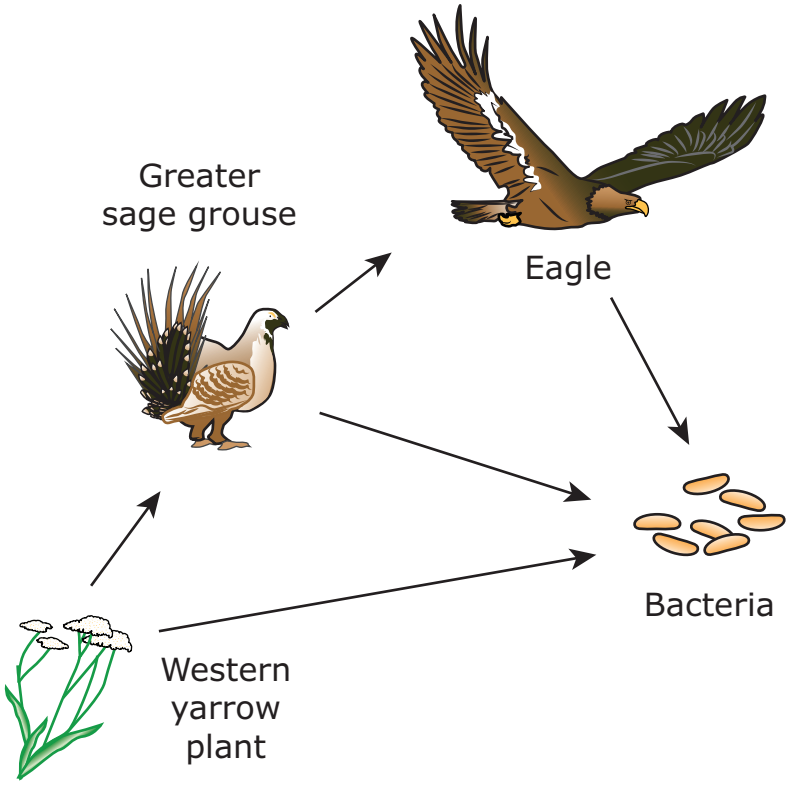
Material	Observation When Stirred in Water	Color in Water
cooking oil	forms drops that float	light tan
soap	disappears	light tan

Explain how a property of cooking oil would allow filter paper to separate the oil from water. Your response should include:

- identification of the property that causes the difference observed when the materials are stirred in water
- an explanation of why filter paper can only use this property to separate oil and water, not soap and water

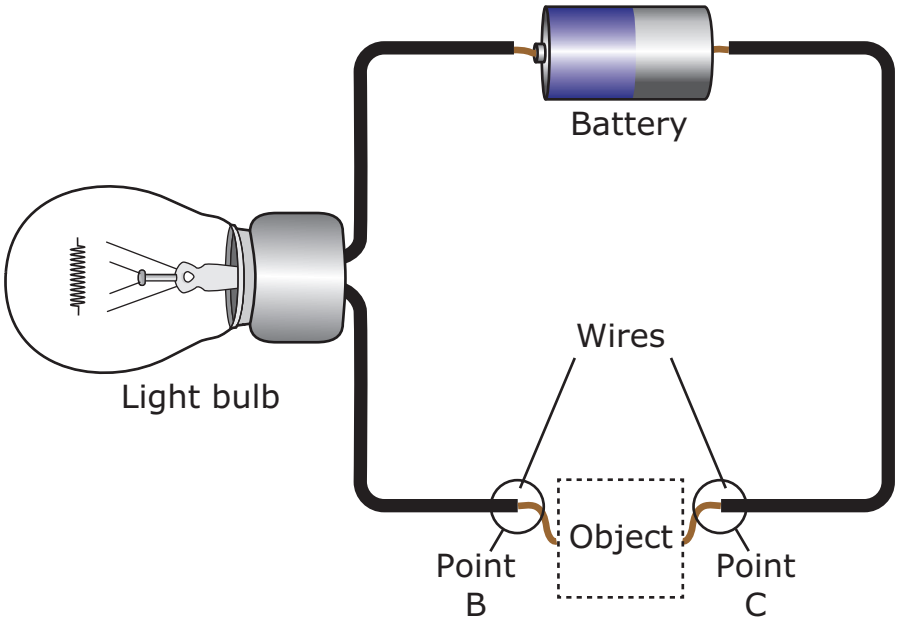
14. Students learn that farmers often put fertilizer in the soil. Fertilizer helps the farmers grow the fruits and vegetables people use for food. The students wonder how wild plants grow without people adding fertilizer to the soil.

Circle **one** organism in the food web that would help the wild plants the same way the fertilizer helps the farmer's crops.



This is the end of Item Set 1.

1. Students investigate a circuit. They observe that the light bulb only turns on when certain materials are placed between points B and C.



Using their observations, they separate the materials they are testing into two groups. The table shows their groupings.

Materials

Group A	Group B
iron nail	rubber eraser
copper penny	plastic button
steel paper clip	wood stick

Circle **one** correct response from each box to complete the sentence.

The property the students tested was whether each material _____.

conducts electricity
conducts heat
is magnetic

A comparison can be made between the penny and the paper clip to see which one is _____

the better conductor
more magnetic

by testing to see which one _____.

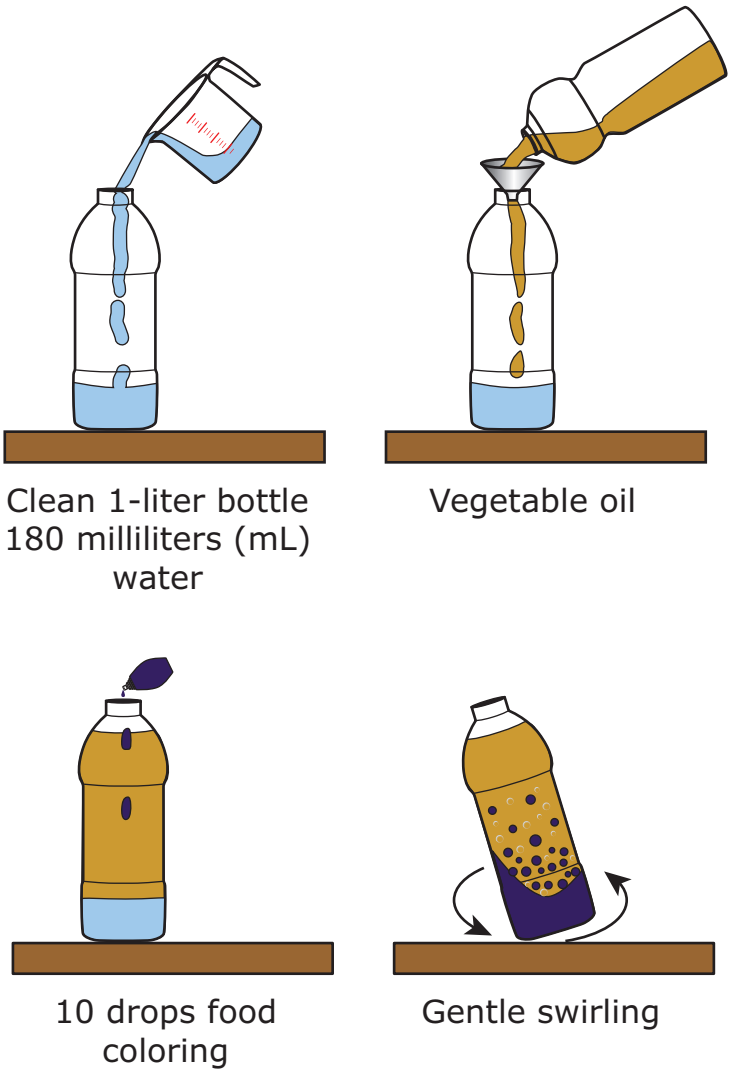
makes the light shine brighter
is more attracted to the wires

Directions: Use the information to answer questions 2 through 5.

Part 1

A group of students observes behaviors of matter using vegetable oil and vinegar salad dressing. The students perform an investigation using similar substances.

Figure 1: Science in a Bottle Setup

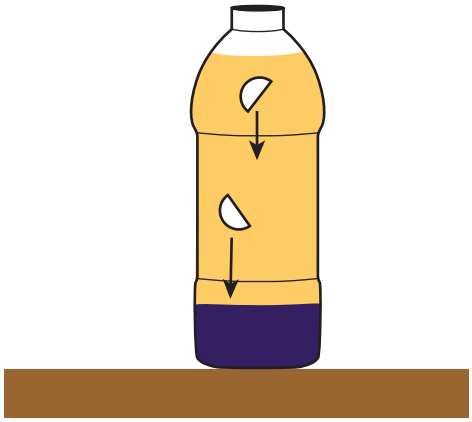


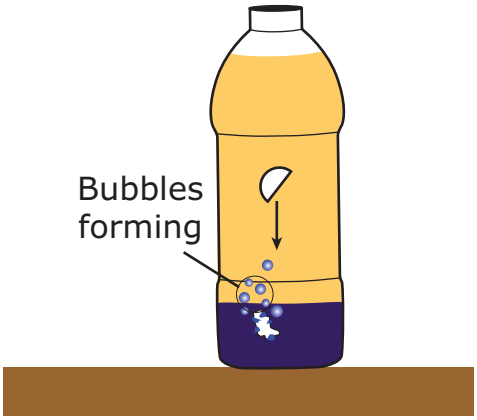
Part 2

After the vegetable oil and colored water sit for 10 minutes, the bottle is ready for the investigation. The students have a tablet that fizzes in water. They break the tablet in half and drop the pieces into the bottle one at a time. The students then screw on the cap to seal the bottle.

The students observe that the tablet pieces sink through the oil and dissolve in the colored water. As the pieces dissolve, bubbles form that move upward and rise to the top of the bottle. Some bubbles pop at the top, and then other bubbles move downward and sink.

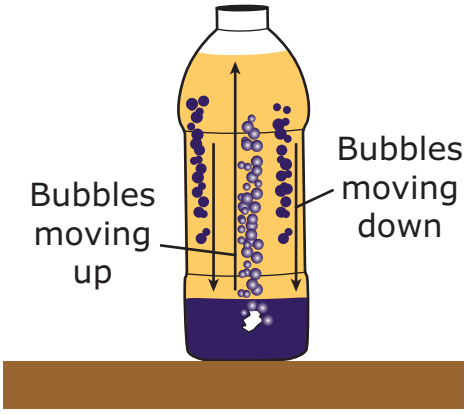
Figure 2: Science in a Bottle Investigation





KEY

= vegetable oil
= water and food coloring
= broken piece of tablet
= dissolving piece of broken tablet



2. When someone shakes a container full of different objects, they may mix together. Objects that are similar in size mix the most. When some objects are smaller than others, the smaller objects usually sink below the larger ones.

The students plan to use a different set of materials to be models for the behavior of the oil and water used in Part 1. Which materials, if shaken, would **most** accurately be models for the behavior of the water and vegetable oil in the bottle?

Ⓐ

Science in a Bottle Setup	Model
water	clear marbles
vegetable oil	yellow marbles

Ⓑ

Science in a Bottle Setup	Model
water	salt
vegetable oil	yellow marbles

Ⓒ

Science in a Bottle Setup	Model
water	clear marbles
vegetable oil	pepper

Ⓓ

Science in a Bottle Setup	Model
water	pepper
vegetable oil	salt

3. After the tablet in the investigation in Part 2 has completely dissolved, a student unscrews the cap to the bottle. As the cap loosens, the students hear a hissing sound. What is the **most likely** explanation for the hissing sound?

Ⓐ Small particles of gaseous matter exit the bottle.

Ⓑ Small bubbles in the bottle turn back into water.

Ⓒ The oil and water mix to form a single layer.

Ⓓ The food coloring dissolves into the oil.

4. Students repeat the investigation in Part 2, but this time they weigh the tablet as well as the bottle and its contents before and after the investigation. The students do not put the cap on the bottle after the tablet is added.

Which statement predicts what the students will observe in the investigation, and which description correctly explains their observation? Select **two** correct answer choices.

Ⓐ The mass of the bottle after the investigation was greater than the mass of the bottle and tablet before the investigation.

Ⓑ The mass of the bottle after the investigation was the same as the mass of the bottle and tablet before the investigation.

Ⓒ The mass of the bottle after the investigation was less than the mass of the bottle and tablet before the investigation.

Ⓓ This is evidence that no new substance was formed as the matter in the tablet was destroyed.

Ⓔ This is evidence that a new substance was formed and left the bottle as a gas.

5. A bottle of water and a bottle of clear oil are on a table. The students notice that the liquid in the bottles looks the same.

Use the information in Part 1 to explain how a student can use food coloring to correctly identify the oil and the water. Your response should include a description of:

- how a student can use the way that food coloring behaves in water to identify a substance as water
- how a student can use the way that food coloring behaves in oil to identify a substance as oil

Directions: Use the information to answer questions 6 through 11.

Students researching the Sun, Earth, and Moon system read about eclipses and find information on a total solar eclipse that will occur in 2024. During a total solar eclipse, the light from the Sun is about the same as the light from a full moon. Since stars can be seen during a full moon, the students wonder whether stars will be seen during the total solar eclipse. This information shows what they learn from doing more research.

Figure 1: Viewing Location and Path of the Total Solar Eclipse near the Center of the United States

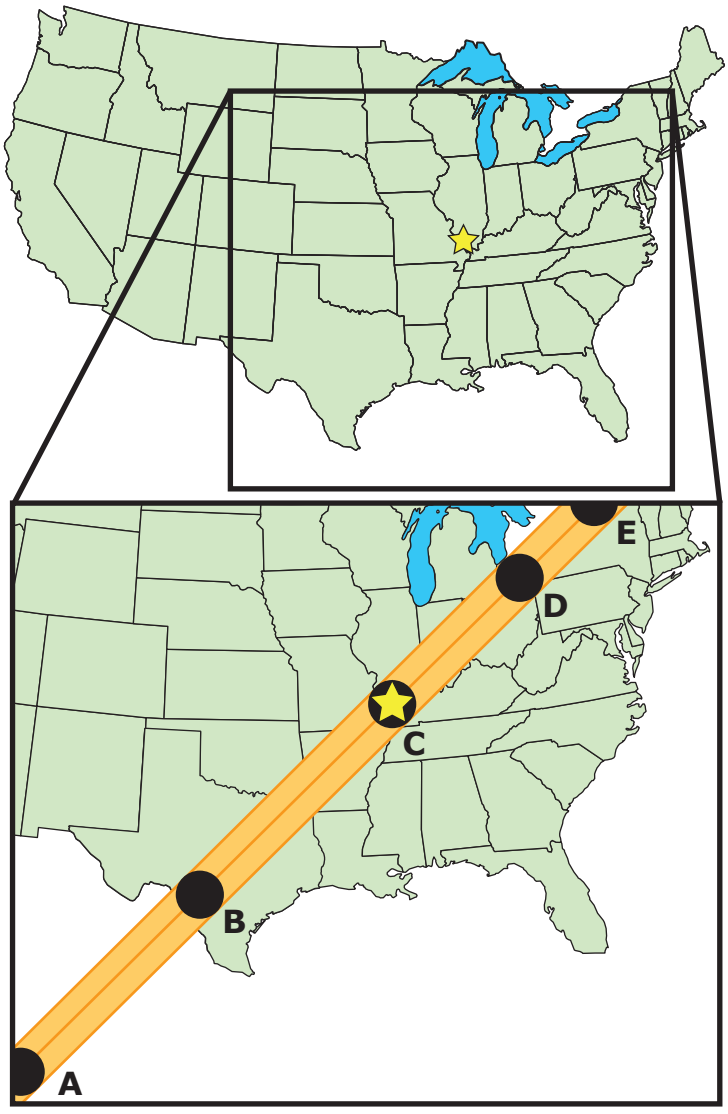
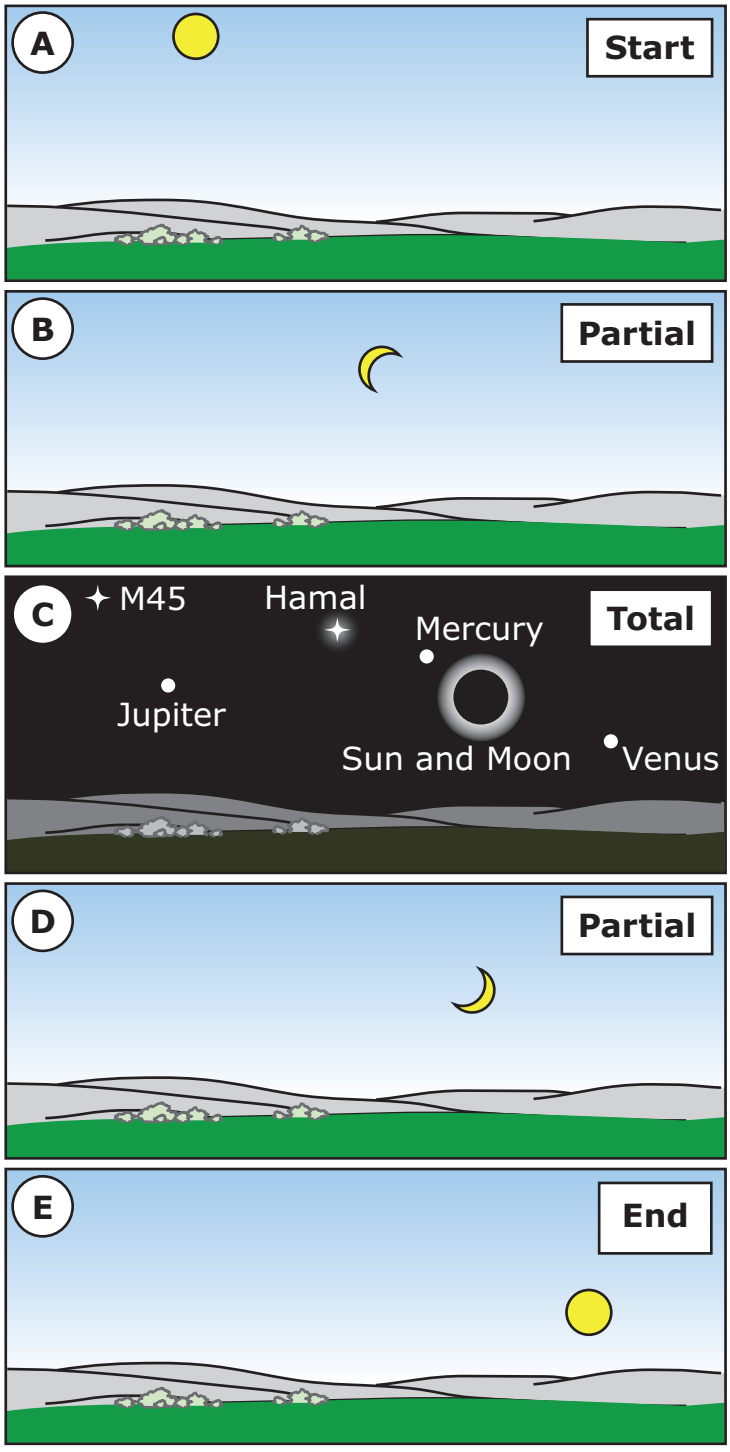


Figure 2: Appearance of the Sky When the Moon's Shadow Is at Each Location



Data Table

Event	Time	Stars Visible in Sky?
start	2:00 p.m.	no
partial eclipse begins	2:42 p.m.	no
total eclipse begins	3:58 p.m.	yes
maximum eclipse	4:00 p.m.	yes
total eclipse ends	4:02 p.m.	no
partial eclipse ends	5:17 p.m.	no

6. In the model of the eclipse, Jupiter, Mercury, and Venus are shown. Venus appears brighter than Mercury in the night sky. Using your knowledge of the factors that affect the brightness of objects, circle **one** correct response from each box to complete the sentences.

Objects that are _____ usually appear dimmer to a viewer

farther away
closer

than objects that are _____. This information supports the claim

farther away
closer

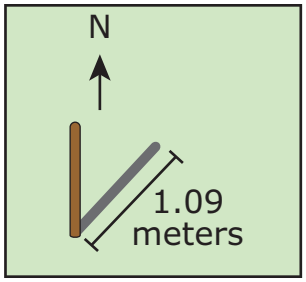
that if Venus appears brighter than Mercury, then Venus is probably _____ Earth than Mercury is.

farther away from
closer to

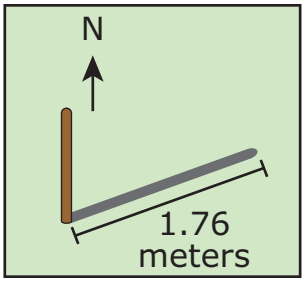
7. Outside the path of the total solar eclipse, the pattern of shadows is the same as on any other day. Show how shadows change on the day of the eclipse for someone outside the path of the eclipse.

Based on the data table, write a letter from the list of shadow images in the correct box. Each shadow may be used once, more than once, or not at all.

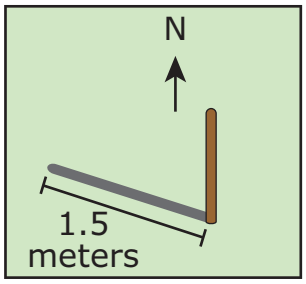
A.



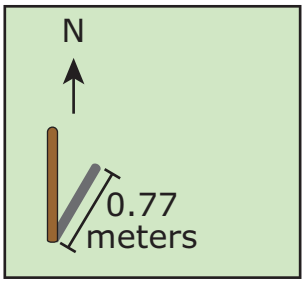
B.



C.



D.



Shadow when partial eclipse begins	Shadow during maximum eclipse	Shadow when partial eclipse ends
_____	_____	_____

8. In the Northern Hemisphere, M45 is visible during the total solar eclipse and also in the night sky. If the same total solar eclipse would occur during the summer, M45 would not be visible. Why would M45 not be visible in the summer?

Ⓐ because M45 changes the amount of light it gives off during different seasons

Ⓑ because M45 moves closer to or farther from planets during different seasons

Ⓒ because Earth revolves around the Sun

Ⓓ because Earth rotates on its axis

9. After observing the model of the eclipse, a student claims that the Sun is the closest star to Earth. Compare the brightness of the objects in the sky during the partial eclipse and the total eclipse to explain why the student's claim is correct. Your response should include:

- a comparison of bright objects seen during the partial solar eclipse and bright objects seen during the total solar eclipse
- an explanation of why the differences in brightness support the student's claim

10. Use the model to observe and compare how each star looks during the total solar eclipse. Your response should include:

- how the appearances of the stars compare to each other
- how comparing the stars provides evidence for the distances of stars from Earth

11. A student wonders whether the stars he saw during the total solar eclipse in the model would be the same stars he could see twelve hours later. Explain how the sky and the stars that are seen would change over twelve hours. Your response should include:

- a description of how the sky and the stars the student could see would look different
- why the sky would look different

Directions: Use the information to answer questions 12 through 16.

Part 1

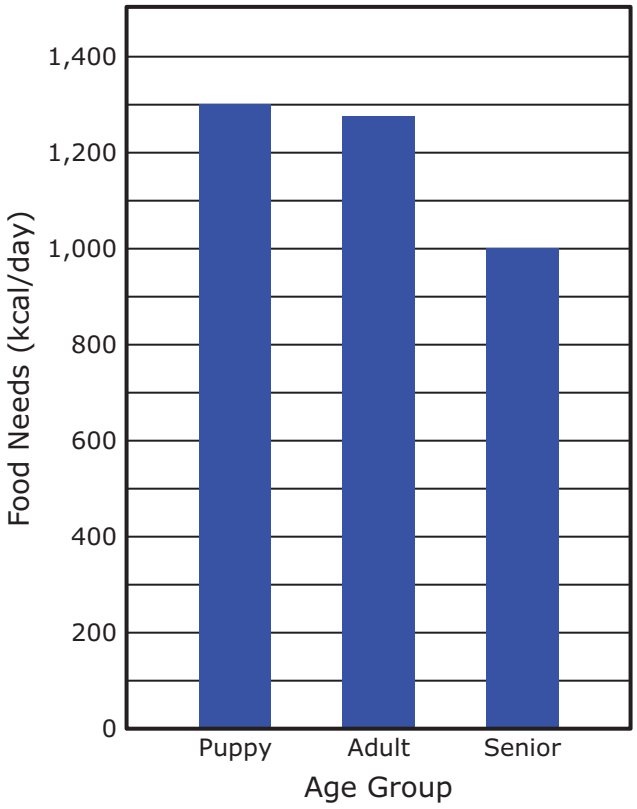
Two dogs eat different amounts of food. Dog 1 is larger than Dog 2, and Dog 1 eats less food than Dog 2. A student wonders why this happens. The student finds a scientific study about the amount of nutrients dogs need from food, measured in a unit called kilocalories (kcal), per day. The student finds this information for different sizes of dogs and different ages of dogs.

Table 1 and Figure 1 show the data the student finds.

Table 1: Different Dog Sizes and Food Needs

Size of Dog	Food Needs (kcal/day)
giant ≥ 40 kg	3,020
large 20–39 kg	1,784
medium 6–19 kg	1,036
small ≤ 5 kg	206

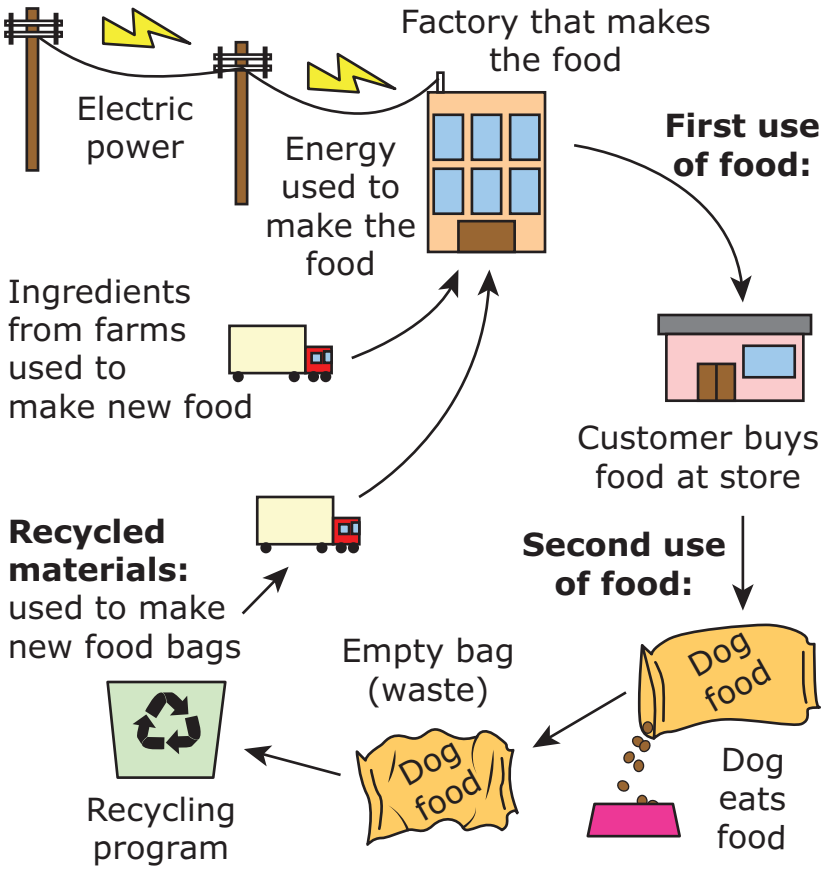
Figure 1: Food Needs Based on Age of Dog



Part 2

The student learns more about the way dog food is made and used. The information reminds the student of an ecosystem. A teacher begins to make a diagram using the information to model an ecosystem.

Figure 2: Model of an Ecosystem Using Dog Food



12. Based on the information in Table 1, which claim is supported?

Ⓐ Medium-sized dogs use more energy from the Sun than small-sized dogs use.

Ⓑ Medium-sized dogs use more energy from water than giant-sized dogs use.

Ⓒ Large-sized dogs use more energy from the Sun than giant-sized dogs use.

Ⓓ Large-sized dogs use more energy from water than small-sized dogs use.

13. The student finds that two medium-sized dogs require different amounts of food to maintain a healthy weight. Dog 1 requires 1,050 kcal/day, and Dog 2 requires 900 kcal/day.

Based on Figure 2, compare the energy use of the dogs. Circle one correct response in each box to complete the sentences.

Dog 1 consumes more kilocalories per day than Dog 2. The energy Dog 1 consumes from the food _____.

originally came from the Sun
was once matter in the soil
used to be electric power

Dog 1 is most likely _____ than Dog 2.

older
younger

14. Which statement is one way the model in Part 2 shows matter moving in an ecosystem?

Ⓐ The truck moving ingredients from the farm is like decomposed matter moving from soil to plants.

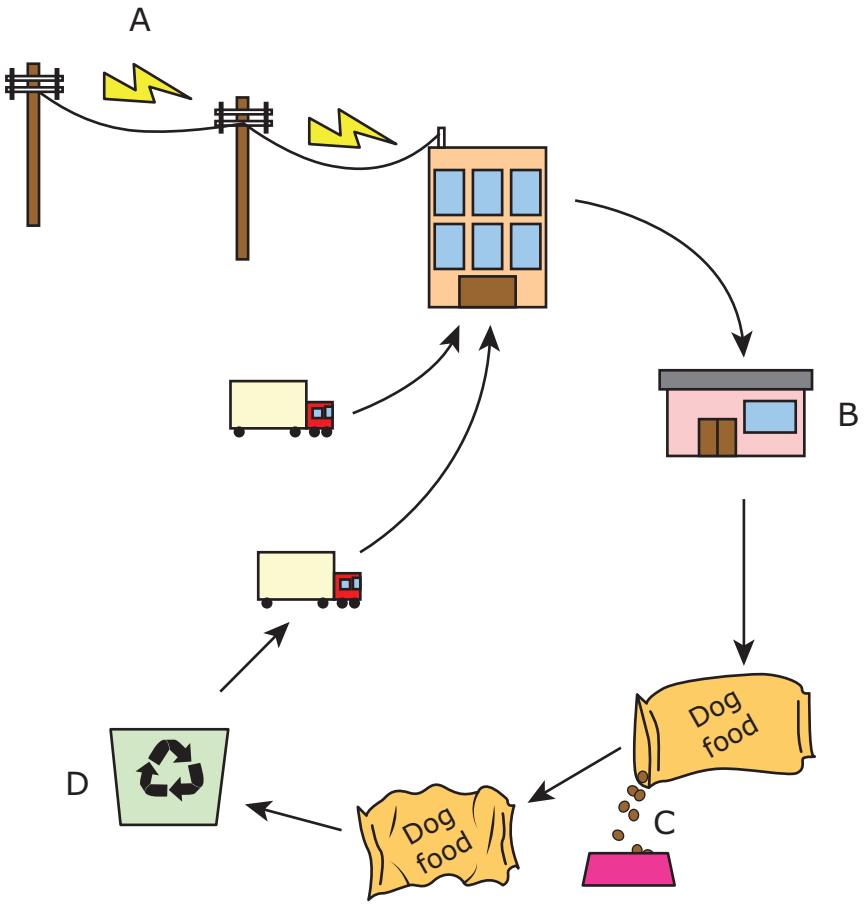
Ⓑ The truck moving recycled materials is like decomposed matter moving from soil to plants.

Ⓒ The truck moving ingredients from the farm is like energy traveling from the Sun to plants.

Ⓓ The truck moving recycled materials is like energy traveling from the Sun to plants.

15. One part of the dog food ecosystem model represents the Sun's energy.

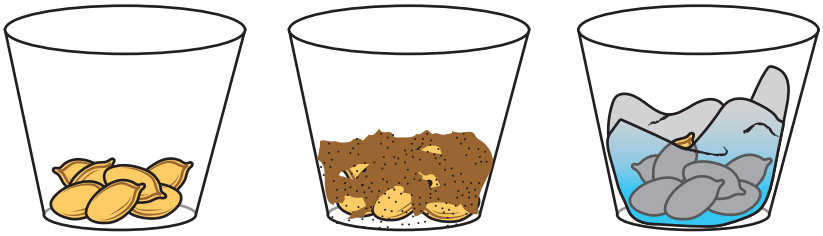
Using the information in Part 2, circle the letter for the part of the model that represents the Sun's energy.



16. Using the information in Part 2, explain decomposition in the ecosystem model. Your response should include:

- which part of the ecosystem model represents decomposers
- an explanation of why this part of the model represents decomposers

17. A student wants to see where seeds grow best. The student puts seven seeds in each of three cups and places the cups near an open window. The seeds in Cup A are left to dry. The seeds in Cup B are in dry soil, and the seeds in Cup C are wrapped in a cloth soaked with water.



Cup A, dry seeds

Cup B, seeds put in dry soil

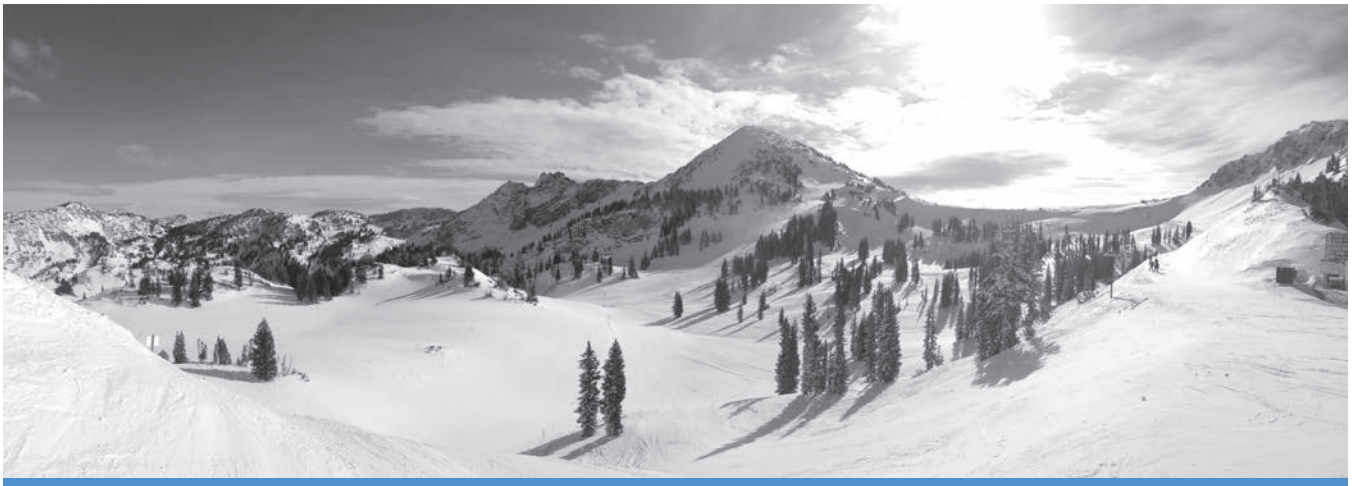
Cup C, seeds wrapped in a cloth soaked in water

Explain what the student will observe after four days. Your answer should include:

- the changes observed in each cup after four days
- the reason for the changes observed in each cup

This is the end of Item Set 2.

Colorado Measures of Academic Success



Grade 5 Science

Answer Key with Scoring Rubrics, Sample Responses & Annotations

Practice Resource for Students

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ANSWER KEY: ITEM SET 1

Item Set 1 – Question 1 (Selected Response)

A student places two seeds on a wet sponge. The student adds water to the sponge each day. After three days, the student observes a root growing out of one seed.

Which claim does this evidence support?

- A. Plants can grow if they have fertilizer and air.
- B. Plants can grow if they have air and water.
- C. Plants need soil and fertilizer to grow.
- D. Plants need soil and water to grow.

Item Information		
Answer:	B	
Grade Level Expectation:	SC.5.2.1	Plants acquire their material from growth chiefly from air and water.
Evidence Outcome:	SC.5.2.1.a	Support an argument that plants get the materials they need for growth chiefly from air and water. (5-LS1-1) (Clarification Statement: Emphasis is on the idea that plant matter comes mostly from air and water, not from the soil.) |SEP 7 EAE|CCC 5 EM|
Standard:	Life Science	

Item Set 1 – Question 2 (Constructed Response)

Rabbits eat grass. A teacher makes an incomplete model to show the transfer of energy in the rabbit's food.

Energy in a Rabbit's Food

To complete the model, show where the energy comes from. Your answer should include:

- what the student should put in the box to complete the model
- an explanation of how energy is transferred from the source in the box to the rabbit

Item Information		
Answer:	See Sample Student Responses	
Grade Level Expectation:	SC.5.1.4	The energy released from food was once energy from the sun.
Evidence Outcome:	SC.5.1.4.a	Use models to describe that energy in animals' food (used for body repair, growth and motion and to maintain body warmth) was once energy from the sun. (5-PS3-1) (Clarification Statement: Examples of models could include diagrams and flowcharts.) |SEP 2 DUM|CCC 5 EM|
Standard:	Physical Science	

Scoring Rubric	
Points	**Attributes**
2	**The student's answer should include:** • What the student should put in the first box to complete the model. • An explanation of how energy is transferred from the source in the first box to the rabbit. **Student responses may include but are not limited to:** • The box should be filled with the Sun to complete the model. • The Sun produces light, which the grass uses to make food. Then the stored energy in the grass is transferred to the rabbit when the rabbit eats the grass.
1	Student response demonstrates a partial understanding of the task.
0	Student response does not demonstrate an understanding of the task.

Sample Student Responses *Sample student responses are not representative of all correct answers for an item and are provided only as a guide to assist teachers with scoring.*	
Points	
2	**Sample Response** **Sample A** The sun should be in the box because sunlight gives energy to the plant. The rabbit gets energy by eating the plant. And then a fox will eat the rabbit and the energy will go to the fox. **Sample B** The sun shines on the grass and the grass makes the energy into food. The rabbit eats the grass for energy so it can grow and survive.
	Sample Annotation
	Sample A • The response states what the student should put in the first box to complete the model (*The sun*). • The response provides an explanation of how energy is transferred from the source in the first box to the rabbit (*The rabbit gets energy by eating the plant*). The extraneous information given (*fox will eat the rabbit and the energy will go to the fox*) is correct and does not affect the score for the response. **Sample B** • The response states what the student should put in the first box to complete the model (*The sun shines on the grass*). It is acceptable that the student did not state that the sun should be in the box. It is clear that the sun is the source of energy. • The response provides an explanation of how energy is transferred from the source in the first box to the rabbit (*The rabbit eats the grass for energy so it can grow and survive*).
1	**Sample Response** **Sample A** The student should put sun in the first block because the grass gets its energy from the sun. **Sample B** The energy for the plant is the dirt because a lot of plants can't live without it and after the rabbit eats the plants it absorbs the nutrients of the plant making it strong.
	Sample Annotation
	Sample A • The response states what the student should put in the first box to complete the model (*grass gets its energy from the sun*). • The response does not address how energy is transferred from the source in the first box to the rabbit. **Sample B** • The response provides an explanation of how energy is transferred from the source in the first box to the rabbit (*the rabbit eats the plants it absorbs the nutrients of the plant*). Energy is not specifically mentioned in this response, but "absorbs the nutrients" is considered sufficient. • The response incorrectly states that the soil is the source of energy.

0	**Sample Response**
	Sample A The student should put water in the empty box because rabbits and all animals need water to survive. To transfer the source of energy into the rabbit is by the rabbit drinking it. **Sample B** The energy comes from the plants. The plants make their own food meaning they grow by themselves all the fiber and stuff they need. The animals need all of that to be healthy and hydrated so that's where they get their energy from and why.
	Sample Annotation
	Sample A • The response incorrectly states that the student should put "*water*" in the first box to complete the model. While living things need water, it is not the source of energy. • The response does not provide an explanation of how energy is transferred from the source in the first box to the rabbit. **Sample B** • The response does not state what the student should put in the first box to complete the model. It incorrectly states that plants make their own energy. • The response does not provide an explanation of how energy is transferred from the source in the first box to the rabbit.

Item Set 1 – Question 3 (TEI Inline Choice)

Based on the information provided, complete this explanation about the source of the two rivers.

Select one correct response from each drop-down menu to complete the sentences.

The source of the two rivers is a [glacier or ice cap] . This type of source is the [biggest] source of [fresh water] on Earth.

Item Information		
Answer:	See Image	
Grade Level Expectation:	SC.5.3.4	Most of Earth's water is in the ocean and much of Earth's freshwater in glaciers or underground.
Evidence Outcome:	SC.5.3.4.a	Describe and graph the amounts and percentages of saltwater and freshwater in various reservoirs to provide evidence about the distribution of water on Earth. (5-ESS2-2) (Boundary Statement: Limited to oceans, lakes, rivers, glaciers, ground water, and polar ice caps, and does not include the atmosphere.) |SEP 5 UMCT|CCC 3 SPQ|
Standard:	Earth and Space Science	

Item Set 1 – Question 4 (Selected Response)

A student claims that a force moves the water away from the source of the river. Based on the model in Figure 1, which statement describes the student's claim?

- ○ A. The claim is incorrect because forces do not affect the movement of the water.
- ○ B. The claim is correct because air pressure resists the movement of the water.
- ◉ C. The claim is correct because the force of gravity pulls the water downward.
- ○ D. The claim is incorrect because the weight of the water pushes it upward.

Item Information		
Answer:	C	
Grade Level Expectation:	SC.5.1.3	The gravitational force of Earth acting on an object near Earth's surface pulls that object toward the planet's center.
Evidence Outcome:	SC.5.1.3.a	Support an argument that the gravitational force exerted by Earth on objects is directed down. (5-PS2-1) (Clarification Statement: "Down" is a local description of the direction that points toward the center of the spherical Earth.) (Boundary Statement: Does not include mathematical representation of gravitational force). |SEP 7 EAE|CCC 2 CAE|
Standard:	Physical Science	

Item Set 1 – Question 5 (TEI Inline Choice)

Ocean water is considered to be salt water because ocean water has 3.5% salt.

Select one correct response from each drop-down menu to complete the sentences.

The amount of salt in the water at the source of the river is [less than] the amount of salt in the water at the delta of the river.

The source water is considered [fresh water] because it has [less than 3.5%] salt.

Item Information		
Answer:	See Image	
Grade Level Expectation:	SC.5.3.4	Most of Earth's water is in the ocean and much of Earth's freshwater in glaciers or underground.
Evidence Outcome:	SC.5.3.4.a	Describe and graph the amounts and percentages of saltwater and freshwater in various reservoirs to provide evidence about the distribution of water on Earth. (5-ESS2-2) (Boundary Statement: Limited to oceans, lakes, rivers, glaciers, ground water, and polar ice caps, and does not include the atmosphere.) |SEP 5 UMCT|CCC 3 SPQ|
Standard:	Earth and Space Science	

Item Set 1 – Question 6 (TEI Multiple Select)

Rivers can carry trash just like they carry rocks in Figure 2. A planning committee wants to identify places where rivers might carry trash. Based on Figure 1, identify the places where rivers could carry trash.

Select **one** box per row to identify the correct places.

Place	Yes	No
Source of the rivers	☐	☑
Delta	☑	☐

Item Information		
Answer:	See Image	
Grade Level Expectation:	SC.5.3.5	Societal activities have had major effects on land, ocean, atmosphere and even outer space.
Evidence Outcome:	SC.5.3.5.a	Obtain and combine information about ways individual communities use science ideas to protect the Earth's resources and environment. (5-ESS3-1)|SEP 8 OECI|CCC 4 SSM|
Standard:	Earth and Space Science	

Item Set 1 – Question 7 (Constructed Response)

A student wonders what force causes the water in the rivers to flow. Based on Figure 1, explain the force that helps the water travel from the source of the rivers toward the ocean. Your response should include:

- identification of the force that causes water to flow from the source of the rivers toward the ocean
- an explanation, based on Figure 1, of why this force affects the direction that the rivers take from their source to the ocean

Item Information		
Answer:	See Sample Student Responses	
Grade Level Expectation:	SC.5.1.3	The gravitational force of Earth acting on an object near Earth's surface pulls that object toward the planet's center.
Evidence Outcome:	SC.5.1.3.a	Support an argument that the gravitational force exerted by Earth on objects is directed down. (5-PS2-1) (Clarification Statement: "Down" is a local description of the direction that points toward the center of the spherical Earth.) (Boundary Statement: Does not include mathematical representation of gravitational force). |SEP 7 EAE|CCC 2 CAE|
Standard:	Physical Science	

Scoring Rubric	
Points	**Attributes**
2	**The student's response should include:** • Identification of the force that causes water to flow from the source of the rivers toward the ocean. • An explanation, based on Figure 1, of why this force affects the direction that the rivers take from their source to the ocean. **Student responses may include but are not limited to:** The force of gravity causes the river water to move from its source toward the ocean. Gravity is a force that acts on an object in a downward direction. Figure 1 shows that the rivers flow downhill from their source in the mountains to the ocean because the force of gravity makes the water move from higher places to lower ones.
1	Student response demonstrates a partial understanding of the task.
0	Student response does not demonstrate an understanding of the task.

Sample Student Responses *Sample student responses are not representative of all correct answers for an item and are provided only as a guide to assist teachers with scoring.*	
Points	
2	**Sample Response**
	Sample A Gravity makes the water move from the top of the mountains where it is stored in snow and ice down to the bottom of the mountains. This is because gravity makes everything move towards the center of the Earth. Gravity also makes the water fall out of the clouds onto the mountains. **Sample B** Gravity pulls everything towards the core of the earth, so it makes the water move down from the mountains and move toward the sea.
	Sample Annotation
	Sample A • The response identifies the force that causes water to flow from the source of the rivers toward the ocean (*Gravity*). • The response explains why this force affects the direction that the rivers take from their source to the ocean (*makes the water move from the top of the mountains where it is stored in snow and ice down to the bottom of the mountains. This is because gravity makes everything move towards the center of the Earth*). **Sample B** • The response identifies the force that causes water to flow from the source of the rivers toward the ocean (*Gravity*). • The response explains why this force affects the direction that the rivers take from their source to the ocean (*Gravity pulls everything towards the core of the earth, so it makes the water move down from the mountains*).
1	**Sample Response**
	Sample A Gravity **Sample B** Momentum makes the water move from the top of the mountain to the ocean because everything goes downward.
	Sample Annotation
	Sample A • The response identifies the force that causes water to flow from the source of the rivers toward the ocean (*Gravity*). • The response does not address why gravity affects the direction that the rivers take from their source to the ocean. **Sample B** • The response explains why this force affects the direction that the rivers take from their source to the ocean (*makes the water move from the top of the mountain to the ocean because everything goes downward*). • The response incorrectly identifies the force (*Momentum*).

0	**Sample Response**
	Sample A Because of the speed of the water it winds around, like if there is a rock in the way it goes around it. **Sample B** Water moves to the ocean because of the chemical reactions with the salt. The rivers are carrying the salt to the ocean to help all of the fish there.
	Sample Annotation
	Sample A • The response incorrectly identifies the force (the speed of the water). • The response attempts to explain the path the water takes (water it winds around, like if there is a rock in the way it goes around it) but does not explain why it moves from its source to the ocean. **Sample B** • The response incorrectly identifies the force (the chemical reactions of the salt). • The response does not attempt to explain why this force affects the direction that the rivers take from their source to the ocean.

Item Set 1 – Question 8 (Selected Response)

A student claims that the force of gravity can be observed during the investigation. Based on the results, which statement **best** provides evidence to support the student's claim?

- A. The soap takes a different shape in the glass than it does in the spoon.
- B. The baking soda and vinegar mixture produces bubbles.
- C. The baking soda and vinegar mixture loses mass.
- D. The soap sinks to the bottom of the glass.

Item Information		
Answer:	D	
Grade Level Expectation:	SC.5.1.3	The gravitational force of Earth acting on an object near Earth's surface pulls that object toward the planet's center.
Evidence Outcome:	SC.5.1.3.a	Support an argument that the gravitational force exerted by Earth on objects is directed down. (5-PS2-1) (Clarification Statement: "Down" is a local description of the direction that points toward the center of the spherical Earth.) (Boundary Statement: Does not include mathematical representation of gravitational force). |SEP 7 EAE|CCC 2 CAE|
Standard:	Physical Science	

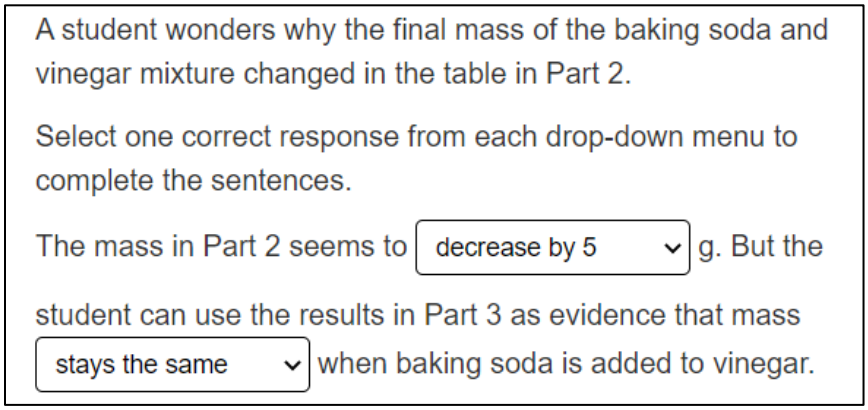
Item Set 1 – Question 9 (Selected Response)

A student claims that a new substance forms during the investigations. Based on the investigation, which observation **best** provides evidence that a new substance forms during the investigations?

- ○ A. The final mass of each mixture is the same as the total mass of the original substances.
- ○ B. The colored soap turns colorless because it was stirred in the water.
- ◉ C. The balloon inflates because baking soda reacts with vinegar.
- ○ D. The penny becomes cleaner in each mixture.

Item Information		
Answer:	C	
Grade Level Expectation:	SC.5.1.2	Chemical Reactions that occur when substances are mixed can be identified by the emergence of substances with different properties; the total mass remains the same.
Evidence Outcome:	SC.5.1.2.b	Conduct an investigation to determine whether the mixing of two or more substances results in new substances. (5-PS1-4)|SEP 3 PCOI|CCC 2 CAE|
Standard:	Physical Science	

Item Set 1 – Question 10 (TEI Inline Choice)



Item Information		
Answer:	See Image	
Grade Level Expectation:	SC.5.1.2	Chemical Reactions that occur when substances are mixed can be identified by the emergence of substances with different properties; the total mass remains the same.
Evidence Outcome:	SC.5.1.2.a	Measure and graph quantities to provide evidence that regardless of the type of change that occurs when heating, cooling or mixing substances, the total weight of matter is conserved. (5-PS1-2) (Clarification Statement: Examples of reactions or changes could include phase changes, dissolving and mixing that form new substances. Does not include distinguishing mass and weight.) (Boundary Statement: Mass and weight are not distinguished at this grade level.) |SEP 5 UMCT|CCC 3 SPQ|
Standard:	Physical Science	

Item Set 1 – Question 11 (Constructed Response)

The teacher provided the students with 100 g of vinegar and asked the students to add salt to the vinegar. Based on the results in Part 2, explain how the students could measure the amount of salt that was added if the final mass of the mixture is 120 g. Your response should include a description of:

- the likely amount of salt that was added to the vinegar
- the evidence from the simulation for the likely amount of salt added to the vinegar

Item Information		
Answer:	See Sample Student Responses	
Grade Level Expectation:	SC.5.1.2	Chemical Reactions that occur when substances are mixed can be identified by the emergence of substances with different properties; the total mass remains the same.
Evidence Outcome:	SC.5.1.2.a	Measure and graph quantities to provide evidence that regardless of the type of change that occurs when heating, cooling or mixing substances, the total weight of matter is conserved. (5-PS1-2) (Clarification Statement: Examples of reactions or changes could include phase changes, dissolving and mixing that form new substances. Does not include distinguishing mass and weight.) (Boundary Statement: Mass and weight are not distinguished at this grade level.) |SEP 5 UMCT|CCC 3 SPQ|
Standard:	Physical Science	

Scoring Rubric	
Points	**Attributes**
2	**The student's response should include a description of:** • The likely amount of salt that was added to the vinegar. • The evidence from the simulation for the likely amount of salt added to the vinegar. **Student responses may include but are not limited to:** The students most likely added 20 g of salt to the vinegar. The table in Part 2 shows that the final mass of a salt-and-vinegar mixture is equal to the combined masses of the salt and the vinegar.
1	Student response demonstrates a partial understanding of the task.
0	Student response does not demonstrate an understanding of the task.

Sample Student Responses *Sample student responses are not representative of all correct answers for an item and are provided only as a guide to assist teachers with scoring.*	
Points	
2	**Sample Response** **Sample A** The salt was 20 g. Nothing was created or destroyed so the total weight of 120 g is the weight of the vinegar plus the weight of the salt, just like it was 110 g in the table. **Sample B** The total mass of 10 g of salt and 100 g of water is 110 g so the total mass of 100 g of water and 20 g of salt is 120 g.
2	**Sample Annotation** **Sample A** • The response correctly determines the likely amount of salt that was added to the vinegar (*20 g*). • The response provides evidence from the experiment for the likely amount of salt added to the vinegar (*so the total weight of 120 g is the weight of the vinegar plus the weight of the salt, just like it was 110 g in the table*). Using the term "weight" instead of mass does not detract from the score. **Sample B** • The response correctly determines the likely amount of salt that was added to the vinegar (*20 g*). Calling the vinegar "water" does not detract from the score. • The response provides evidence from the experiment for the likely amount of salt added to the vinegar (*The total mass of 10 g of salt and 100 g of water is 110*).
1	**Sample Response** **Sample A** The mass of salt is 20 g. **Sample B** In the experiment it said that 10 g of salt and 100 g of vinegar equals 110 g.
1	**Sample Annotation** **Sample A** • The response correctly determines the likely amount of salt that was added to the vinegar (*20 g*). • The response does not provide evidence from the experiment for the likely amount of salt added to the vinegar. **Sample B** • The response provides evidence from the experiment for the likely amount of salt added to the vinegar (*In the experiment it said that 10 g of salt and 100 g of vinegar equals 110 g*). • The response does not determine the likely amount of salt that was added to the vinegar.
0	**Sample Response** **Sample A** It would be 10 g because that is how much salt they used in the experiment. **Sample B** The salt dissolved in the vinegar and cleaned the penny.
0	**Sample Annotation** **Sample A** • The response does not determine the likely amount of salt that was added to the vinegar. • The response does not provide evidence from the experiment for the likely amount of salt added to the vinegar. Since only the mass of the salt, and not the total mass, is given, this is considered to be insufficient evidence. **Sample B** • The response does not determine the likely amount of salt that was added to the vinegar. • The response does not provide evidence from the experiment for the likely amount of salt added to the vinegar.

Item Set 1 – Question 12 (Constructed Response)

A student claims that a new substance forms only with the mixture of baking soda and vinegar. Based on the results of Part 3, explain why the student's claim is correct. Your response should include:

- a description of the evidence from Part 3 that supports the student's claim
- an explanation of how this evidence supports the student's claim

Item Information		
Answer:	See Sample Student Responses	
Grade Level Expectation:	SC.5.1.2	Chemical Reactions that occur when substances are mixed can be identified by the emergence of substances with different properties; the total mass remains the same.
Evidence Outcome:	SC.5.1.2.b	Conduct an investigation to determine whether the mixing of two or more substances results in new substances. (5-PS1-4)|SEP 3 PCOI|CCC 2 CAE|
Standard:	Physical Science	

Scoring Rubric	
Points	**Attributes**
2	**The student's response should include:** • A description of the evidence from Part 3 that supports the student's claim. • An explanation of how this evidence supports the student's claim. **Student responses may include but are not limited to:** The inflating of the balloon in Part 3 shows that a new substance is produced when baking soda is mixed with vinegar. The balloon inflates because of the gas that is produced when baking soda is mixed with vinegar. The balloon only inflates for baking soda and vinegar, because the other mixtures do not produce a gas to fill it.
1	Student response demonstrates a partial understanding of the task.
0	Student response does not demonstrate an understanding of the task.

Sample Student Responses *Sample student responses are not representative of all correct answers for an item and are provided only as a guide to assist teachers with scoring.*	
Points	
2	**Sample Response**
	Sample A The balloon inflates when the baking soda is mixed with the vinegar because they are reacting and making a new substance. So gas is released. Gas is not released in the other two because they are just mixing together, not making anything new. **Sample B** Gas is released when they are mixed together, meaning that a chemical reaction is happening.
	Sample Annotation
	Sample A • The response includes a description of the evidence from Part 3 that supports the student's claim (*The balloon inflates … because they are reacting and making a new substance. So gas is released*). • The response gives an explanation of how this evidence supports the student's claim (*Gas is not released in the other two because they are just mixing together, not making anything new*). **Sample B** • The response includes a description of the evidence from Part 3 that supports the student's claim (*Gas is released when they are mixed together*). In this context, "they" is taken to mean vinegar and baking soda, since those are the ingredients mentioned in the prompt. The response does not state that the balloon inflates, but "gas is released" is sufficient. • The response gives an explanation of how this evidence supports the student's claim (*a chemical reaction is happening*).
1	**Sample Response**
	Sample A When you mix vinegar and baking soda., it releases gas and inflates the balloon. **Sample B** If a new substance didn't form, then the mass of the mixture would be the same as the mass of the baking soda and the mass of the vinegar.
	Sample Annotation
	Sample A • The response includes a description of the evidence from Part 3 that supports the student's claim (*it releases gas and inflates the balloon*). • The response does not give an explanation of how this evidence supports the student's claim. **Sample B** • The response gives an explanation of how this evidence supports the student's claim (*If a new substance didn't form, then the mass of the mixture would be the same as the mass of the baking soda and the mass of the vinegar*). • The response does not include a description of the evidence from Part 3 that supports the student's claim. The prompt states that the change in mass is evidence of the formation of a new substance, so this does not receive credit.

0	**Sample Response**
	Sample A I do not believe that the balloon is evidence that a new substance didn't form in the other experiments. There could be other evidence. **Sample B** They put helium in the third bottle and that made the balloon float.
	Sample Annotation
	Sample A • The response does not include a description of the evidence from Part 3 that supports the student's claim, or how this evidence supports the student's claim. **Sample B** • The response does not include a description of the evidence from Part 3 that supports the student's claim, or how this evidence supports the student's claim.

Item Set 1 – Question 13 (Constructed Response)

A student has a sample of 10 g of cooking oil that looks similar to the soap in Part 2. Properties of cooking oil and soap are shown in the table.

Properties of Cooking Oil and Soap

Material	Observation When Stirred in Water	Color in Water
cooking oil	forms drops that float	light tan
soap	disappears	light tan

Explain how a property of cooking oil would allow filter paper to separate the oil from water. Your response should include:

- identification of the property that causes the difference observed when the materials are stirred in water
- an explanation of why filter paper can only use this property to separate oil and water, not soap and water

Item Information		
Answer:	See Sample Student Responses	
Grade Level Expectation:	SC.5.1.1	Matter exists as particles that are too small to be seen; measurements of a variety of observable properties can be used to identify particular materials.
Evidence Outcome:	SC.5.1.1.b	Make observations and measurements to identify materials based on their properties. (5-PS1-3) (Clarification Statement: Examples of materials to be identified could include baking soda and other powders, metals, minerals and liquids. Examples of properties could include color, hardness, reflectivity, electrical conductivity, thermal conductivity, response to magnetic forces and solubility; density is not intended as an identifiable property. Does not include density or distinguishing mass and weight.) (Boundary Statement: At this grade level, mass and weight are not distinguished, and no attempt is made to define the unseen particles or explain the atomic-scale mechanism of evaporation and condensation.) |SEP 3 PCOI|CCC 3 SPQ|
Standard:	Physical Science	

Scoring Rubric	
Points	**Attributes**
2	**The student's response should include:** • Identification of the property that causes the difference observed when the materials are stirred in water. • An explanation of why filter paper can only use this property to separate oil and water, not soap and water. **Student responses may include but are not limited to:** The property is solubility in water. The cooking oil will not pass through the filter paper because it does not dissolve in water, while the soap does dissolve in water and will pass through the filter paper. Note: For B1, student may also say ability to dissolve in water. For B2, student may say the drops are too large to pass through the filter paper.
1	Student response demonstrates a partial understanding of the task.
0	Student response does not demonstrate an understanding of the task.

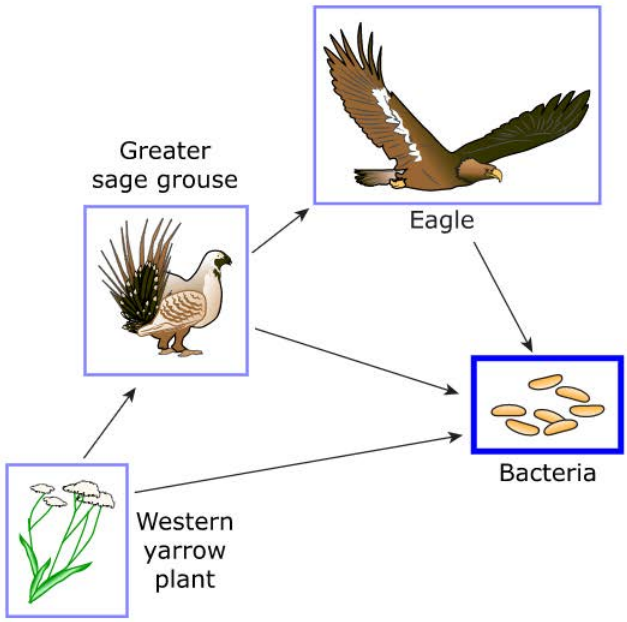
Sample Student Responses *Sample student responses are not representative of all correct answers for an item and are provided only as a guide to assist teachers with scoring.*	
Points	
2	**Sample Response** **Sample A** The difference is observed because the soap dissolves in water and the oil stays separate. If you put the soapy water through filter paper the soap will stay dissolved and stay with the water, but the oil is separate so it will stick to the filter paper. **Sample B** The property is solubility. The soap goes through the filter paper with the water, but the oil is too thick and it can't get through.
	Sample Annotation
	Sample A • The response identifies the property that causes the difference observed when the materials are stirred in water (*soap dissolves in water and the oil stays separate*). • The response explains why filter paper can only use this property to separate oil and water, not soap and water (*the soap will stay dissolved and stay with the water, but the oil is separate so it will stick to the filter paper*). **Sample B** • The response identifies the property that causes the difference observed when the materials are stirred in water (*The property is solubility*). • The response explains why filter paper can only use this property to separate oil and water, not soap and water (*The soap goes through the filter paper with the water, but the oil is too thick and it can't get through*).

1	**Sample Response** **Sample A** The soap dissolves in water and the oil doesn't. You could use filter paper to filter out the soap and the oil and then you would have clean water. **Sample B** The oil won't go through the filter paper because it's thicker than water.
	Sample Annotation
	Sample A • The response identifies the property that causes the difference observed when the materials are stirred in water (The soap dissolves in water and the oil doesn't). • The response incorrectly states that the soap could be filtered out using the filter paper and does not explain how solubility affects this process. **Sample B** • The response explains why filter paper can only use this property to separate oil and water, not soap and water (The oil won't go through the filter paper because it's thicker than water). • The response does not identify the property that causes the difference observed when the materials are stirred in water.
0	**Sample Response** **Sample A** The property is temperature. To filter out the soap and water you just need to heat them up. **Sample B** You could mix the soapy water with the oily water and that would make the oil separate.
	Sample Annotation
	Sample A • The response does not identify the property that causes the difference observed when the materials are stirred in water. • The response does not explain why filter paper can only use this property to separate oil and water, not soap and water. **Sample B** • The response does not identify the property that causes the difference observed when the materials are stirred in water. • The response does not explain why filter paper can only use this property to separate oil and water, not soap and water.

Item Set 1 – Question 14 (TEI Hot Spot)

Students learn that farmers often put fertilizer in the soil. Fertilizer helps the farmers grow the fruits and vegetables people use for food. The students wonder how wild plants grow without people adding fertilizer to the soil.

Select **one** organism in the food web that would help the wild plants the same way the fertilizer helps the farmer's crops.

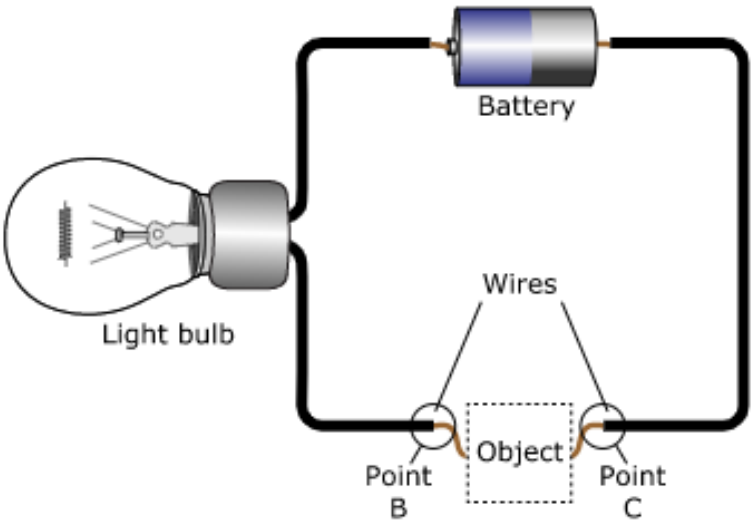


Item Information		
Answer:	See Image	
Grade Level Expectation:	SC.5.2.2	Matter cycles between air and soil and among plants, animals and microbes as these organisms live and die.
Evidence Outcome:	SC.5.2.2.a	Develop a model to describe the movement of matter among plants, animals, decomposers, and the environment. (5-LS2-1) (Clarification Statement: Emphasis is on the idea that matter that is not food [air, water, decomposed materials in soil] is changed by plants into matter that is food. Examples of systems could include organisms, ecosystems, and the Earth.) (Boundary Statement: Does not include molecular explanations.) |SEP 2 DUM|CCC 4 SSM|
Standard:	Life Science	

ANSWER KEY: ITEM SET 2

Item Set 2 – Question 1 (TEI Inline Choice)

Students investigate a circuit. They observe that the light bulb only turns on when certain materials are placed between points B and C.



Using their observations, they separate the materials they are testing into two groups. The table shows their groupings.

Materials

Group A	Group B
iron nail	rubber eraser
copper penny	plastic button
steel paper clip	wood stick

Select one correct response from each drop-down menu to complete the sentences.

The property the students tested was whether each material [conducts electricity] . A comparison can be made between the penny and the paper clip to see which one is [the better conductor] by testing to see which one [makes the light shine brighter] .

Item Information		
Answer:	See Image	
Grade Level Expectation:	SC.5.1.1	Matter exists as particles that are too small to be seen; measurements of a variety of observable properties can be used to identify particular materials.
Evidence Outcome:	SC.5.1.1.b	Make observations and measurements to identify materials based on their properties.
Standard:	Physical Science	

Item Set 2 – Question 2 (Selected Response)

The students plan to use a different set of materials to be models for the behavior of the oil and water used in Part 1. Which materials, if shaken, would **most** accurately be models for the behavior of the water and vegetable oil in the bottle?

A.

Science in a Bottle Setup	Model
water	clear marbles
vegetable oil	yellow marbles

B.

Science in a Bottle Setup	Model
water	salt
vegetable oil	yellow marbles

C.

Science in a Bottle Setup	Model
water	clear marbles
vegetable oil	pepper

D.

Science in a Bottle Setup	Model
water	pepper
vegetable oil	salt

Item Information		
Answer:	B	
Grade Level Expectation:	SC.5.1.1	Matter exists as particles that are too small to be seen; measurements of a variety of observable properties can be used to identify particular materials.
Evidence Outcome:	SC.5.1.1.a	Develop a model to describe that matter is made of particles too small to be seen.
Standard:	Physical Science	

Item Set 2 – Question 3 (Selected Response)

After the tablet in the investigation in Part 2 has completely dissolved, a student unscrews the cap to the bottle. As the cap loosens, the students hear a hissing sound. What is the **most likely** explanation for the hissing sound?

- (●) A. Small particles of gaseous matter exit the bottle.
- ( ) B. Small bubbles in the bottle turn back into water.
- ( ) C. The oil and water mix to form a single layer.
- ( ) D. The food coloring dissolves into the oil.

Item Information		
Answer:	A	
Grade Level Expectation:	SC.5.1.1	Matter exists as particles that are too small to be seen; measurements of a variety of observable properties can be used to identify particular materials.
Evidence Outcome:	SC.5.1.1.a	Develop a model to describe that matter is made of particles too small to be seen.
Standard:	Physical Science	

Item Set 2 – Question 4 (Multiple Select)

Students repeat the investigation in Part 2, but this time they weigh the tablet as well as the bottle and its contents before and after the investigation. The students do not put the cap on the bottle after the tablet is added.

Which statement predicts what the students will observe in the investigation, and which description correctly explains their observation? Select **two** correct answer choices.

- ☐ A. The mass of the bottle after the investigation was greater than the mass of the bottle and tablet before the investigation.
- ☐ B. The mass of the bottle after the investigation was the same as the mass of the bottle and tablet before the investigation.
- ☑ C. The mass of the bottle after the investigation was less than the mass of the bottle and tablet before the investigation.
- ☐ D. This is evidence that no new substance was formed as the matter in the tablet was destroyed.
- ☑ E. This is evidence that a new substance was formed and left the bottle as a gas.

Item Information		
Answer:	C, E	
Grade Level Expectation:	SC.5.1.2	Chemical Reactions that occur when substances are mixed can be identified by the emergence of substances with different properties; the total mass remains the same.
Evidence Outcome:	SC.5.1.2.b	Conduct an investigation to determine whether the mixing of two or more substances results in new substances.
Standard:	Physical Science	

Item Set 2 – Question 5 (Constructed Response)

A bottle of water and a bottle of clear oil are on a table. The students notice that the liquid in the bottles looks the same.

Use the information in Part 1 to explain how a student can use food coloring to correctly identify the oil and the water. Your response should include a description of:

- how a student can use the way that food coloring behaves in water to identify a substance as water
- how a student can use the way that food coloring behaves in oil to identify a substance as oil

Item Information		
Answer:	See Sample Student Responses	
Grade Level Expectation:	SC.5.1.1	Matter exists as particles that are too small to be seen; measurements of a variety of observable properties can be used to identify particular materials.
Evidence Outcome:	SC.5.1.1.b	Make observations and measurements to identify materials based on their properties.
Standard:	Physical Science	

Scoring Rubric	
Points	**Attributes**
2	**The response should include a description of:** • How a student can use the way that food coloring behaves in water to identify a substance as water. • How a student can use the way that food coloring behaves in oil to identify a substance as oil. **Student responses may include but are not limited to:** It dissolves in water. It does not dissolve in oil. Note: Swirling may be mentioned for mixing food coloring with the liquids. Students may describe the dissolving rather than naming it as dissolving.
1	Student response demonstrates a partial understanding of the task.
0	Student response does not demonstrate an understanding of the task.

Sample Student Responses *Sample student responses are not representative of all correct answers for an item and are provided only as a guide to assist teachers with scoring.*	
Points	
2	**Sample Response**
	It dissolves in water. It does not dissolve in oil.
	Sample Annotation
	This response demonstrates a complete understanding of the task. The student describes the behavior of the food coloring both in the water (*It dissolves*) and in the oil (*It does not dissolve*).
1	**Sample Response**
	The students can put food coloring in the bottles. The food color doesn't dissolve in the oil, it just lays at the bottom of the bottle until you swirl it around, then it just makes a bunch of little bubble in the oil, like a snow globe.
	Sample Annotation
	This response demonstrates a partial understanding of the task because it is incomplete. Only the behavior of food coloring in vegetable oil is described *(The food color doesn't dissolve in the oil, it just lays at the bottom until you swirl it … makes a bunch of little bubble).* The behavior of food coloring in vegetable water is not described.
0	**Sample Response**
	They could pour some on their hand. If it's wet, it's water. If it feels slimy, it's oil.
	Sample Annotation
	This response does not demonstrate an understanding of the task because it does not address the behavior of food coloring with either liquid. Although a tactile approach may work to differentiate water from vegetable oil, the prompt specifically asks how a student can use food coloring to correctly identify the oil and the water.

Item Set 2 – Question 6 (Inline Choice)

In the simulation, Jupiter, Mercury, and Venus are shown. Venus appears brighter than Mercury in the night sky. Using your knowledge of the factors that affect the brightness of objects, select one correct response from each drop-down menu to complete the sentences.

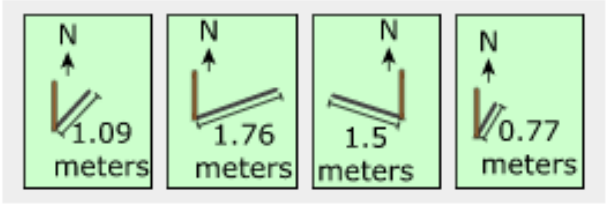
Objects that are [farther away] usually appear dimmer to a viewer than objects that are [closer]. This information supports the claim that if Venus appears brighter than Mercury, then Venus is probably [closer to] Earth than Mercury is.

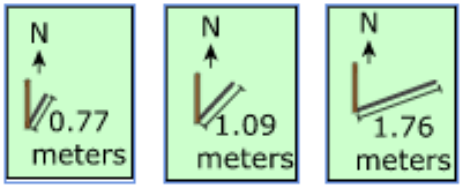
Item Information		
Answer:	See Image	
Grade Level Expectation:	SC.5.3.1	Stars range greatly in size and distance from Earth, and this can explain their relative brightness.
Evidence Outcome:	SC.5.3.1.a	Support an argument that differences in the apparent brightness of the sun compared to other stars is due to their relative distances from the Earth
Standard:	Earth and Space Science	

Item Set 2 – Question 7 (TEI Drag and Drop)

Outside the path of the total solar eclipse, the pattern of shadows is the same as on any other day. Show how shadows change on the day of the eclipse for someone outside the path of the eclipse.

Based on the data table, drag and drop the correct shadow image into each labeled box. Each shadow may be used once, more than once, or not at all.





Shadow when partial eclipse begins

Shadow during maximum eclipse

Shadow when partial eclipse ends

Item Information		
Answer:	See Image	
Grade Level Expectation:	SC.5.3.2	Earth's orbit and rotation and the orbit of the moon around Earth cause observable patterns.
Evidence Outcome:	SC.5.3.2.a	Represent data in graphical displays to reveal patterns of daily changes in length and direction of shadows, day and night, and the seasonal appearance of some stars in the night sky.
Standard:	Earth and Space Science	

Item Set 2 – Question 8 (Selected Response)

The star M45 is visible during the total solar eclipse in the night sky in the Northern Hemisphere. If the same total solar eclipse would occur during the summer, M45 would not be visible. Why would M45 not be visible in the summer?

A. because M45 changes the amount of light it gives off during different seasons

B. because M45 moves closer to or farther from planets during different seasons

C. because Earth revolves around the Sun

D. because Earth rotates on its axis

Item Information		
Answer:	C	
Grade Level Expectation:	SC.5.3.2	Earth's orbit and rotation and the orbit of the moon around Earth cause observable patterns.
Evidence Outcome:	SC.5.3.2.a	Represent data in graphical displays to reveal patterns of daily changes in length and direction of shadows, day and night, and the seasonal appearance of some stars in the night sky.
Standard:	Earth and Space Science	

Item Set 2 – Question 9 (Constructed Response)

After observing the simulation, a student claims that the Sun is the closest star to Earth. Compare the brightness of the objects in the sky during the partial eclipse and the total eclipse to explain why the student's claim is correct. Your response should include:

- a comparison of bright objects seen during the partial solar eclipse and bright objects seen during the total solar eclipse
- an explanation of why the differences in brightness support the student's claim

Item Information		
Answer:	See Sample Student Responses	
Grade Level Expectation:	SC.5.3.1	Stars range greatly in size and distance from Earth, and this can explain their relative brightness.
Evidence Outcome:	SC.5.3.1.a	Support an argument that differences in the apparent brightness of the sun compared to other stars is due to their relative distances from the Earth
Standard:	Earth and Space Science	

Scoring Rubric	
Points	**Attributes**
2	**The student's response should include:** • A comparison of bright objects seen during the partial solar eclipse and bright objects seen during the total solar eclipse. • An explanation of why the differences in brightness support the student's claim. **Student responses may include but are not limited to:** During the partial solar eclipse, only the Sun is visible in the sky, while stars such as Hamal and M45 and planets such as Mercury, Venus, and Jupiter are visible during the total solar eclipse. The brightness of the Sun outshines the other stars during the partial solar eclipse because it is the closest star to Earth.
1	Student response demonstrates a partial understanding of the task.
0	Student response does not demonstrate an understanding of the task.

Sample Student Responses *Sample student responses are not representative of all correct answers for an item and are provided only as a guide to assist teachers with scoring.*	
Points	
2	**Sample Response**
	During the partial solar eclipse, only the Sun is visible in the sky, while stars such as Hamal and M45 and planets such as Mercury, Venus, and Jupiter are visible during the total solar eclipse. The brightness of the Sun outshines the other stars during the partial solar eclipse because it is the closest star to Earth.
	Sample Annotation
	The student demonstrates a complete understanding of the task. The comparison of bright objects seen during the partial eclipse to those seen during the total eclipse is correct *(During the partial solar eclipse, only the Sun is visible in the sky, while stars such as Hamal and M45 and planets such as Mercury, Venus, and Jupiter are visible during the total solar eclipse)*. The explanation of why the differences in brightness correctly support the student's claim *(The brightness of the Sun outshines the other stars during the partial solar eclipse because it is the closest star to Earth)*.
1	**Sample Response**
	During a partial eclipse, you can only see the bright sun in the sky. But during a total eclipse, you can see lots of stars like Hamal and M45 and some planets like Venus and Jupiter, because it's so dark, just like at night.
	Sample Annotation
	The response demonstrates a partial understanding of the task. The comparison of bright objects seen during the partial eclipse to those seen during the total eclipse is correct *(During a partial eclipse, you can only see the bright sun in the sky. But during a total eclipse, you can see lots of stars like Hamal and M45 and some planets like Venus and Jupiter)*. The explanation of why the differences in brightness correctly support the student's claim *(because it's so dark, just like at night)* does not mention the sun outshining the stars during the partial eclipse to support the student's claim that the sun is the star closest to earth.
0	**Sample Response**
	During a total solar eclipse, the sky gets very dark, just like at night. It is so dark that you can even see stars in the sky, in the middle of the day.
	Sample Annotation
	This response does not demonstrate an understanding of the task. There is no comparison of bright objects seen during the partial eclipse to those seen during the total eclipse, only a mention that stars are visible during the total solar eclipse. There is no explanation of the differences in brightness to support the student's claim.

Item Set 2 – Question 10 (Constructed Response)

Use the simulation to observe and compare how each star looks during the total solar eclipse. Your response should include:

- how the appearances of the stars compare to each other
- how comparing the stars provides evidence for the distances of stars from Earth

Item Information		
Answer:	See Sample Student Responses	
Grade Level Expectation:	SC.5.3.1	Stars range greatly in size and distance from Earth, and this can explain their relative brightness.
Evidence Outcome:	SC.5.3.1.a	Support an argument that differences in the apparent brightness of the sun compared to other stars is due to their relative distances from the Earth.
Standard:	Earth and Space Science	

Scoring Rubric	
Points	**Attributes**
2	**The student response should include:** • How the appearances of the stars compare to each other. • How comparing the stars provides evidence for the distances of stars from Earth. **Student responses may include but are not limited to:** Some stars appear larger and brighter than other stars. Compared to the size of the Sun, the sizes of the other stars appear very small and their apparent brightness is much less. This provides evidence that the other stars are different distances from Earth, though they are all much farther away than the Sun.
1	Student response demonstrates a partial understanding of the task.
0	Student response does not demonstrate an understanding of the task.

Sample Student Responses *Sample student responses are not representative of all correct answers for an item and are provided only as a guide to assist teachers with scoring.*	
Points	
2	**Sample Response**
	Some stars appear larger and brighter than other stars. Compared to the size of the Sun, the sizes of the other stars appear very small and their apparent brightness is much less. This provides evidence that the other stars are different distances from Earth, though they are all much farther away than the Sun.
	Sample Annotation
	The student demonstrates a complete understanding of the task. The comparison of the appearance of the stars is correct *(Some stars appear larger and brighter than other stars. Compared to the Sun, the sizes of the other stars appear very small and their apparent brightness is much less)*. The explanation of how this comparison gives evidence of the stars' distances from earth is also correct *(the other stars are different distances from Earth, though they are all much farther away than the Sun).*
1	**Sample Response**
	During the total solar eclipse, you can see the stars in the sky. Some look brighter and some look dimmer than the others. And some look bigger and some smaller. But none look as big or as bright as the sun.
	Sample Annotation
	The response demonstrates a partial understanding of the task. The comparison of the appearance of the stars is correct *(Some look brighter and some look dimmer than the others. And some look bigger and some smaller … none look as big or as bright as the sun)*. The response is incomplete because there is no explanation of how the comparison gives evidence of the stars' distances from earth because distance from the earth is not mentioned.
0	**Sample Response**
	The stars and the planets are just little dots of light so that means they are all about the same distance away.
	Sample Annotation
	This response does not demonstrate an understanding of the task. The attempted comparison of the stars is not acceptable because it does not address relative apparent brightness or size. The supposition that the planets and stars are all about the same distance from earth is incorrect.

Item Set 2 – Question 11 (Constructed Response)

A student wonders whether the stars he saw during the total solar eclipse in the simulation would be the same stars he could see twelve hours later. Explain how the sky and the stars that are seen would change over twelve hours. Your response should include:

- a description of how the sky and the stars the student could see would look different
- why the sky would look different

Item Information		
Answer:	See Sample Student Responses	
Grade Level Expectation:	SC.5.3.2	Earth's orbit and rotation and the orbit of the moon around Earth cause observable patterns.
Evidence Outcome:	SC.5.3.2.a	Represent data in graphical displays to reveal patterns of daily changes in length and direction of shadows, day and night, and the seasonal appearance of some stars in the night sky.
Standard:	Earth and Space Science	

Scoring Rubric	
Points	**Attributes**
2	**The student response should include:** • A description of how the sky and the stars the student could see would look different. • Why the sky would look different. **Student responses may include but are not limited to:** The current stars would move across the sky, and different stars will appear twelve hours later. This is because Earth rotates on its axis, so the point of view on Earth would be facing a different part of the sky.
1	Student response demonstrates a partial understanding of the task.
0	Student response does not demonstrate an understanding of the task.

Sample Student Responses *Sample student responses are not representative of all correct answers for an item and are provided only as a guide to assist teachers with scoring.*	
Points	
2	**Sample Response**
	The current stars would move across the sky, and different stars will appear twelve hours later. This is because Earth rotates on its axis, so the point of view on Earth would be facing a different part of the sky.
	Sample Annotation
	This response demonstrates a complete understanding of the task. The description of how the sky and stars would look different is correct *(The current stars would move across the sky, and different stars will appear),* and the explanation as to why the sky would look different is correct *(Earth rotates on its axis, so the point of view on Earth would be facing a different part of the sky)*.
1	**Sample Response**
	They would see different stars in 12 hours because the stars move across the sky, like the sun.
	Sample Annotation
	This response demonstrates a partial understanding of the task. The description of how the sky and stars would look different is correct *(because the stars move across the sky, like the sun);* however, there is no mention of the Earth rotating on its axis as the explanation why the sky would look different.
0	**Sample Response**
	It's going to be the same stars because they have been there for millions of years and will be for millions more.
	Sample Annotation
	This response does not demonstrate an understanding of the task. The response is incorrect, as the stars visible behind the sun during the solar eclipse are not visible to that side of Earth at night. The Earth's rotation, which would expose a different part of the sky to a place on Earth over 12 hours, is not mentioned.

Item Set 2 – Question 12 (Selected Response)

Based on the information in Table 1, which claim is supported?

- A. Medium-sized dogs use more energy from the Sun than small-sized dogs use.
- B. Medium-sized dogs use more energy from water than giant-sized dogs use.
- C. Large-sized dogs use more energy from the Sun than giant-sized dogs use.
- D. Large-sized dogs use more energy from water than small-sized dogs use.

Item Information		
Answer:	A	
Grade Level Expectation:	SC.5.1.4	The energy released from food was once energy from the sun.
Evidence Outcome:	SC.5.1.4.a	Use models to describe that energy in animals' food (used for body repair, growth and motion and to maintain body warmth) was once energy from the sun.
Standard:	Life/Physical Science*	

Item Set 2 – Question 13 (TEI Inline Choice)

The student finds that two medium-sized dogs require different amounts of food to maintain a healthy weight. Dog 1 requires 1,050 kcal/day, and Dog 2 requires 900 kcal/day.

Based on Figure 1, compare the energy use of the dogs. Select one correct response from each drop-down menu to complete the sentences.

Dog 1 consumes more kilocalories per day than Dog 2. The energy Dog 1 consumes from the food [originally came from the Sun] . Dog 1 is most likely [younger] than Dog 2.

Item Information		
Answer:	See Image	
Grade Level Expectation:	SC.5.1.4	The energy released from food was once energy from the sun.
Evidence Outcome:	SC.5.1.4.a	Use models to describe that energy in animals' food (used for body repair, growth and motion and to maintain body warmth) was once energy from the sun.
Standard:	Life/Physical Science*	

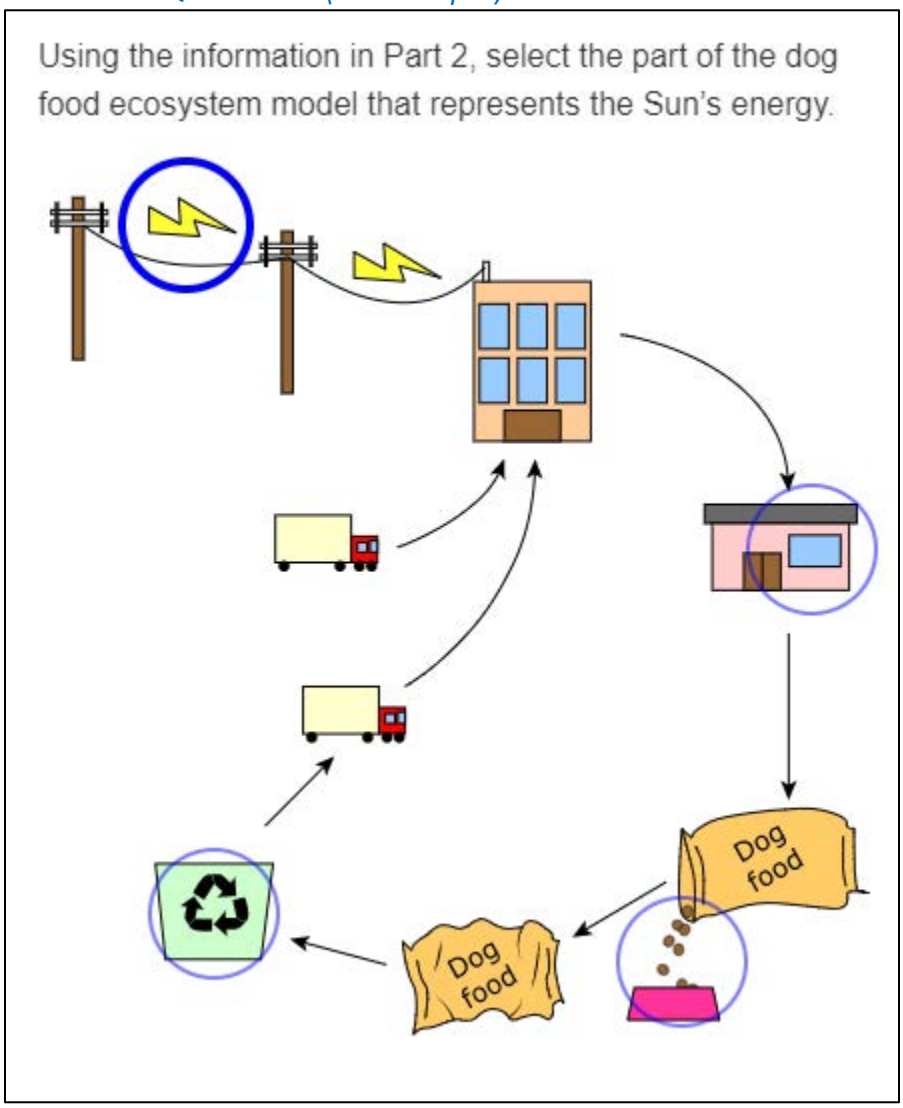
Item Set 2 – Question 14 (Selected Response)

Which statement is one way the model in Part 2 shows matter moving in an ecosystem?

- A. The truck moving ingredients from the farm is like decomposed matter moving from soil to plants.
- B. The truck moving recycled materials is like decomposed matter moving from soil to plants.
- C. The truck moving ingredients from the farm is like energy traveling from the Sun to plants.
- D. The truck moving recycled materials is like energy traveling from the Sun to plants.

Item Information		
Answer:	B	
Grade Level Expectation:	SC.5.2.2	Matter cycles between air and soil and among plants, animals and microbes as these organisms live and die.
Evidence Outcome:	SC.5.2.2.a	Develop a model to describe the movement of matter among plants, animals, decomposers, and the environment.
Standard:	Life/Physical Science*	

Item Set 2 – Question 15 (TEI Hot Spot)



Item Information		
Answer:	See Image	
Grade Level Expectation:	SC.5.1.4	The energy released from food was once energy from the sun.
Evidence Outcome:	SC.5.1.4.a	Use models to describe that energy in animals' food (used for body repair, growth and motion and to maintain body warmth) was once energy from the sun.
Standard:	Life/Physical Science*	

Item Set 2 – Question 16 (Constructed Response)

Using the information in Part 2, explain decomposition in the ecosystem model. Your response should include:

- which part of the ecosystem model represents decomposers
- an explanation of why this part of the model represents decomposers

Item Information		
Answer:	See Sample Student Responses	
Grade Level Expectation:	SC.5.2.2	Matter cycles between air and soil and among plants, animals and microbes as these organisms live and die.
Evidence Outcome:	SC.5.2.2.a	Develop a model to describe the movement of matter among plants, animals, decomposers, and the environment.
Standard:	Life/Physical Science*	

Scoring Rubric	
Points	**Attributes**
2	**The student's response should include:** • Which part of the ecosystem model represents decomposers. • An explanation of why this part of the model represents decomposers. **Student responses may include but are not limited to:** In the ecosystem model, the recycling program represents the decomposers. The recycling program and the decomposers both take waste materials and break them down to be reused.
1	Student response demonstrates a partial understanding of the task.
0	Student response does not demonstrate an understanding of the task.

Sample Student Responses *Sample student responses are not representative of all correct answers for an item and are provided only as a guide to assist teachers with scoring.*	
Points	
2	**Sample Response**
	In the ecosystem model, the recycling program represents the decomposers. The recycling program and the decomposers both take waste materials and break them down to be reused.
	Sample Annotation
	This response demonstrates a complete understanding of the task. The student identifies which part of the ecosystem model represents decomposers (*the recycling program*) and explains why (*both take waste materials and break them down to be reused*).
1	**Sample Response**
	Recycling is like decomposition.
	Sample Annotation
	This response demonstrates a partial understanding of the task by correctly identifying which part of the ecosystem represents decomposers (*Recycling*).
0	**Sample Response**
	The food that comes from the farm that is used to make new food.
	Sample Annotation
	This response does not demonstrate an understanding of the task. The part of the ecosystem model which represents decomposers is not identified, and there is no explanation why any part of the model represents decomposers.

Item Set 2 – Question 17 (Constructed Response)

A student wants to see where seeds grow best. The student puts seven seeds in each of three cups and places the cups near an open window. The seeds in Cup A are left to dry. The seeds in Cup B are in dry soil, and the seeds in Cup C are wrapped in a cloth soaked with water.

Cup A, dry seeds

Cup B, seeds put in dry soil

Cup C, seeds wrapped in a cloth soaked in water

Explain what the student will observe after four days. Your answer should include:

- the changes observed in each cup after four days
- the reason for the changes observed in each cup

Item Information		
Answer:	See Sample Student Responses	
Grade Level Expectation:	SC.5.2.1	Plants acquire their material from growth chiefly from air and water.
Evidence Outcome:	SC.5.2.1.a	Support an argument that plants get the materials they need for growth chiefly from air and water.
Standard:	Life/Physical Science*	

Scoring Rubric	
Points	**Attributes**
2	**The student response should include:** • The changes observed in each cup after four days. • The reason for the changes observed in each cup. **Student responses may include but are not limited to:** The seeds in Cup A and Cup B will show no change, but the seeds in Cup C will have roots growing out of them after four days. The seeds in cups A and B will not show any change because they did not get water and air to grow. The seeds in Cup C got water from the wet cloth and air from the surroundings and would start to grow.
1	Student response demonstrates a partial understanding of the task.
0	Student response does not demonstrate an understanding of the task.

Sample Student Responses *Sample student responses are not representative of all correct answers for an item and are provided only as a guide to assist teachers with scoring.*	
Points	
2	**Sample Response**
	The seeds in Cup A and Cup B will show no change, but the seeds in Cup C will have roots growing out of them after four days. The seeds in cups A and B will not show any change because they did not get water and air to grow. The seeds in Cup C got water from the wet cloth and air from the surroundings and would start to grow.
	Sample Annotation
	This response demonstrates a complete understanding of the task. The student explains the changes observed in each cup (*Cup A and Cup B will show no change, but the seeds in Cup C will have roots growing out of them after four days*) and the reason for the changes observed (*The seeds in Cup C got water from the wet cloth and air from the surroundings*).
1	**Sample Response**
	Cup A no growth Cup B no growth Cup C grows
	Sample Annotation
	This response demonstrates a partial understanding of the task. The student correctly states the observations for each cup after 4 days.
0	**Sample Response**
	Cup B and Cup C will grow
	Sample Annotation
	This response does not demonstrate an understanding of the task. No reasons for the changes or lack of changes are given, and an incorrect proposed observation is given for Cup B.

*Refer to the "Grade 5 Science: Colorado Academic Standards 2020 Frameworks" document for an explanation of the Life/Physical Science category.