MASSACHUSETTS
Department of Elementary
and Secondary Education

Release of Spring 2025 MCAS Test Items

from the

Grade 5 Science and Technology/Engineering Paper-Based Test

July 2025
Massachusetts Department of Elementary and Secondary Education

MASSACHUSETTS
Department of Elementary
and Secondary Education

This document was prepared by the
Massachusetts Department of Elementary and Secondary Education
Pedro Martinez
Commissioner

Massachusetts Department of Elementary and Secondary Education
135 Santilli Highway, Everett, MA 02149
Phone 781-338-3000 TTY: N.E.T. Relay 800-439-2370
www.doe.mass.edu

Overview of Grade 5 Science and Technology/Engineering Test

The spring 2025 grade 5 Science and Technology/Engineering (STE) test was administered in two formats: a computer-based version and a paper-based version. Most students took the computer-based test. The paper-based test was offered as an accommodation for eligible students who were unable to use a computer. More information can be found on the MCAS Test Administration Resources page at www.doe.mass.edu/mcas/admin.html.

Most of the operational items on the grade 5 STE test were the same, regardless of whether a student took the computer-based version or the paper-based version. In places where a technology-enhanced item was used on the computer-based test, an adapted version of the item was created for use on the paper test. These adapted paper items were multiple-choice or multiple-select items that tested the same STE content and assessed the same standard as the technology-enhanced item.

This document displays released items from the paper-based test. Paper-based test booklets for the Spanish-language edition were issued in side-by-side English/Spanish format: pages on the left side of each booklet presented questions in Spanish; pages on the right side presented the same questions in English. English-language questions have been omitted from this document. To view these English-language questions, please refer to the released spring 2025 test items for Science and Technology/Engineering, available on the Department's website at www.doe.mass.edu/mcas/release.html. Released items from the computer-based test are available on the MCAS Resource Center website at mcas.onlinehelp.cognia.org/released-items.

Test Sessions and Content Overview

The grade 5 STE test was made up of two separate test sessions. Each session included selected-response questions and constructed-response questions. On the paper-based test, the selected-response questions were multiple-choice items and multiple-select items, in which students select the correct answer(s) from among several answer options.

Standards and Reporting Categories

The grade 5 STE test was based on learning standards in the four major content strands in the 2016 *Massachusetts Science and Technology/Engineering Curriculum Framework*. The Framework is available on the Department website at www.doe.mass.edu/frameworks/current.html. The four content strands are listed below.

- Earth and Space Science
- Life Science
- Physical Science
- Technology/Engineering

Science and Technology/Engineering test results are reported under four MCAS reporting categories, which are identical to the four framework content strands listed above.

Most items on the grade 5 STE test are also reported as aligning to one of three MCAS Science and Engineering Practice Categories. The three practice categories are listed below.

- Practice Category A: Investigations and Questioning
- Practice Category B: Mathematics and Data
- Practice Category C: Evidence, Reasoning, and Modeling

More information about the practice categories is available on the Department website at www.doe.mass.edu/mcas/tdd/practice-categories.html.

The tables at the conclusion of this document provide the following information about each operational item: reporting category, standard covered, science and engineering practice category covered (if any), item type, and item description. The correct answers for released selected-response questions are also displayed in the released item table.

Reference Materials

Each student taking the grade 5 STE test was provided with a ruler and a calculator.

During both STE test sessions, the use of authorized bilingual word-to-word dictionaries and glossaries was allowed for students who are currently or were ever reported as English learners. No other reference tools or materials were allowed.

Grade 5
Science and Technology/Engineering
SESSION 1

This session contains 13 questions.

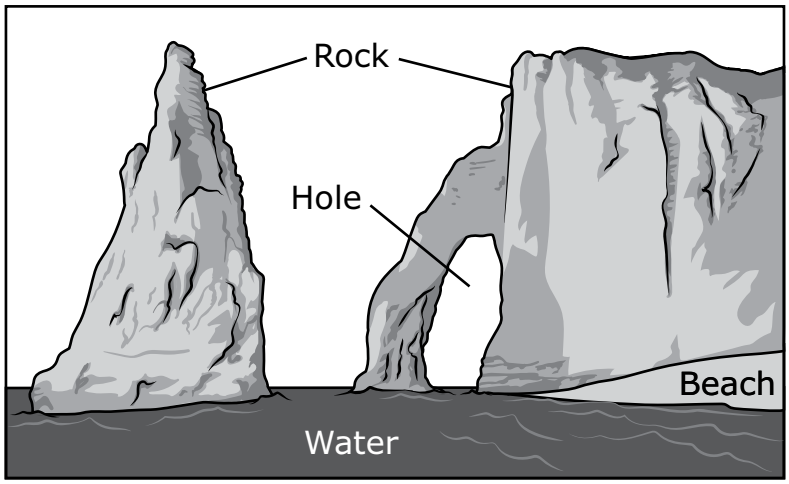
Directions

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

For some questions, you will mark your answers by filling in the circles in your Test & Answer 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. Only responses written within the provided space will be scored.

1 A rock formation with a hole is shown in the diagram.



Which of the following describes how the hole in the rock most likely formed?

Ⓐ Lava turned into rock.

Ⓑ Deposition of sediment occurred.

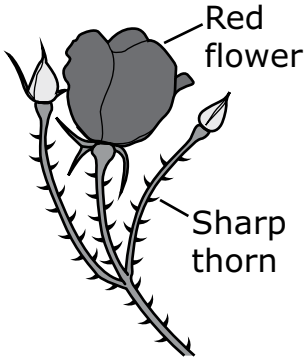
Ⓒ Weathering and erosion occurred.

Ⓓ Heat and pressure were applied to rock layers.

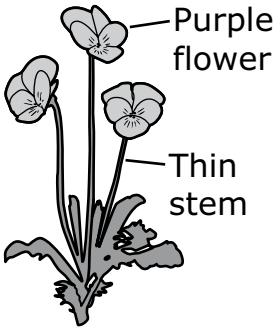
2 A gardener wants to plant a flower garden in an area where a large number of deer live. Deer eat the flowers, leaves, and stems of many types of garden plants.

Which of the following plants is most likely to survive in this garden?

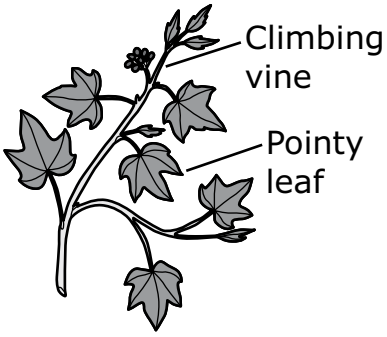
Ⓐ



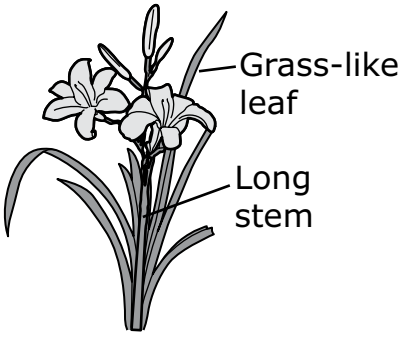
Ⓑ



Ⓒ

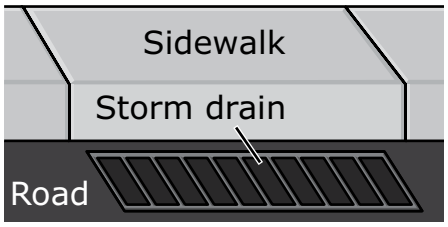


Ⓓ

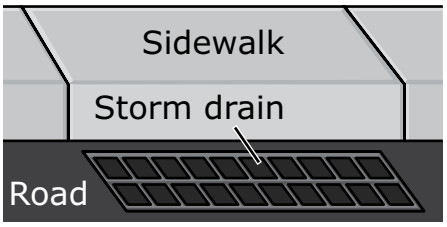


3 Storm drains are put in city streets to keep streets from flooding during heavy rain. Storm drain covers allow water to pass through them but keep large objects out. The diagrams show two storm drain cover designs: design X and design Y.

Design X



Design Y



A city council is discussing the benefits of each storm drain cover design. Which of the following is a benefit of using design Y instead of design X?

Ⓐ Water will flow more slowly through design Y.

Ⓑ Less material is needed to manufacture design Y.

Ⓒ Design Y will block more trash from going into the drain.

Ⓓ Design Y will block more water from going into the drain.

The following section focuses on the climates of Boston, Massachusetts, and Phoenix, Arizona.

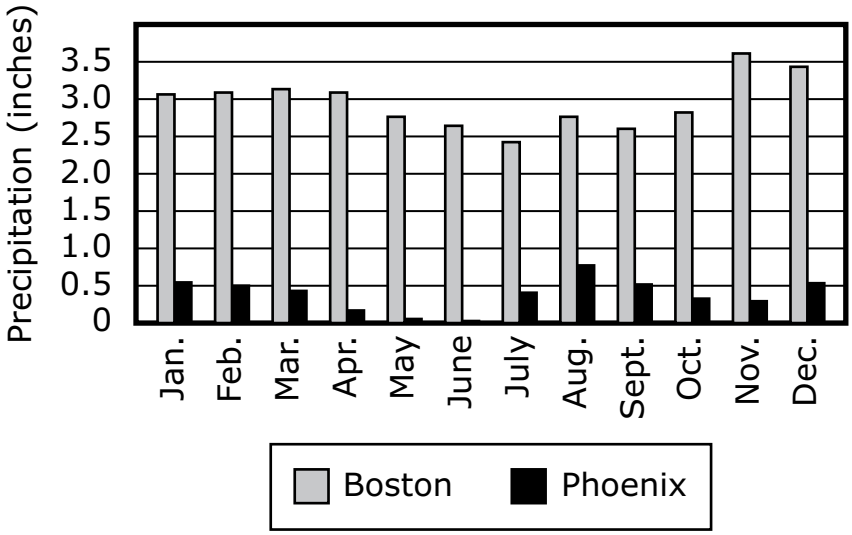
Read the information below and use it to answer the three selected-response questions and one constructed-response question that follow.

A group of students compared the climates of Boston, Massachusetts, and Phoenix, Arizona. The students created graphs showing the monthly averages for the amount of precipitation, low temperature, and hours of sunshine for each city.

Precipitation Data

Graph A shows the average amount of precipitation for each month in Boston and in Phoenix.

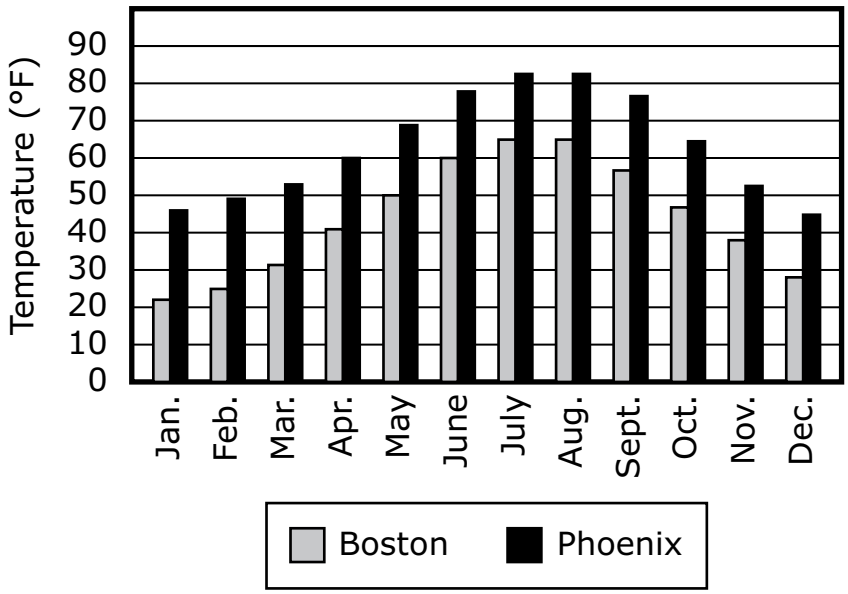
Graph A: Amount of Precipitation



Temperature Data

Graph B shows the average low temperature for each month in Boston and in Phoenix.

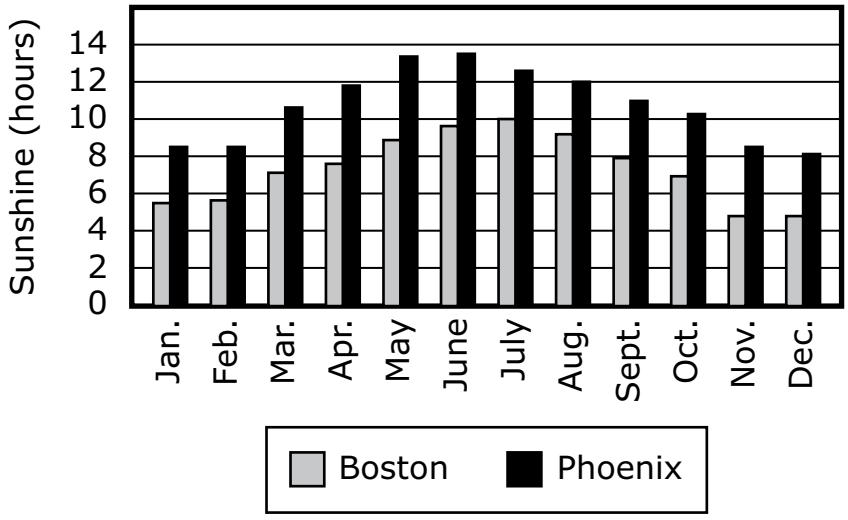
Graph B: Low Temperature



Sunshine Data

Graph C shows the average hours of sunshine per day for each month in Boston and in Phoenix.

Graph C: Amount of Sunshine



4 The table shows weather data for the first three days of a month for one of the two cities.

Day	High Temperature (°F)	Low Temperature (°F)	Hours of Sunshine	Amount of Precipitation (in.)
1	102	72	13.5	none
2	104	75	13.5	none
3	102	73	13.5	none

In which city and month were the data most likely collected?

Ⓐ Boston in May

Ⓑ Boston in August

Ⓒ Phoenix in June

Ⓓ Phoenix in October

5 Erosion plays a role in the landscapes of both Boston and Phoenix.

Based on the climate data, which of the following tables correctly shows the city where each weather event would most likely occur and the type of erosion that would occur there?

Ⓐ

Weather Event	City	Erosion
a nor'easter with heavy rain and strong winds	Boston	Frost wedging breaks apart large rocks.
extreme heat and very little rain for months	Phoenix	Land dries up and soil blows away.

Ⓑ

Weather Event	City	Erosion
a nor'easter with heavy rain and strong winds	Boston	Water carries sand away from beaches.
extreme heat and very little rain for months	Phoenix	Frost wedging breaks apart large rocks.

Ⓒ

Weather Event	City	Erosion
a nor'easter with heavy rain and strong winds	Boston	Water carries sand away from beaches.
extreme heat and very little rain for months	Phoenix	Land dries up and soil blows away.

Ⓓ

Weather Event	City	Erosion
a nor'easter with heavy rain and strong winds	Phoenix	Frost wedging breaks apart large rocks.
extreme heat and very little rain for months	Boston	Water carries sand away from beaches.

6 The students want to know whether solar panels would be more effective for generating electricity in Phoenix or in Boston.

Which of the following describes the energy resource used by solar panels?

Ⓐ renewable

Ⓑ nonrenewable

Which of the following best explains why more electricity can be generated from solar panels in Phoenix than in Boston?

Ⓐ Phoenix is farther from the ocean than Boston.

Ⓑ Phoenix has warmer temperatures than Boston.

Ⓒ Phoenix has more hours of sunshine than Boston.

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

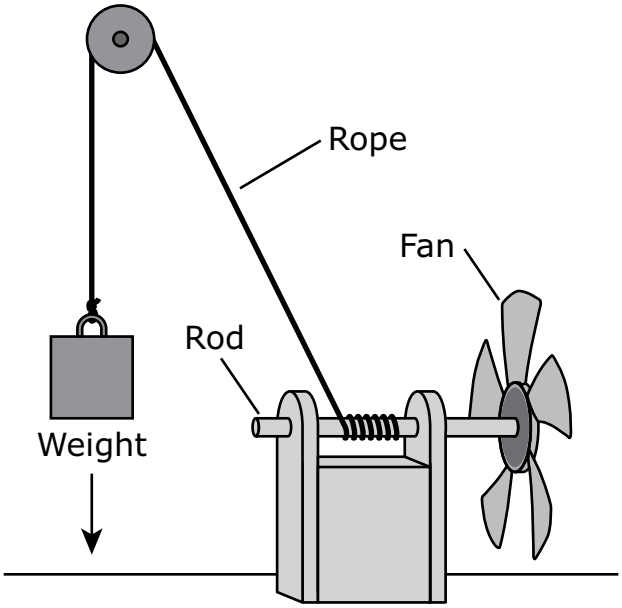
7 The students compared the climates of Boston and Phoenix in summer and winter.

A. Compare the low temperatures in both cities in January to the low temperatures in both cities in July. Use climate data from the graphs to support your answer.

B. Describe **two** ways July and August in Boston are different from July and August in Phoenix. Use climate data from the graphs to support your answer.

7

8 A device is designed to spin a fan. A weight moves downward, as shown, and causes the fan to spin until the weight hits the ground.



Which of the following changes would cause the fan to spin for a longer time?

Ⓐ making the rod longer

Ⓑ making the fan blades larger

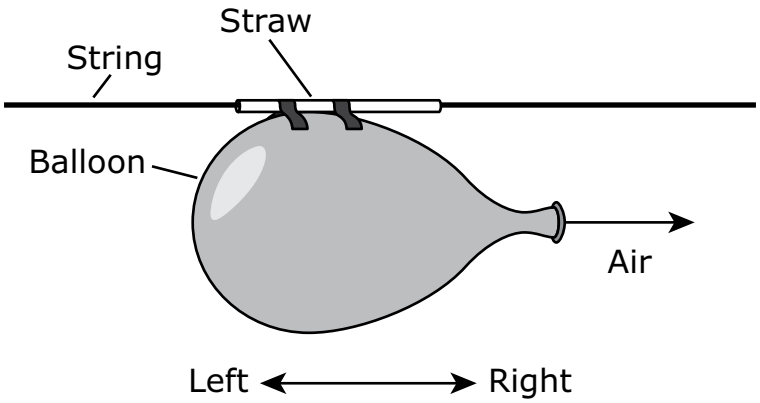
Ⓒ tying a thicker rope to the weight

Ⓓ dropping the weight from a greater height

9 A group of students conducted an investigation using the following steps:

1. Put a long string through a straw.
2. Tape the ends of the string to opposite walls of the classroom.
3. Blow up a balloon and hold it closed.
4. Tape the balloon to the straw.
5. Let go of the balloon.

Air was released from the balloon, as shown, and the balloon moved to the left.



What caused the balloon to move left?

Ⓐ The forces on the balloon were balanced.

Ⓑ The forces on the balloon were unbalanced.

Ⓒ The force of gravity on the balloon was equal to the force of friction.

Ⓓ The force of friction on the balloon was equal to the force from the moving air.

This question has two parts. Write your response in the space provided. Be sure to label each part of your response.

10 In an ecosystem, birds prey on snails, and snails eat grass. Mice also eat grass. These organisms are shown in the pictures.

Bird Grass Snail Mouse

A. Identify the original source of energy in this ecosystem.

B. In each box in the diagram below, write one organism from the list to represent the flow of energy.

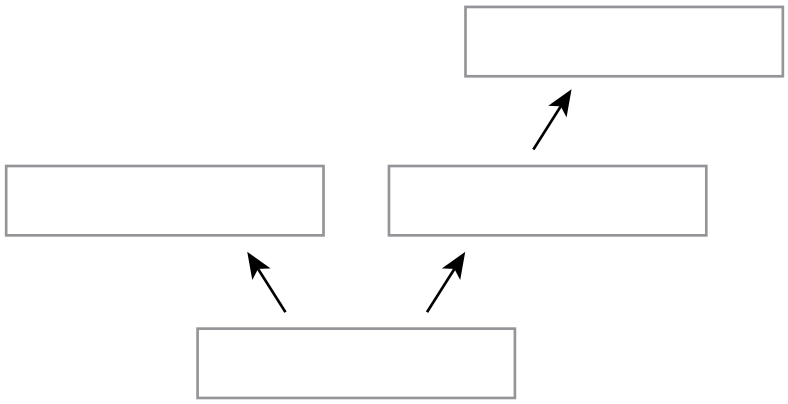
- bird
- grass
- snail
- mouse

10 _____

_____

_____

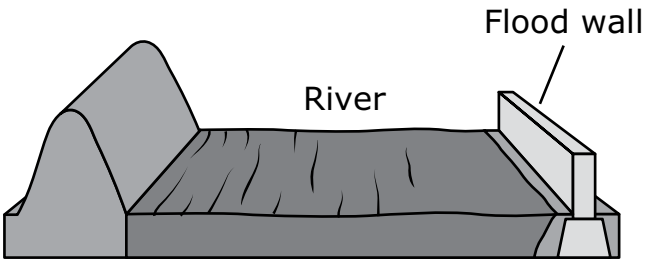
B.



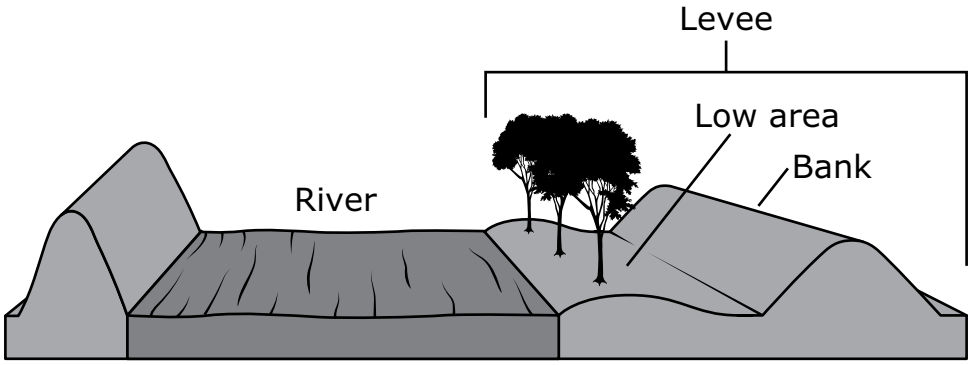
This question has two parts.

11 The diagrams show two structures used to control flooding: a flood wall and a levee. The flood wall is made of concrete. The levee is a low area with trees and a bank made of soil.

Flood Wall



Levee



Part A

Which of the following is an advantage of using the levee instead of the flood wall to control flooding?

Ⓐ The levee is built using natural materials.

Ⓑ The levee changes the landscape over time.

Ⓒ The levee takes up more space than the flood wall.

Ⓓ The levee takes longer to build than the flood wall.

Part B

A flood wall can be made of stone, brick, or concrete. An engineer wants to determine whether concrete is the most effective construction material for a flood wall.

Which of the following describes the best way for the engineer to determine whether concrete is more effective than stone or brick?

Ⓐ The engineer builds a concrete flood wall and observes what happens when the river floods.

Ⓑ The engineer interviews people to learn how to build flood walls using either concrete, brick, or stone.

Ⓒ The engineer builds concrete flood walls on several rivers and observes what happens when the rivers flood.

Ⓓ The engineer compares what happens during flooding on rivers that have concrete walls and rivers that have brick or stone flood walls.

12 A student stirred salt into a beaker of water. The student observed the color, smell, and temperature of the contents of the beaker before and after the salt was added.

Which of the following questions was the student most likely investigating?

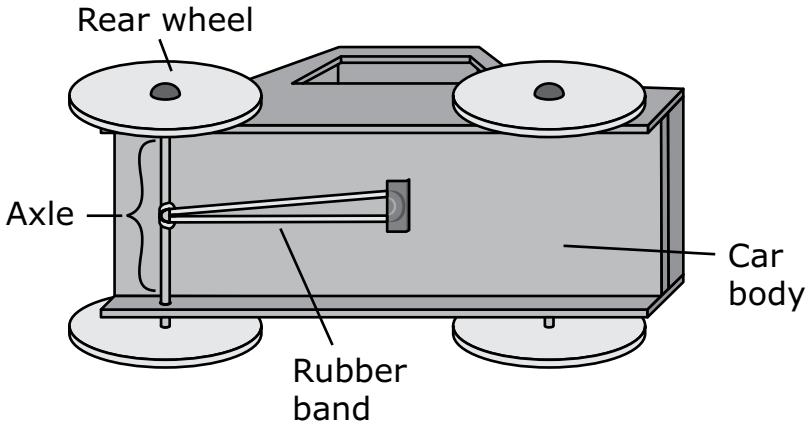
Ⓐ Can gases have a color?

Ⓑ Did the water gain stored energy?

Ⓒ Did a chemical reaction take place?

Ⓓ How does temperature affect smell?

13 The diagram shows a view of the bottom of a toy car that is powered by energy from a stretched rubber band.



Based on the diagram, which of the following describes the main function of the axle?

Ⓐ The axle holds the car body together.

Ⓑ The axle spins and turns the rear wheels.

Ⓒ The axle keeps the car body on the ground.

Ⓓ The axle adds extra weight to the bottom of the car.

Grade 5
Science and Technology/Engineering
SESSION 2

This session contains 7 questions.

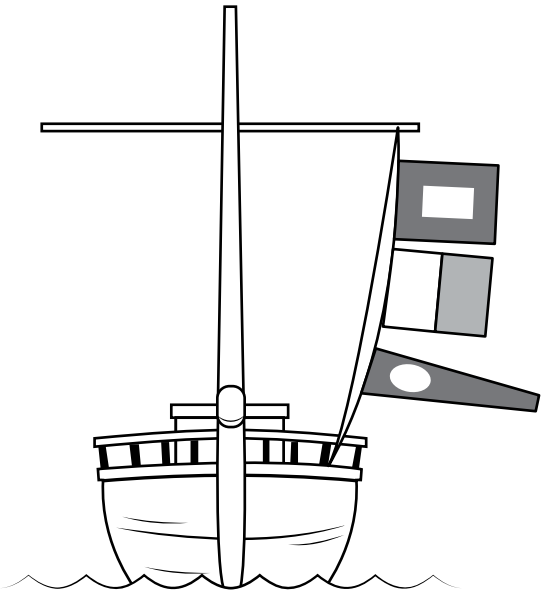
Directions

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

For some questions, you will mark your answers by filling in the circles in your Test & Answer 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. Only responses written within the provided space will be scored.

14 People on different ships can communicate with each other using combinations of flags with colorful symbols. Each combination represents a different message. To send a message, a person on one ship raises the flags so people on other ships can see them. The diagram shows a ship with a message that means "Our ship is moving toward your ship."



Which of the following **best** describes one advantage of using flags for communication instead of talking over a radio?

Ⓐ The messages can be sent and received at night.

Ⓑ Encoding the messages is the fastest way to send the messages.

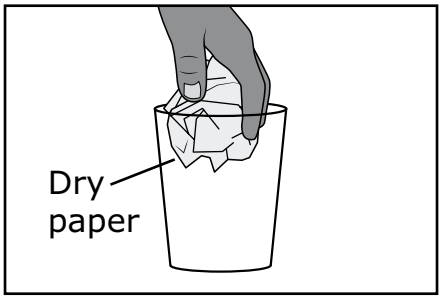
Ⓒ The messages sent do not need to be decoded to be understood.

Ⓓ The people encoding and decoding the messages do not have to speak the same language.

This question has two parts.

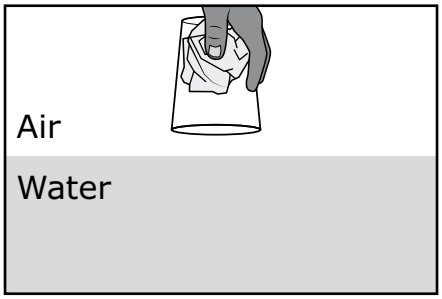
15 A student conducted a demonstration using a dry sheet of paper, a cup, and a container of water. The diagram shows four steps in the demonstration.

Step 1



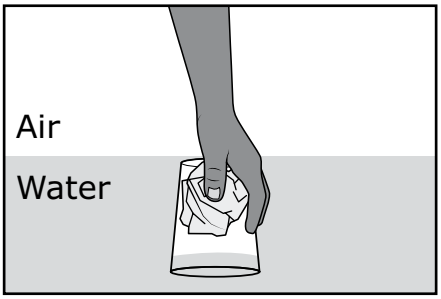
The student pushed the dry sheet of paper into the bottom of the cup.

Step 2



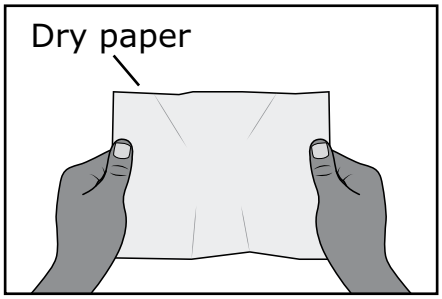
The student turned the cup over and held it in the air above the container of water.

Step 3



The student pushed the cup into the water and held it there for two seconds.

Step 4



The student then lifted the cup out of the water and removed the paper, showing that it was still dry.

Part A

Which of the following **best** explains why the paper stayed dry in the demonstration?

Ⓐ A force pulled the water away from the paper.

Ⓑ Electrical forces in the paper repelled the water.

Ⓒ The paper filled the cup so the water could not enter.

Ⓓ Air in the cup prevented the water from touching the paper.

Part B

Which of the following is a property of matter that supports your answer to Part A?

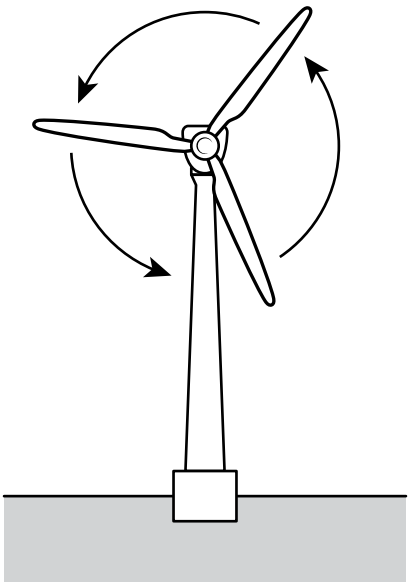
Ⓐ All matter takes up space.

Ⓑ All matter expands to fill its container.

Ⓒ All matter can be pushed apart by a force.

Ⓓ All matter is pulled toward Earth by gravity.

16 Wind turbines convert kinetic energy from wind into electrical energy. A wind turbine is shown.



Under which of the following conditions will a wind turbine produce the most electrical energy?

Ⓐ temperatures of 20–30°F

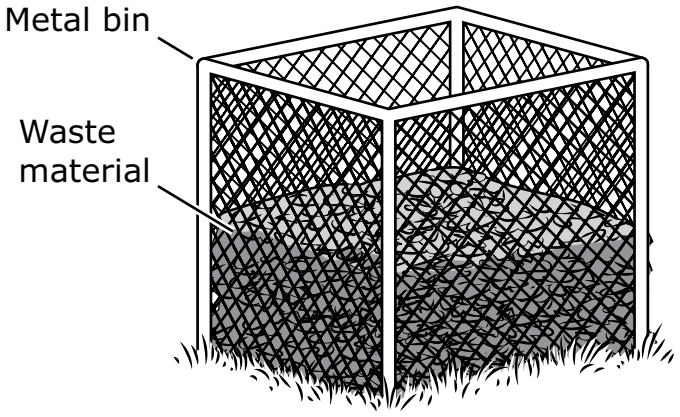
Ⓑ temperatures of 70–80°F

Ⓒ wind speeds of 5–10 miles per hour

Ⓓ wind speeds of 15–20 miles per hour

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

17 Students tested a composter to determine how well it worked. The students added waste material to the composter. The composter is shown.



After several weeks, the students observed how well the composter worked.

A. Identify what the students should have measured to determine how well the composter worked.

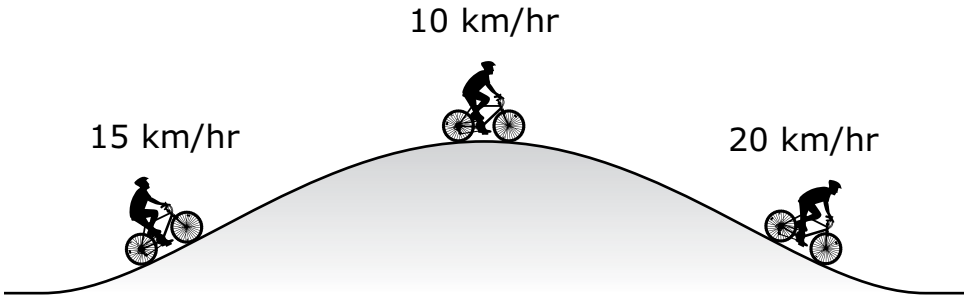
B. After their observation, the students added bacteria to the composter.

Explain how adding bacteria could make the composter work better.

C. Describe one way, other than adding more bacteria, the students could make the composter work better.

17

18 The diagram shows a person riding a bicycle at three positions on a trail that goes up and down a hill. The speed of the bicycle at each position is shown in kilometers per hour (km/hr).



A student claims that the bicycle has the most kinetic energy when it is at the top of the hill. What piece of evidence shows that the student's claim is **incorrect**?

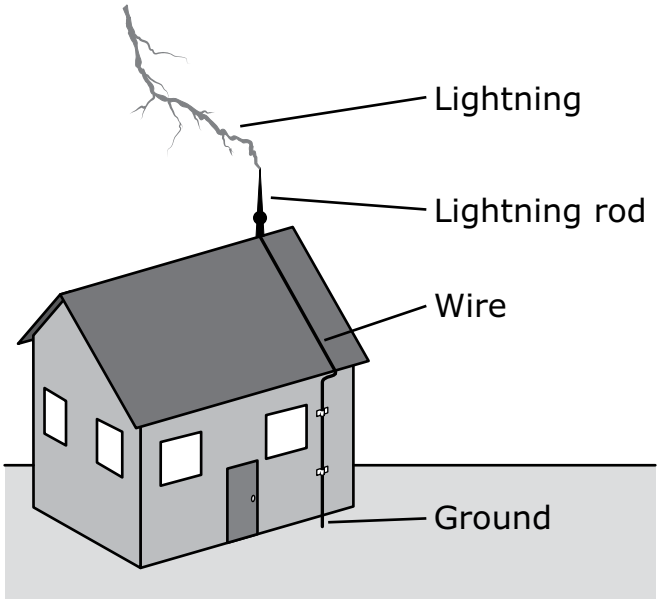
Ⓐ The bicycle has to be pedaled when going up the hill.

Ⓑ The bicycle has a constant mass at the top of the hill.

Ⓒ The bicycle can move down the hill without being pedaled.

Ⓓ The bicycle is moving the slowest when at the top of the hill.

19 A lightning rod is a pole placed on the top of a building. If struck by lightning, the rod conducts electricity away from the building. The electricity travels through a wire to the ground so the building is not damaged. The diagram shows lightning striking a lightning rod on top of a building.



What material should be used for the lightning rod?

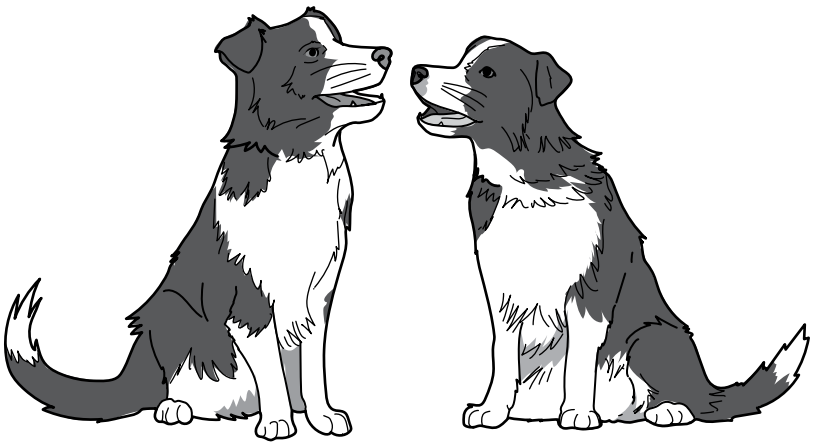
Ⓐ metal

Ⓑ plastic

Ⓒ rubber

Ⓓ wood

20 A male dog and a female dog are shown in the picture. The dogs are bred and produce puppies.



Select **two** traits or behaviors that the puppies most likely inherit from the parents.

Ⓐ color of fur

Ⓑ length of tail

Ⓒ catching a ball

Ⓓ sitting on command

Grade 5 Science and Technology/Engineering
Spring 2025 Released Operational Items

PBT Item No.	Page No.	Reporting Category	Standard	Science and Engineering Practice Category	Item Type*	Item Description	Correct Answer**
1	3	*Earth and Space Science*	4.ESS.1.1	C. Evidence, Reasoning, and Modeling	SR	Interpret a diagram to identify the cause of a change in a landscape over time.	C
2	4	*Life Science*	3.LS.4.2	C. Evidence, Reasoning, and Modeling	SR	Determine which plant has a survival advantage based on its characteristics.	A
3	5	*Technology/ Engineering*	3.ETS.1.2	C. Evidence, Reasoning, and Modeling	SR	Analyze two designs to determine a benefit of using one design instead of the other design to solve a problem.	C
4	8	*Earth and Space Science*	3.ESS.2.1	B. Mathematics and Data	SR	Analyze climate graphs for two cities to determine which city and month weather data were most likely collected in.	C
5	9	*Earth and Space Science*	4.ESS.2.1	C. Evidence, Reasoning, and Modeling	SR	Analyze climate data to identify the cities where two different weather events would most likely occur and the type of erosion that would most likely occur in each city.	C
6	10	*Earth and Space Science*	4.ESS.3.1	B. Mathematics and Data	SR	Identify that solar energy is renewable and use climate data to explain why more electricity can be generated by solar energy in one city than in another city.	A;C
7	11–12	*Earth and Space Science*	3.ESS.2.2	B. Mathematics and Data	CR	Analyze climate data to compare the temperatures in two cities and describe two ways the climate in one city is different from the climate in the other city.	
8	13	*Physical Science*	4.PS.3.4	A. Investigations and Questioning	SR	Analyze a device to determine which change to the device would improve how well it functions.	D
9	14	*Physical Science*	3.PS.2.1	C. Evidence, Reasoning, and Modeling	SR	Use a diagram to describe the forces acting on a balloon as it moves in an investigation.	B
10	15	*Life Science*	5.PS.3.1	C. Evidence, Reasoning, and Modeling	CR	Identify the original source of energy for an ecosystem and complete a model that represents the flow of energy in the ecosystem.	
11	16–17	*Technology/ Engineering*	4.ESS.3.2	A. Investigations and Questioning	SR	Compare two design solutions to identify an advantage of using one of the solutions, and describe how to determine which material is more effective to use in one of the solutions.	A;D
12	18	*Physical Science*	5.PS.1.4	A. Investigations and Questioning	SR	Determine which question a student was investigating when making observations before and after a substance was added to a beaker.	C
13	18	*Technology/ Engineering*	5.ETS.3.2	C. Evidence, Reasoning, and Modeling	SR	Interpret a diagram to describe the function of a structure in a toy car.	B
14	20	*Technology/ Engineering*	4.PS.4.3	C. Evidence, Reasoning, and Modeling	SR	Compare two types of communication to determine an advantage of one type over the other.	D
15	21–22	*Physical Science*	5.PS.1.1	C. Evidence, Reasoning, and Modeling	SR	Use evidence to explain that all matter, including gas, takes up space.	D;A

PBT Item No.	Page No.	Reporting Category	Standard	Science and Engineering Practice Category	Item Type*	Item Description	Correct Answer**
16	23	*Physical Science*	4.PS.3.2	B. Mathematics and Data	SR	Determine which weather condition would cause a wind turbine to produce the most electric energy.	D
17	24–25	*Life Science*	5.LS.2.2	A. Investigations and Questioning	CR	Identify what could be measured to determine how well a composter works and describe changes to the composter to make it work better.	
18	26	*Physical Science*	4.PS.3.1	C. Evidence, Reasoning, and Modeling	SR	Use evidence from a diagram to explain why a claim about an object's kinetic energy is incorrect.	D
19	27	*Technology/ Engineering*	3.ESS.3.1	None	SR	Identify a material that could be used to conduct electricity in a lightning rod.	A
20	28	*Life Science*	3.LS.3.2	None	SR	Identify traits that offspring would most likely inherit from their parents.	A,B

* Science and Technology/Engineering item types are: selected-response (SR) and constructed-response (CR).

** Answers are provided here for selected-response items only. Sample responses and scoring guidelines for any constructed-response items will be posted to the Department's website later this year.

Grade 5 Science and Technology/Engineering
Spring 2025 Unreleased Operational Items

PBT Item No.	Reporting Category	Standard	Science and Engineering Practice Category	Item Type*	Item Description
21	*Earth and Space Science*	5.ESS.3.1	None	SR	Determine the best solution for reducing the amount of waste that ends up in a landfill.
22	*Earth and Space Science*	5.ESS.2.2	B. Mathematics and Data	SR	Use data to describe the availability of fresh water for drinking.
23	*Physical Science*	5.PS.2.1	C. Evidence, Reasoning, and Modeling	SR	Determine the direction of the gravitational force acting on an object.
24	*Physical Science*	3.PS.2.1	C. Evidence, Reasoning, and Modeling	SR	Explain why an object moves at a different speed when a substance is added to the bottom of the object.
25	*Physical Science*	4.PS.3.4	C. Evidence, Reasoning, and Modeling	SR	Describe the type of energy an object that is not moving has at the top of a hill.
26	*Physical Science*	4.PS.3.3	C. Evidence, Reasoning, and Modeling	CR	Describe how one form of energy is converted into another form of energy during a collision and analyze data to explain which substance, when added to the bottom of an object, would cause the object to make the loudest noise during a collision.
27	*Technology/ Engineering*	4.ETS.1.5	C. Evidence, Reasoning, and Modeling	CR	Describe factors that should be considered when deciding on the features of a design and explain the reasoning for using such features.
28	*Physical Science*	4.PS.4.2	C. Evidence, Reasoning, and Modeling	SR	Determine the model that shows how light travels in order for a person to see an object.
29	*Life Science*	3.LS.4.2	C. Evidence, Reasoning, and Modeling	SR	Determine which environmental condition would help individuals with a certain fur color to survive.
30	*Technology/ Engineering*	3.ETS.1.4	None	SR	Determine which information would best help a person build a device.
31	*Life Science*	5.LS.2.1	None	SR	Identify the main role of bacteria in the cycling of matter in an ecosystem.
32	*Technology/ Engineering*	4.ETS.1.5	C. Evidence, Reasoning, and Modeling	SR	Determine which design feature would make an area most accessible to people who use wheelchairs.
33	*Earth and Space Science*	4.ESS.2.2	C. Evidence, Reasoning, and Modeling	SR	Interpret a map to describe the location of volcanoes.
34	*Technology/ Engineering*	5.ETS.3.1	C. Evidence, Reasoning, and Modeling	SR	Use information about a design to explain why a feature of the design is an innovation.
35	*Life Science*	3.LS.4.1	C. Evidence, Reasoning, and Modeling	SR	Use fossil evidence to identify the rock layers that contain evidence that the area was once covered by water.
36	*Earth and Space Science*	5.ESS.2.1	C. Evidence, Reasoning, and Modeling	CR	Identify two steps that are not labeled on a water cycle model and describe what happens to water during each step.
37	*Earth and Space Science*	5.ESS.1.2	None	SR	Identify when a certain moon phase will occur next and describe how long it takes the Moon to orbit Earth.
38	*Earth and Space Science*	5.ESS.3.2	A. Investigations and Questioning	SR	Determine what to measure to see how well water filters work.
39	*Life Science*	5.LS.2.1	C. Evidence, Reasoning, and Modeling	SR	Analyze a food web to identify which population would decrease if there were a change to another population, and describe the role of consumers in an ecosystem.

PBT Item No.	Reporting Category	Standard	Science and Engineering Practice Category	Item Type*	Item Description
40	*Life Science*	3.LS.1.1	None	SR	Determine when a plant and an animal are going through the same life cycle stage.
41	*Life Science*	5.LS.1.1	C. Evidence, Reasoning, and Modeling	SR	Identify a model that shows the inputs and outputs of photosynthesis.

* Science and Technology/Engineering item types are: selected-response (SR) and constructed-response (CR).