

PRACTICE TEST

**Science and
Technology/Engineering**

Grade 5

Student Name

School Name

District Name



Grade 5 Science and Technology/Engineering PRACTICE TEST

This practice test contains 23 questions.

Directions

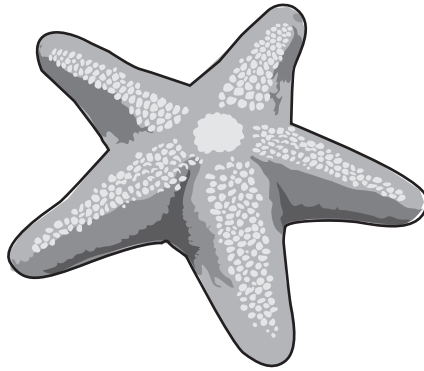
Read each question carefully and then answer it as well as you can. You must record all answers in this Practice Test Booklet.

For some questions, you will mark your answers by filling in the circles in your Practice Test Booklet. Make sure you darken the circles completely. Do not make any marks outside of the circles. 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 this Practice Test Booklet. 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. When you are finished, you may review your answers and go back to any questions you did not answer.

- 1 A group of students observe some sea stars (also known as starfish) while on a field trip. A sea star is shown in the picture below.



Most of the sea stars have five arms, but two of the sea stars each have an arm that is much shorter than their other arms. A park ranger tells the students that the shorter arms were once missing because they were probably eaten by a fish or a crab, but the arms have started to grow back.

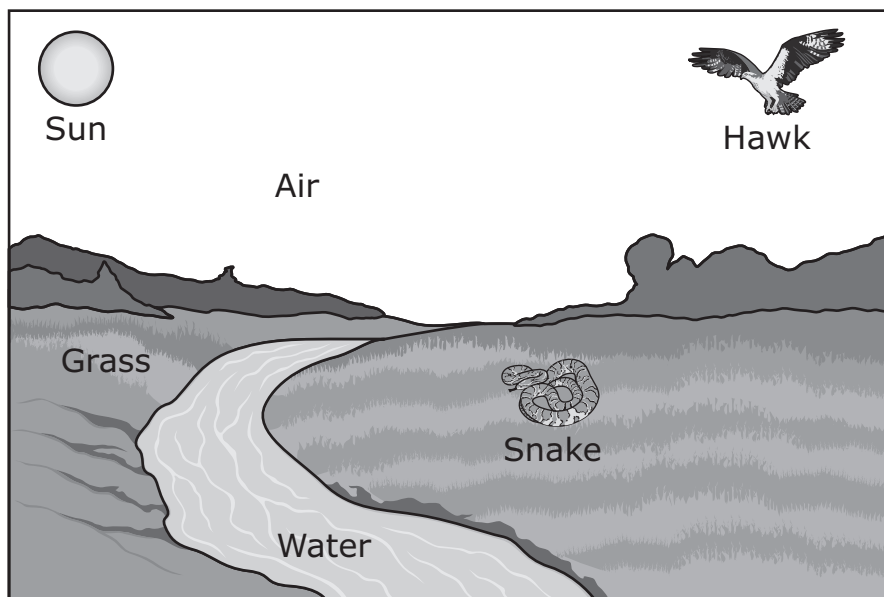
Which of the following **best** describes how sea stars are able to regrow their arms?

- Ⓐ Sea stars learn how to regrow their arms.
- Ⓑ Sea stars inherit the ability to regrow their arms.
- Ⓒ Sea stars eat food that causes their arms to regrow.
- Ⓓ Sea stars move to warmer water that causes their arms to regrow.

- 2 A student took pictures of the Moon on different days. Which set of pictures did the student take on Sunday, Wednesday, and Saturday of the same week?



- 3 The diagram shows parts of an ecosystem.

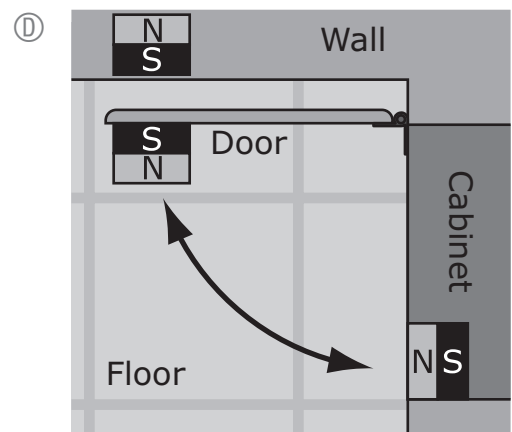
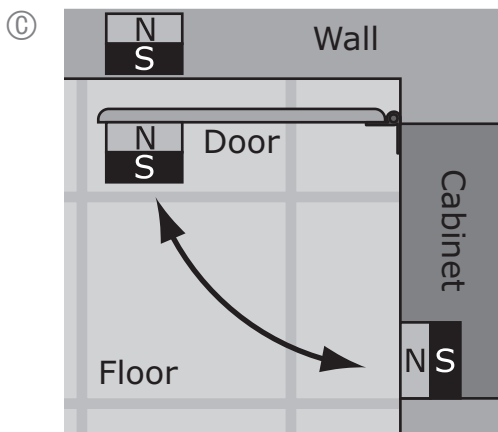
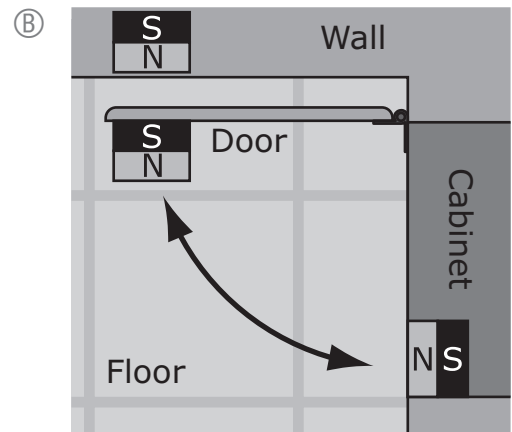
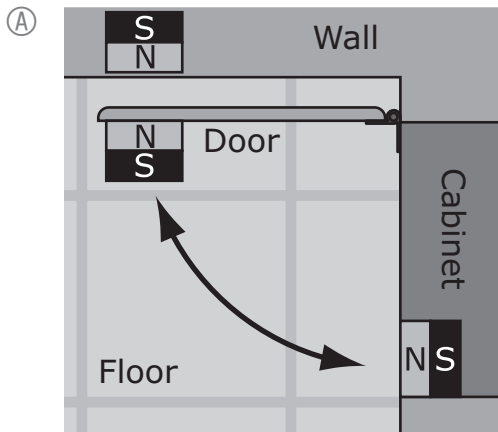


Which of the following is the source of all the energy in the ecosystem?

- Ⓐ Air
- Ⓑ Grass
- Ⓒ Hawk
- Ⓓ Snake
- Ⓔ Sun
- Ⓕ Water

- 4 A carpenter wants to use magnets to help keep a cabinet door closed. The carpenter also wants to make sure the cabinet door does not hit a nearby wall when the cabinet door is opened.

Which diagram shows how the carpenter should place the magnets?



- 5 A student is testing different types of wood to use for a bookshelf. The student tests each type of wood to predict how many books the bookshelf will safely hold.

Which of the following characteristics of the wood determines how many books the bookshelf can safely hold?

- Ⓐ flexibility
- Ⓑ hardness
- Ⓒ strength
- Ⓓ weight

The following section focuses on seasonal climate data.

Read the information below and use it to answer the three selected-response questions and one constructed-response question that follow.

On a spring day, a student in Worcester, Massachusetts, reads in the news that a local river has flooded. The student asks a science teacher what caused the river to flood. The teacher explains that the flooding is a result of seasonal weather and the water cycle. The water cycle describes how water moves from one location to another. For example, water in an ocean may move through the water cycle and become part of a lake. As water moves and changes form, it has an effect on both daily and seasonal weather in an area.

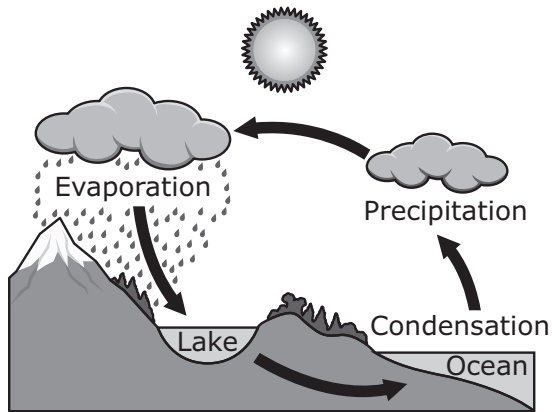
The table shows seasonal climate data for Worcester, Massachusetts.

Seasonal Climate Data for Worcester, MA

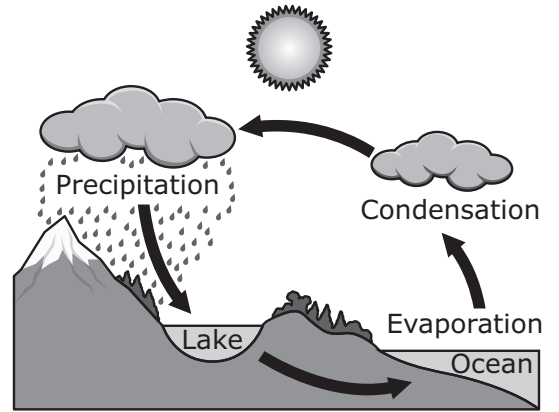
Season	Average Precipitation (inches)	Average Low Temperature (°F)	Average High Temperature (°F)	Average Wind Speed (miles per hour)
winter	10.5	19.6	34.0	11.4
spring	12.5	36.7	54.6	11.0
summer	12.1	59.3	76.8	8.6
fall	12.9	42.5	58.5	9.3

- 6** Which of the following diagrams correctly shows how water can move through the water cycle from an ocean to a lake?

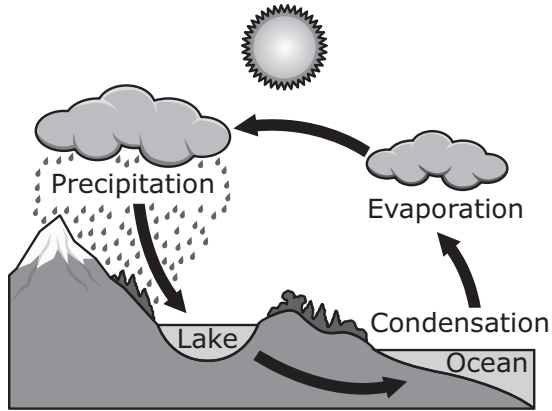
(A)



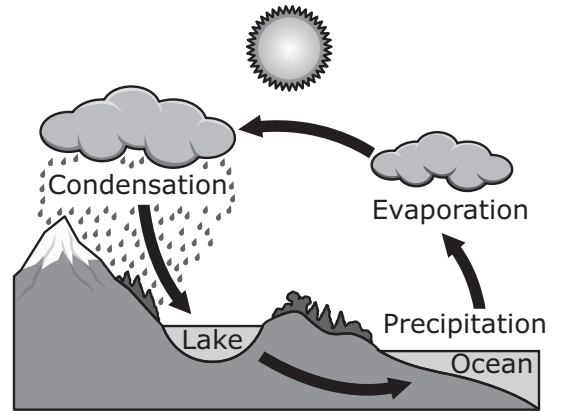
(B)



(C)

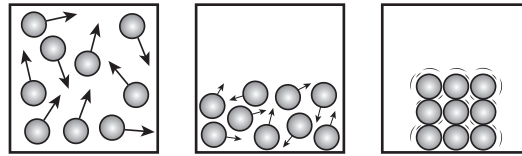


(D)

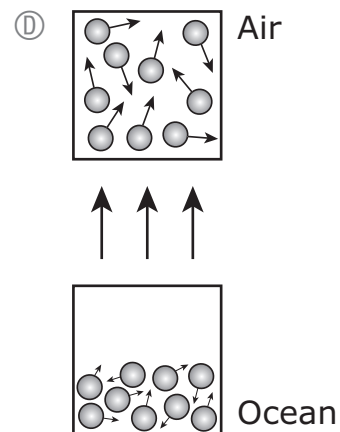
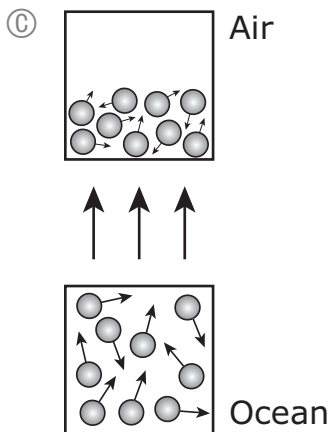
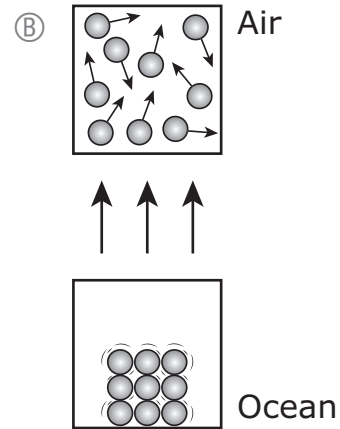
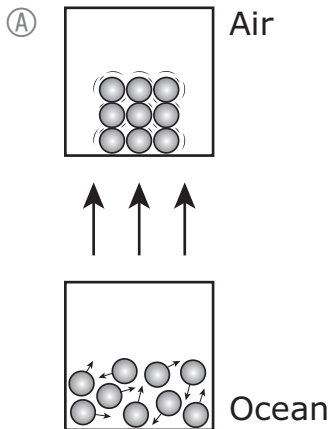


- 7 Which of the following **best** explains why more water flows in a river in Worcester in spring than in other seasons?
- Ⓐ The melting snow in spring causes more runoff.
 - Ⓑ The high winds in spring push on the river at a greater speed.
 - Ⓒ The average high temperature in spring results in fewer rainstorms.
 - Ⓓ The average low temperature in spring causes less water to evaporate from the river.

- 8 The diagram shows water particles in three different phases.



On a summer day, water particles from the ocean change phase as they move into the air. Which of the following models best shows this process?

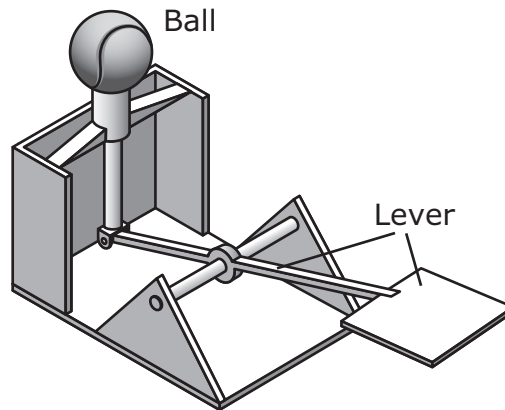


This question has two parts. Write your response on the next page. Be sure to label each part of your response.

- 9** The amounts of water on and below Earth's surface can change during the year.
- A. Identify the season when the **least** amount of water becomes groundwater in Worcester. Explain why this season has the least amount of groundwater. Include data from the seasonal climate table to support your answer.
 - B. Identify the season when the **greatest** amount of water moves from Earth's surface into the atmosphere in Worcester. Explain why this season has the greatest amount of water moving into the atmosphere. Include data from the seasonal climate table **and** describe the role of energy to support your answer.

9

- 10 A dog trainer designed a device to launch a ball into the air for a dog to catch. The device launches the ball when a sandbag is dropped on the lever shown.



The trainer wants to be able to launch the ball one meter into the air.

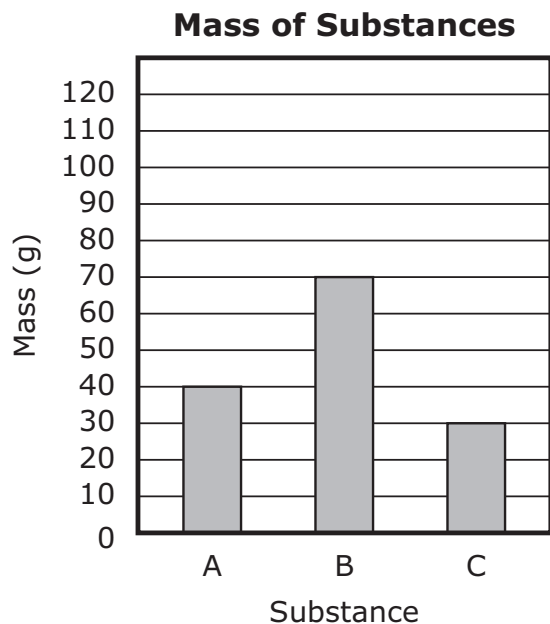
Which set of steps should the dog trainer follow to make sure the device launches the ball to the correct height?

- Ⓐ
 1. Drop the sandbag.
 2. Listen for a sound.
 3. Replace the sandbag with something that weighs the same.
 4. Repeat all steps until the ball reaches exactly one meter.
- Ⓑ
 1. Drop the sandbag.
 2. Measure how high the ball reaches.
 3. Replace the sandbag with something that has a different shape.
 4. Repeat all steps until the ball reaches exactly one meter.
- Ⓒ
 1. Drop the sandbag.
 2. Add electrical energy to the system.
 3. Replace the sandbag with something that weighs the same.
 4. Repeat all steps until the ball reaches exactly one meter.
- Ⓓ
 1. Drop the sandbag.
 2. Measure how high the ball reaches.
 3. Adjust the energy of the sandbag by holding it at a different height.
 4. Repeat all steps until the ball reaches exactly one meter.

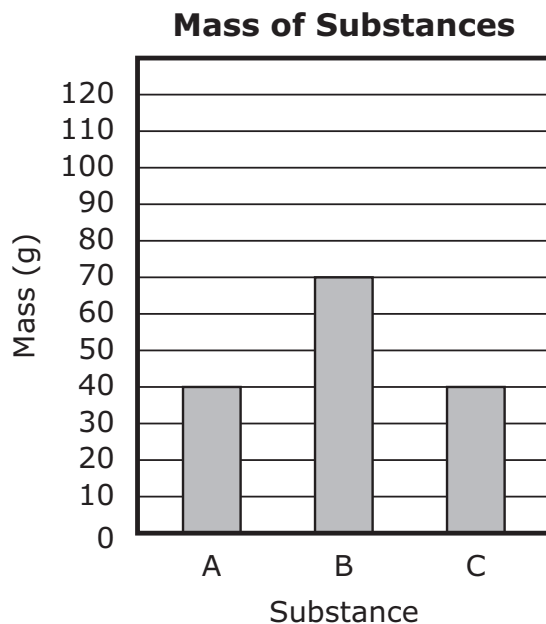
- 11** Two substances, substance A and substance B, react to form substance C. Substance A has a mass of 40 g, and substance B has a mass of 70 g. The reaction takes place in a closed system.

Which of the following graphs best represents the mass of each substance?

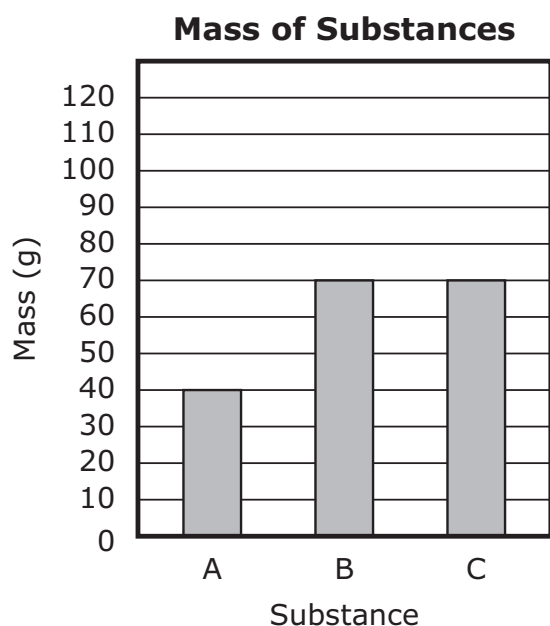
(A)



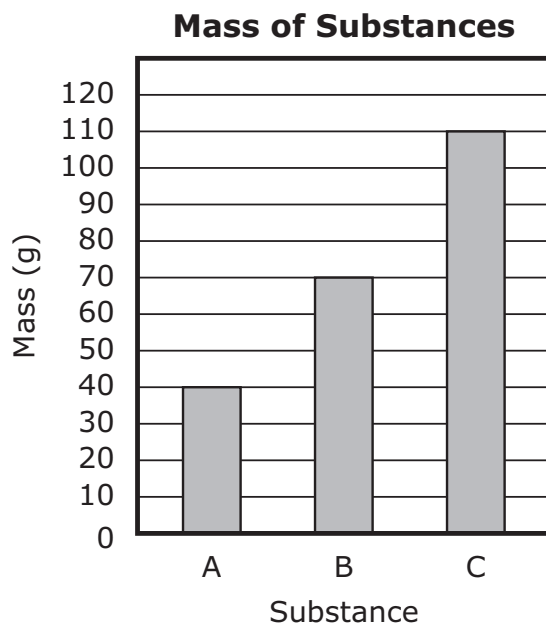
(B)



(C)



(D)

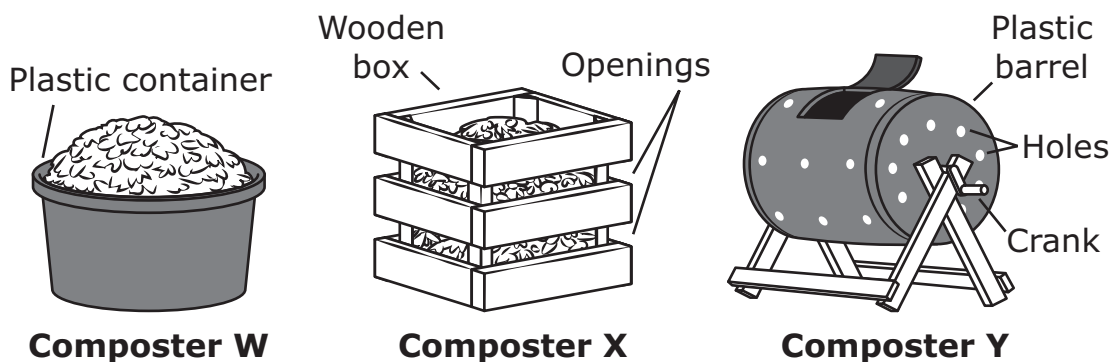


This question has three parts. Write your response on the next page. Be sure to label each part of your response.

12 Students are comparing three composters.

- Composter W is a wide, black plastic container with an open top.
- Composter X is a light-colored wooden box that has openings on all sides and an open top.
- Composter Y is a black plastic barrel with a door. The barrel has holes and can spin when the crank is turned.

The composters are shown.

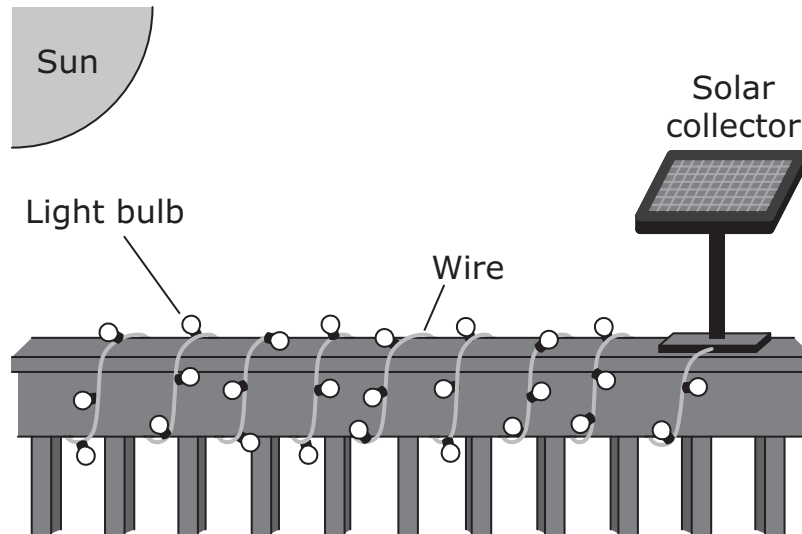


- A. Describe the purpose of a composter.
- B. Identify **two** conditions that make a composter work well.
- C. Identify which composter (W, X, or Y) will work best. Explain your answer using the conditions you identified in Part B.

12

Write your response on the next page. Be sure to label each part of your response.

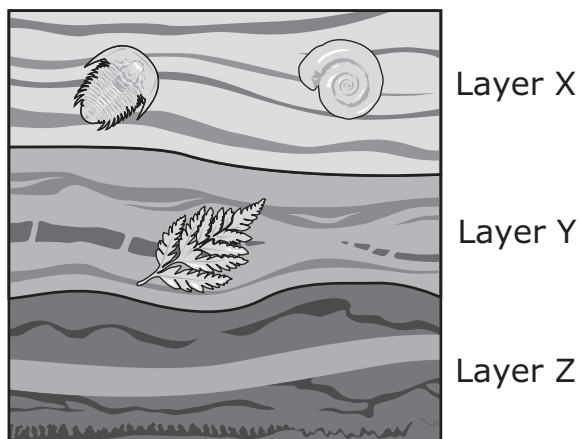
- 13** Solar string lights are sometimes used as a decoration. An example of solar string lights is shown.



The solar collector is connected by a wire to the light bulbs. Describe **two** ways in which energy is transferred in the setup. In your description, include the types of energy that are transferred.

This image shows a single sheet of white paper with horizontal ruling lines. The lines are evenly spaced and run across the width of the page. There are no margins, text, or other markings on the paper.

- 14 A cross section of three sedimentary rock layers is shown.



Which of the following represents the rock layers in order from the youngest to the oldest?

- Ⓐ Layer X → Layer Y → Layer Z
- Ⓑ Layer X → Layer Z → Layer Y
- Ⓒ Layer Y → Layer Z → Layer X
- Ⓓ Layer Z → Layer Y → Layer X

This question has two parts.

- 15** The characteristics of trees can be influenced by the environment and by inheritance.

Part A

Determine whether each characteristic is the result of the environment, inheritance, or both the environment and inheritance.

The height of a tree in a forest is the result of

- Ⓐ the environment.
- Ⓑ inheritance.
- Ⓒ both the environment and inheritance.

A burn mark on a tree in a forest is the result of

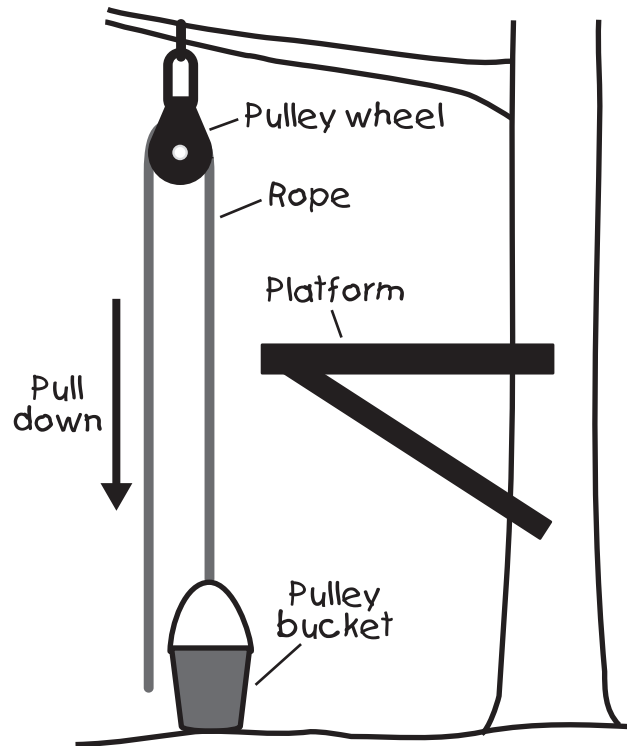
- Ⓐ the environment.
- Ⓑ inheritance.
- Ⓒ both the environment and inheritance.

Part B

Inherited characteristics of trees come from which of the following?

- Ⓐ air particles
- Ⓑ parent trees
- Ⓒ nutrients from soil
- Ⓓ several nearby trees

- 16 The diagram shows a student's design for a pulley system used to lift objects up to a platform.



Which of the following is **most** important to consider when choosing the type of rope for the pulley system?

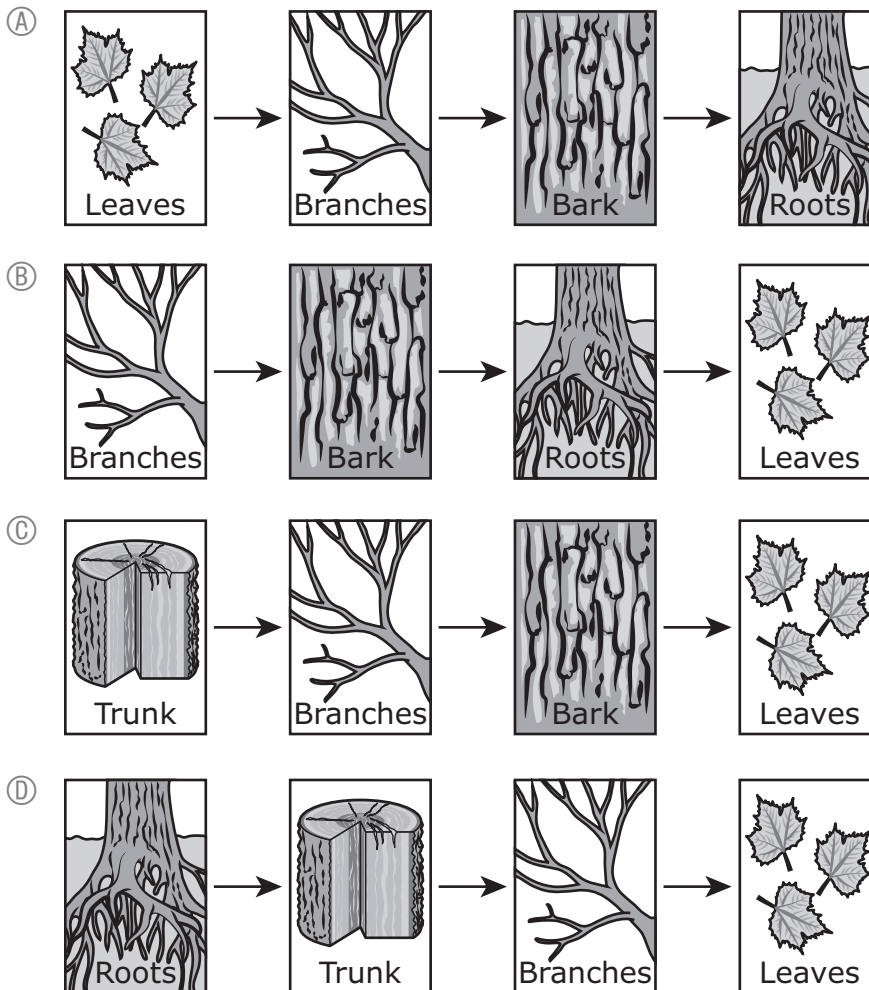
- Ⓐ the shape of the pulley bucket handle
- Ⓑ the speed at which the pulley wheel moves
- Ⓒ the amount of weight the pulley bucket will hold
- Ⓓ the distance of the pulley wheel from the platform

This question has two parts.

17 Part A

After water enters a tree, it travels through different parts of the tree.

Which of the following best shows the order in which water moves through the tree's parts?



Part B

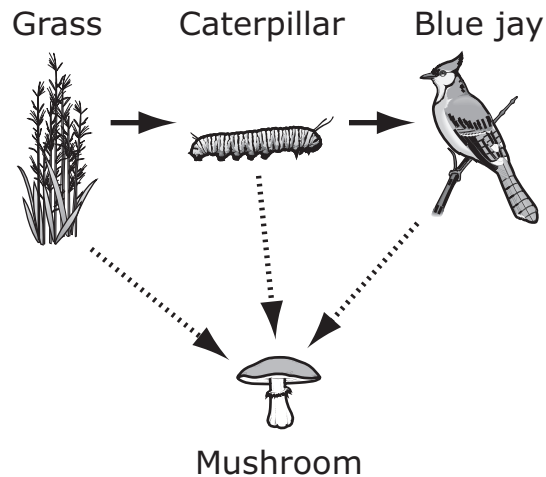
What is the main reason the tree needs structures to move water?

- (A) to protect the tree from insects
- (B) to support the tree in strong winds
- (C) to make sugars so the tree can grow

18 Select the **two** sentences that describe examples of erosion.

- Ⓐ Ice melts on a lake.
- Ⓑ Waves rise and fall in the ocean.
- Ⓒ Rainwater moves soil down a hill.
- Ⓓ Rock forms at the bottom of the ocean.
- Ⓔ Wind blows sand on a beach to a different area.

- 19 A food web is shown.



Which of the following best classifies each organism based on its role in the food web?

Ⓐ

Producer	Consumer	Decomposer
grass mushroom	blue jay	caterpillar

Ⓑ

Producer	Consumer	Decomposer
grass	blue jay caterpillar	mushroom

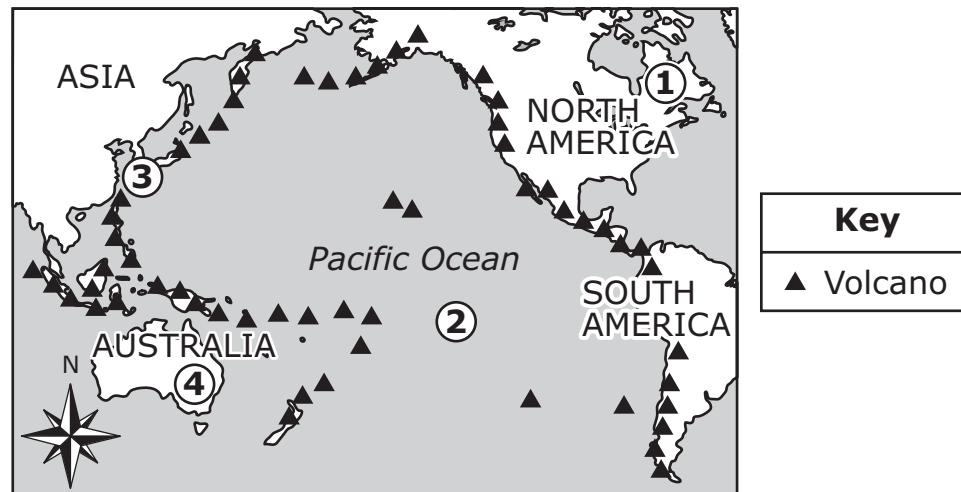
Ⓒ

Producer	Consumer	Decomposer
blue jay caterpillar	grass	mushroom

Ⓓ

Producer	Consumer	Decomposer
blue jay	mushroom	grass caterpillar

- 20 Four locations on the map are labeled 1, 2, 3, and 4.



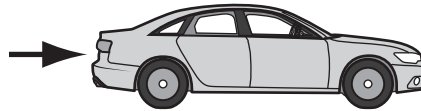
Which location is most likely on a plate boundary?

- 21 A student is constructing four different electrical circuits. Each circuit has a battery, wires, a switch, and a light bulb.

Which of the following is the **best** way for the student to record information so that another student can construct exactly the same four circuits?

- Ⓐ Draw a diagram that shows each circuit.
- Ⓑ Make a tally of the parts used in each circuit.
- Ⓒ Make a list of the materials needed for each circuit.
- Ⓓ Create a graph that shows the number of parts in each circuit.

- 22 The model shows a force acting on a car. The amount of the force is represented by the size of the arrow.



A second force is applied to the car. As a result, the car's motion stops changing.

Which of the following models best represents the forces acting on the car as the second force is applied?

- (A) A side-view illustration of a car. Two arrows of equal length point horizontally in opposite directions: one to the rear and one to the front.
- (B) A side-view illustration of a car. Two arrows of equal length point horizontally in opposite directions: one to the rear and one to the front.
- (C) A side-view illustration of a car. A small arrow points horizontally to the rear, and a large arrow points horizontally to the front.
- (D) A side-view illustration of a car. A small arrow points horizontally to the rear, and a large arrow points horizontally to the front.

- 23 Butterflies go through different stages of life, including birth, growth, and reproduction. Which of the following best classifies four events that occur during those stages?

Ⓐ

Birth	Growth	Reproduction
Adults mate and the females lay eggs.	Larvae change form and become adults. Larvae get older and bigger.	Larvae hatch from eggs.

Ⓑ

Birth	Growth	Reproduction
Larvae get older and bigger.	Larvae change form and become adults.	Adults mate and the females lay eggs. Larvae hatch from eggs.

Ⓒ

Birth	Growth	Reproduction
Larvae hatch from eggs.	Larvae change form and become adults. Larvae get older and bigger.	Adults mate and the females lay eggs.

Ⓓ

Birth	Growth	Reproduction
Larvae change form and become adults. Adults mate and the females lay eggs.	Larvae get older and bigger.	Larvae hatch from eggs.

MCAS Grade 5 Science & Technology/Engineering (STE)

Paper-based Practice Test Answer Key

The practice test is approximately equal to what students experience (common items and matrix items) in a single session of the MCAS Grade 5 STE test. Information about the test design is posted [here](#).

The following pages include the reporting category, [standard alignment](#), and practice (if applicable) for each question on the practice test. An answer key is also provided for each selected-response item. A rubric and sample student responses are included for each constructed-response item.

Item Number	Reporting Category	2016 Standard	Practice	Correct Answer and Number of Points
1	Life Science	3-LS3-2	No Practice	B (1 point)
2	Earth & Space Science	5-ESS1-2	Evidence, Reasoning, & Modeling	C (1 point)
3	Life Science	5-PS3-1	Evidence, Reasoning, & Modeling	E (1 point)
4	Physical Science	3-PS2-4	Evidence, Reasoning, & Modeling	A (1 point)
5	Physical Science	5-PS1-3	No Practice	C (1 point)

Module: Students read about a scientific scenario or phenomenon and then answered three 1-point questions and one constructed response question worth 3 points.

Item Number	Reporting Category	2016 Standard	Practice	Correct Answer and Number of Points
6	Earth & Space Science	5-ESS2-1	Evidence, Reasoning, & Modeling	B (1 point)
7	Earth & Space Science	5-ESS2-1	No Practice	A (1 point)
8	Physical Science	5-PS1-1	Evidence, Reasoning, & Modeling	D (1 point)
9	Earth & Space Science	3-ESS2-2	Mathematics & Data	See scoring guide and sample student responses below. (Maximum of 3 points)

Item Number	Reporting Category	2016 Standard	Practice	Correct Answer and Number of Points	
10	Technology/Engineering	4.3-5ETS1-3	Investigations & Questioning	D (1 point)	
11	Physical Science	5-PS1-2	Mathematics & Data	D (1 point)	
12	Life Science	5-LS2-2 (MA)	Evidence, Reasoning, & Modeling	See scoring guide and sample student responses below. (Maximum of 3 points)	
13	Physical Science	4-PS3-2	Evidence, Reasoning, & Modeling	See scoring guide and sample student responses below. (Maximum of 2 points)	
14	Earth & Space Science	4-ESS1-1	Evidence, Reasoning, & Modeling	A (1 point)	
15	Life Science	3-LS3-2	No Practice	Part A	C, A (1 point)
				Part B	B (1 point)
16	Technology/Engineering	4.3-5-ETS1-5 (MA)	Investigations & Questioning	C (1 point)	
17	Life Science	4-LS1-1	Evidence, Reasoning, & Modeling	Part A	D (1 point)
				Part B	C (1 point)
18	Earth & Space Science	4-ESS2-1	No Practice	C, E (1 point)	
19	Life Science	5-LS2-1	Evidence, Reasoning, & Modeling	B (1 point)	
20	Earth & Space Science	4-ESS2-2	Evidence, Reasoning, & Modeling	C (1 point)	
21	Technology/Engineering	3.3-5-ETS1-4 (MA)	No Practice	A (1 point)	
22	Physical Science	3-PS2-1	Evidence, Reasoning, & Modeling	B (1 point)	
23	Life Science	3-LS1-1	Evidence, Reasoning, & Modeling	C (1 point)	

Question 9: Scoring Guide

Score	Description
3	The response demonstrates a thorough understanding of using the cycling of water through a watershed. The response correctly identifies the season when the least amount of water becomes groundwater, clearly explains why this season has the least amount of groundwater, and uses data from the table to support why it is that season. The response correctly identifies the season when the greatest amount of water moves from Earth's surface into the atmosphere, clearly explains why this season has the greatest amount of water moving into the atmosphere, and uses data from the table to support why it is that season.
2	The response demonstrates a partial understanding of understanding of using the cycling of water through a watershed.
1	The response demonstrates a minimal understanding of understanding of using the cycling of water through a watershed.
0	The response is incorrect or contains some correct work that is irrelevant to the skill or concept being measured.

Question 9: Sample Student Responses (Actual Student Responses)

Score	Part	Student Response
3	A	Winter has the least amount to groundwater because it doesn't have a lot of precipitation in the winter so the groundwater is very little because only 10.5 inches of precipitation fall usually every year in the winter.
	B	Summer is because it has just 0.4 more inches of rain and it has the hottest temperatures so evaporation is going to happen a lot. Heat energy is going to make the 12.1 inches of precipitation evaporate.
2	A	Winter has the least amount of water that became ground water because the temperatures get so low that the water will just freeze into a solid and you would have to bury all the ice to make it go into the ground. <i>(Note: Student did not provide data to support answer.)</i>
	B	Summer has the greatest amount of water that moves into the atmosphere because the temperatures will get high enough to make the water evaporate and go into the atmosphere as part of the water cycle.
1	A	A season that has the least amount of water is winter because in the winter it's very cold and it snows a lot. So because it is so cold the snow doesn't melt at all. And also there won't be as much water in the winter as the other seasons.
	B	The season with the greatest amount of water is fall because in fall it rains a ton! Fall is just the beginning of the cold weather so instead of snowing it rains.
0	A	Summer because it is humid hot and dry but in winter it is snowy and a lot of ice and cold but in the spring it all ways rainy but in fall it is just rainy and cold so summer is it.

	B	Spring because it always is rainy and it is very wet.
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Question 12: Scoring Guide

Score	Description
3	The response demonstrates a thorough understanding of composter designs and their functions. The response clearly describes the purpose of a composter and correctly identifies two conditions that make a composter work well. The response also correctly identifies a composter design that will work best and clearly explains the answer.
2	The response demonstrates a partial understanding of the function of composter designs and their functions.
1	The response demonstrates a minimal understanding of the function of composter designs and their functions.
0	The response is incorrect or contains some correct work that is irrelevant to the skill or concept being measured.

Question 12: Sample Student Responses (*Actual Student Responses*)

Score	Part	Student Response
3	A	The purpose of a composter is to recycle food scraps and some other things that you would normally throwaway, sending them back into the Earth or a good fertilizer producer if you have a garden.
	B	Two conditions that make a composter work are, lot's of oxygen and also lot's of decomposers like worms and other bugs.
	C	I think that Composter X will work the best. It has giant spaces for small things to get in and it provides lost's of oxygen. I don't think the others will work as well because Composter W won't get enough oxygen in and out and Composer Y doesn't get enogh oxygen in and out as well, but it has the holes for some small things to get in.
2	A	A composter makes compost. Compost is a fertilizer that helps plants grow.
	B	All composters need air, that is why they have holes or openings. They also need worms to transform the compost.
	C	I think composter Y would work the best. It has air holes, a door to place worms, and a door to place other ingredients.
1	A	To make compost which can be used to fertilize the soil.
	B	spinning and turning
	C	y, it can spin
0	A	I think the purpose of a composter is to hold stuff, for example food, hay, animals, cement, or anything that can fit inside of it.
	B	One condition is how it can hold a lot, another is its plastic and its not that easy to break.
	C	I think the wide plastic container is the best because you can carry a lot of stuff, and its easy to carry around when your traveling to places.

Question 13: Scoring Guide

Score	Description
2	The response demonstrates a thorough understanding of energy being transferred from place to place by light, heat, and electric currents. The response clearly describes two ways in which energy is transferred in the setup and includes the types of energy that are transferred.
1	The response demonstrates a partial understanding of energy being transferred from place to place by light, heat, and electric currents.
0	The response is incorrect or contains some correct work that is irrelevant to the skill or concept being measured.

Question 13: Sample Student Responses (*Actual Student Responses*)

Score	Student Response
2	One way energy is tranferd in this setup is that the Solar energy from the sun is collected by the solar panel and then turned into electrical energy. Another way that the energy is transferd is that the electrical energy in the wires turns into heat and light energy in the lightbulbs.
1	The energy from the sun is collected by the solar collector, and the energy the solar collector transfers energy to the bulbs. The light and heat energy from the sun get turned into electrical energy.
0	The solar collector transfers thermal energy from the sun to the wires, which will make light energy which will turn on the light bulbs.