



MASSACHUSETTS

Department of Elementary
and Secondary Education

*Release of Spring 2026
MCAS Test Items from the
Grade 8 Science and
Technology/Engineering
Paper-Based Test*

Spring 2026

**Massachusetts Department of
Elementary and Secondary Education**



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and Secondary Education

This document was prepared by the
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Overview of Grade 8 Science and Technology/Engineering Test

The spring 2026 grade 8 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 8 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. 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 8 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 8 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 8 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 8 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 8

Science and Technology/Engineering

SESSION 1

This session contains 15 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.

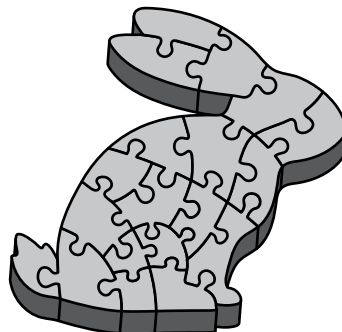
If a question asks you to show or explain your work, you must do so to receive full credit. Write your response in the space provided. Only responses written within the provided space will be scored.

- 1 A student is holding an apple 3 m above the ground. In which of the following situations will the potential energy of the apple increase the **most**?
- Ⓐ when the student throws the apple to the ground at a speed of 4 m/s
 - Ⓑ when the student throws the apple horizontally through the air at a speed of 9 m/s
 - Ⓒ when the student throws the apple up in the air with enough speed to reach a height of 6 m above the ground
 - Ⓓ when the student throws the apple up in the air with enough speed to reach a height of 7 m above the ground

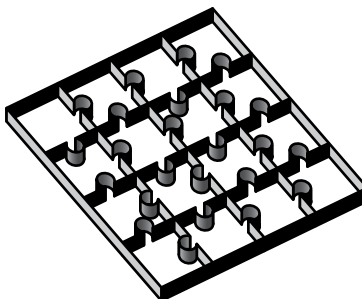
The following section focuses on how puzzles are made.

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

A company makes three types of puzzles: wooden, cardboard, and plastic. Wooden puzzles are made using a jigsaw. An example of a wooden puzzle is shown in the picture.



Cardboard and plastic puzzles are made using a steel cutting die. The cutting die is a sharp tool used to cut out puzzle pieces. A steel cutting die is shown in the picture.



2 Which of the following would **best** protect a worker who is using a jigsaw to cut a wooden puzzle?

- Ⓐ apron
- Ⓑ hardhat
- Ⓒ loose clothing
- Ⓓ safety goggles

3 A machine uses a cutting die to make all the puzzle pieces in one puzzle at the same time. A person uses a jigsaw to make one puzzle piece at a time.

Which of the following would be an advantage of using a jigsaw instead of a cutting die to make puzzle pieces?

- Ⓐ A jigsaw can be used to make custom-shaped puzzle pieces.
- Ⓑ A jigsaw reduces the need for quality control of the puzzle pieces.
- Ⓒ A jigsaw cuts puzzle pieces with greater accuracy than a cutting die.
- Ⓓ A jigsaw can be used to make puzzle pieces faster than a cutting die.

4 The company created a 16 in. by 22 in. puzzle of a picture that was painted on the side of a building. The actual size of the picture was 64 ft. by 88 ft.

What scale was used to create the puzzle?

- Ⓐ $\frac{1}{16}$ in. = 1 ft.
- Ⓑ $\frac{1}{8}$ in. = 1 ft.
- Ⓒ $\frac{1}{4}$ in. = 1 ft.
- Ⓓ $\frac{1}{2}$ in. = 1 ft.

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

- 5 Workers at the company made a decision matrix to choose the material for a new puzzle design. The decision matrix scores each material on three equally important criteria: cost, durability, and weight. The workers’ decision matrix is shown. The total points are missing.

Scoring Key

Worst —————> Best

1	2	3
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Material	Criteria			Total Points
	Cost	Durability	Weight	
wood	1	3	1	
cardboard	3	1	2	
plastic	2	3	3	

- A. Based on the decision matrix, describe **one** advantage of using cardboard instead of wood or plastic.
- B. Based on the decision matrix, identify which material the company should use. Explain your reasoning.
- C. Other than the criteria listed in the decision matrix, identify one property of the material you identified in Part B that makes it a good choice for the company to use. Explain your reasoning.

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

- 6 Ethanol is a biofuel made from plant crops. Farming biofuel crops can affect the health and the biodiversity of the ecosystem where the crops are grown.

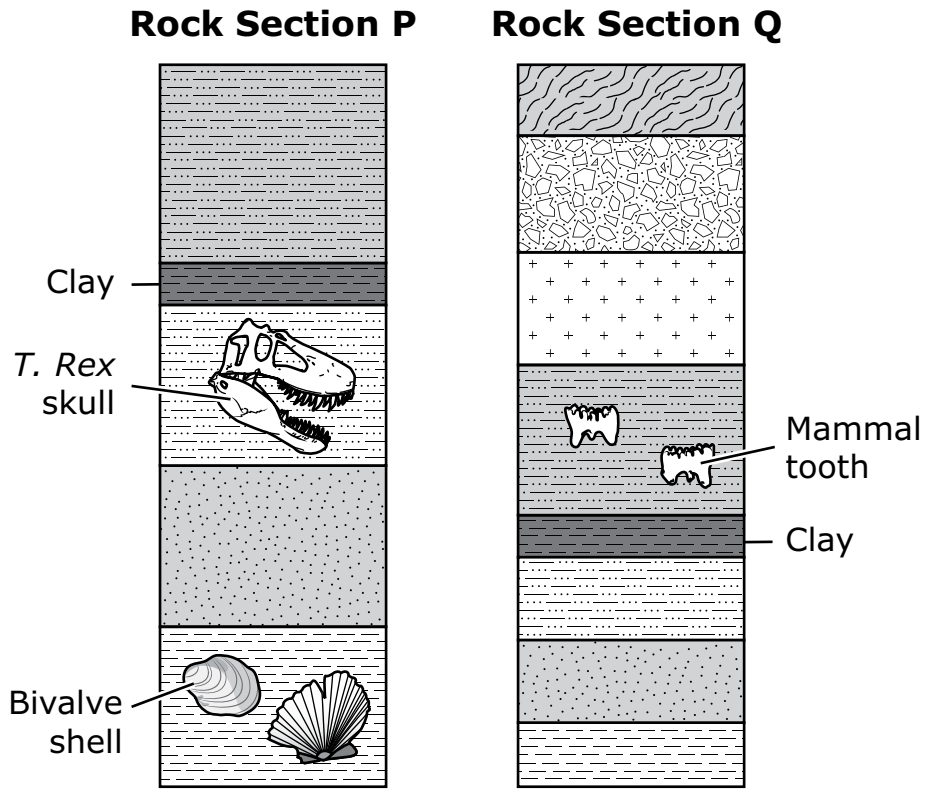
Scientists are investigating the best ways to grow biofuel crops. The table compares the environmental impact of four crops on an ecosystem.

Environmental Factors of Four Crops

Crop	Fertilizer and Pesticide Usage	Erosion of Soil	Amount of CO ₂ from Farming Machines	Biodiversity of Fields
corn	high	high	high	low
switchgrass	low	low	low	medium
elephant grass	low	low	low	low
mixture of native grasses	low	low	low	high

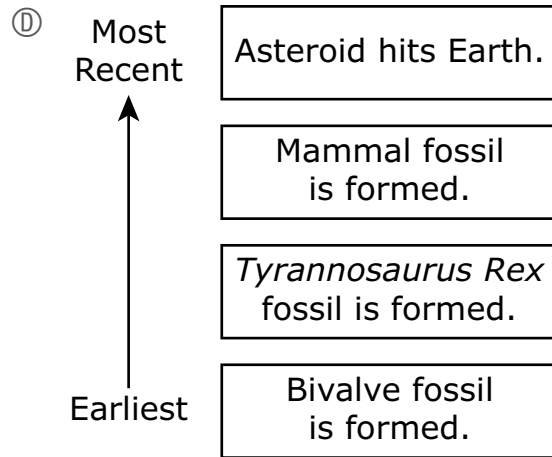
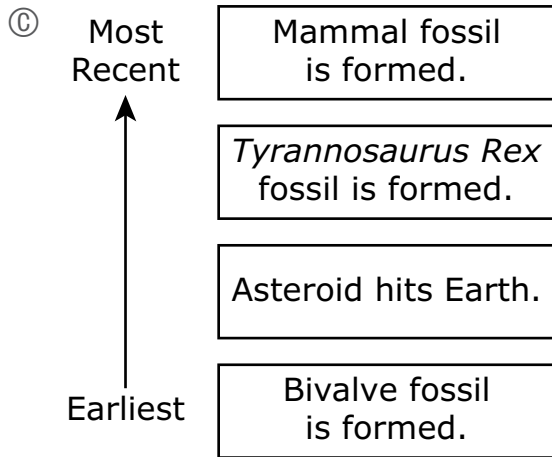
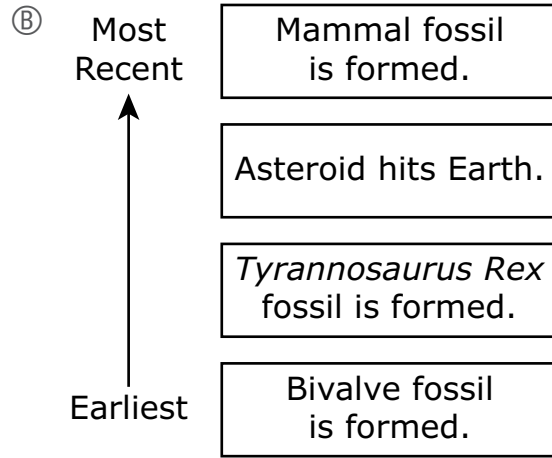
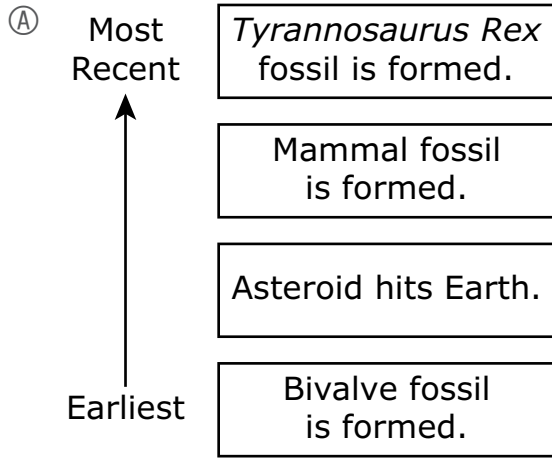
- A. Identify the crop that would contribute the most to an increase in global temperatures. Use evidence from the table to support your answer.
- B. Identify the crop that would allow for the greatest number of species in the farm ecosystem. Use evidence from the table to support your answer.
- C. Describe one way farmers could reduce the environmental impact of a cornfield grown for biofuel.

- 7 About 66 million years ago, an asteroid hit Earth’s surface. As a result, a large amount of rock dust spread over an area of land, forming a layer of clay. The diagrams show two sections of rock, P and Q, that include this layer of clay.

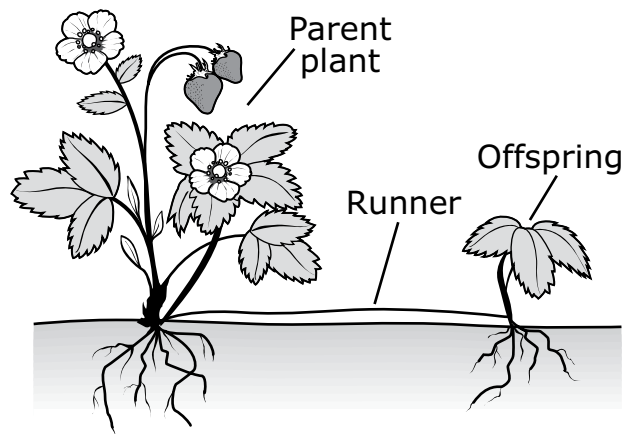


(not to scale)

Based on the information, which timeline shows the events in order from earliest to most recent?



- 8 Strawberry plants reproduce asexually when a parent plant produces offspring from a runner, as shown in the diagram.



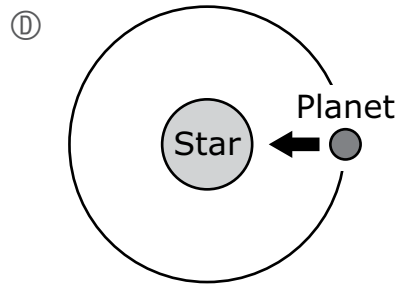
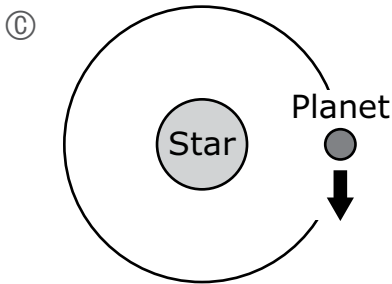
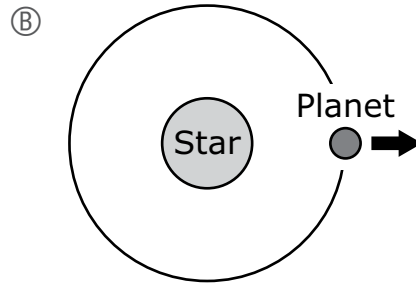
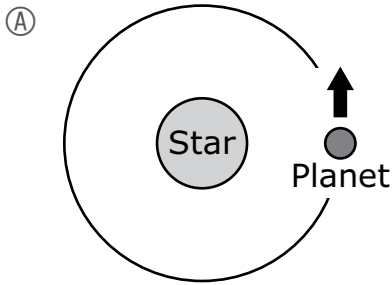
What percentage of the parent plant's genetic material is received by the offspring?

- (A) 25%
- (B) 50%
- (C) 75%
- (D) 100%

This question has two parts. Mark your answer to Part A by filling in the correct circle and then write your response to Part B in the space provided.

9 A student is making a model of a planet orbiting a star. The student wants to show the force that acts on the planet to keep the planet in orbit around the star. The student decides to show the force as an arrow.

A. Which of the following best represents the force that keeps the planet in orbit?



B. Identify the type of force that keeps the planet in orbit.

9 _____

This question has two parts.

- 10** Nectar is a sweet liquid found in the flowers of a plant.

Part A

Which of the following **best** explains how the nectar benefits the plant?

- Ⓐ It attracts mates for the plant.
- Ⓑ It keeps predators from eating the plant.
- Ⓒ It attracts animals that pollinate the plant.
- Ⓓ It keeps animals from nesting in the plant.

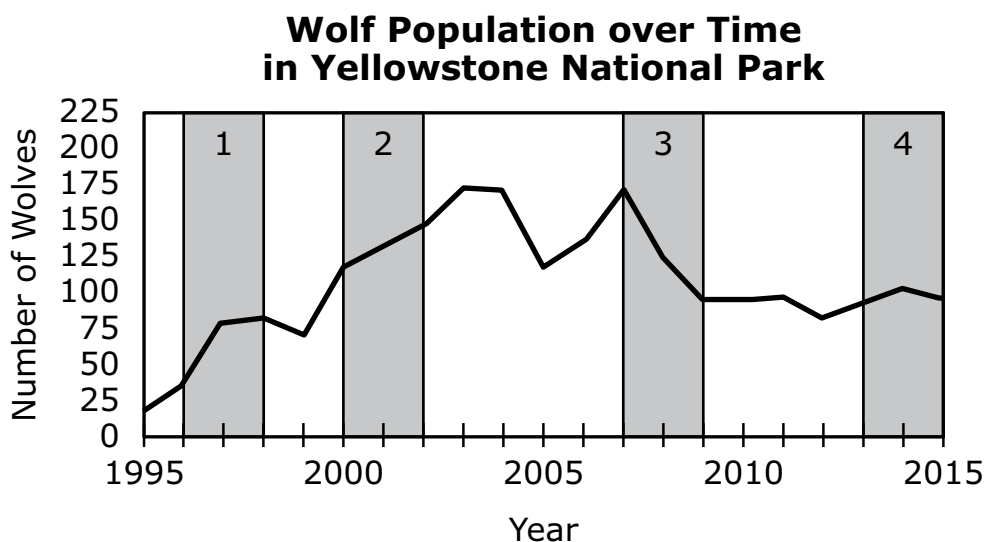
Part B

Which of the following traits in a plant provides the same benefit as the nectar?

- Ⓐ sharp thorns
- Ⓑ tough, deep roots
- Ⓒ strong, sturdy stems
- Ⓓ brightly colored petals

- 11 Which of the following **best** explains why frost forms as the temperature drops on a cold winter night?
- (A) Moisture in clouds freezes and falls to the ground.
 - (B) Oxygen gas in the air freezes and forms ice crystals.
 - (C) Heat flows out of warm objects and into the water vapor in the air.
 - (D) Water vapor in the air loses energy and forms ice crystals on the ground.

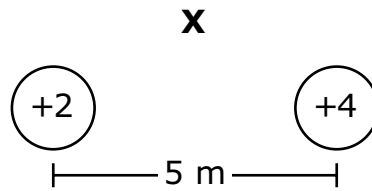
- 12 The graph shows the wolf population in Yellowstone National Park over a 20-year period. Four time periods on the graph are labeled 1, 2, 3, and 4.



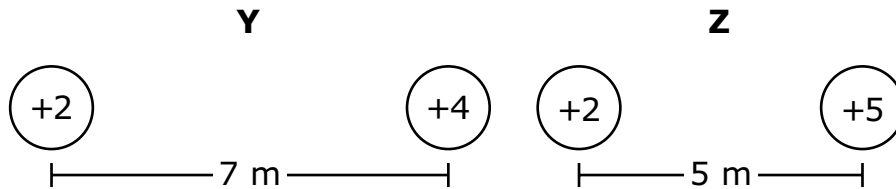
The amount of resources, including the number of prey, available to the wolves changed over these years. In which time period did the wolf population most likely **not** have enough resources available?

- (A) time period 1
- (B) time period 2
- (C) time period 3
- (D) time period 4

- 13 A pair of electric charges, labeled X, are 5 m apart, as shown in the diagram. An electric force exists between the charges.



Two other pairs of electric charges, Y and Z, are shown.



Which of the following correctly shows whether the force between each pair of electric charges is greater than or less than the force between the charges in pair X?

(A)

Force Is Greater	Force Is Less
pair Y	pair Z

(B)

Force Is Greater	Force Is Less
pair Z	pair Y

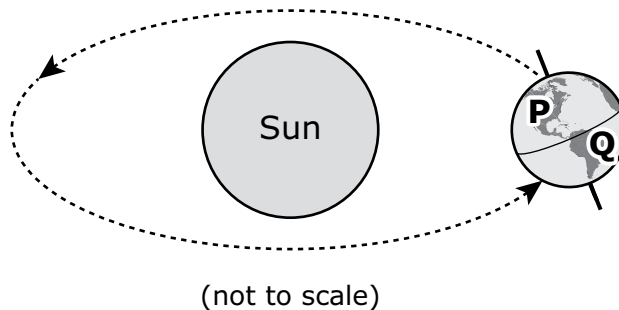
(C)

Force Is Greater	Force Is Less
pair Y and pair Z	no pairs

(D)

Force Is Greater	Force Is Less
no pairs	pair Y and pair Z

- 14 The model shows Earth in its revolution around the Sun. Two locations on Earth, P and Q, are labeled.



What is the season at each location in the model?

Ⓐ

Location	Season
P	fall
Q	spring

Ⓑ

Location	Season
P	summer
Q	winter

Ⓒ

Location	Season
P	spring
Q	fall

Ⓓ

Location	Season
P	winter
Q	summer

- 15 A pebble collides with the windshield of a moving car. The windshield applies a 25 N force to the pebble.

What amount of force does the pebble apply to the windshield?

- Ⓐ 0 N
- Ⓑ between 1 N and 24 N
- Ⓒ 25 N
- Ⓓ more than 25 N

Grade 8

Science and Technology/Engineering

SESSION 2

This session contains 5 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.

- 16 A plant is wilting because it needs water. A student views the cells of the plant through a microscope and observes that one cell part is smaller than expected.

The lack of water has the **greatest** affect on the size of which cell part?

- Ⓐ chloroplast
 - Ⓑ mitochondrion
 - Ⓒ nucleus
 - Ⓓ vacuole
- 17 Runoff from chemical pesticides used on a farm enters a nearby lake. Scientists discovered that some male fish exposed to these pesticides are unable to reproduce.
- Which of the following actions would most help these fish?
- Ⓐ organizing a trip to collect fish in the lake
 - Ⓑ creating regulations that require farmers to limit the use of pesticides
 - Ⓒ building an area to raise fish rather than allowing them to live in the lake
 - Ⓓ designing an informational poster about the benefits of using pesticides on farms

This question has two parts.

18 Students investigated what happens when calcium chloride is combined with baking soda in water. They followed these steps:

1. Mix 2 g of baking soda with water in a beaker.
2. Add 2 g of calcium chloride to the beaker and stir for 5 s.

The students made the following observations:

- The baking soda dissolved.
- Bubbles formed.
- A white solid formed.
- The sides of the beaker became warm.

Part A

Which of the following provides evidence that an exothermic reaction occurred?

- Ⓐ The baking soda dissolved.
- Ⓑ Bubbles formed.
- Ⓒ A white solid formed.
- Ⓓ The sides of the beaker became warm.

Part B

Which of the following should the students use to measure the change in average molecular kinetic energy during the reaction?

- Ⓐ graduated cylinder
- Ⓑ hot plate
- Ⓒ thermometer
- Ⓓ triple beam balance

- 19 Some students are investigating how the kinetic energy of a cart is affected by its speed. The students roll a cart with a mass of 1 kg across the floor twice. First they roll the cart at 1 m/s and then they roll it at 4 m/s.

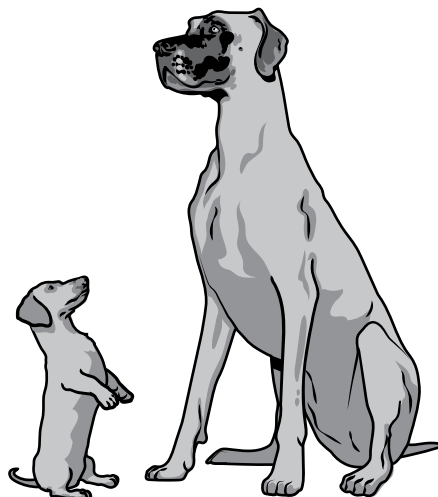
Kinetic energy can be calculated using the following equation:

$$\text{Kinetic Energy} = \frac{1}{2} \text{mass} \times \text{speed}^2$$

Which of the following correctly compares the kinetic energy of the cart at 4 m/s to the kinetic energy of the cart at 1 m/s?

- Ⓐ It is the same.
- Ⓑ It is 2 times greater.
- Ⓒ It is 4 times greater.
- Ⓓ It is 16 times greater.

- 20 All dogs belong to the same species. Dachshunds and Great Danes are two different dog breeds. Dachshunds are much smaller than Great Danes. A picture of each breed of dog is shown.



Which of the following claims about individuals of the same species is best supported by this information?

- Ⓐ Individuals can have genetic differences, which result in different traits.
- Ⓑ Individuals are genetically identical, even though they have different traits.
- Ⓒ Individuals always have different traits when living in the same environment.
- Ⓓ Individuals always have different traits when living in different environments.

Grade 8 Science and Technology/Engineering Spring 2026 Released Operational Items

PBT Item No.	Page No.	Reporting Category	Standard	Science and Engineering Practice Category	Item Type*	Item Description	Correct Answer**
1	4	<i>Physical Science</i>	7.PS.3.2	C. Evidence, Reasoning, and Modeling	SR	Determine when the potential energy of an object will change the most.	D
2	6	<i>Technology/Engineering</i>	6.ETS.2.3	None	SR	Determine which piece of safety equipment would best protect a worker.	D
3	6	<i>Technology/Engineering</i>	8.ETS.2.5	None	SR	Describe an advantage of using one manufacturing method compared to another method.	A
4	6	<i>Technology/Engineering</i>	6.ETS.1.5	B. Mathematics and Data	SR	Determine the scale used to create an object.	C
5	7–8	<i>Technology/Engineering</i>	7.ETS.1.2	C. Evidence, Reasoning, and Modeling	CR	Analyze a decision matrix to describe an advantage of using a certain material, explain why a material from the decision matrix should be used to make a certain object, and explain why a property of the material makes it a good choice to use.	
6	9–10	<i>Earth and Space Science</i>	7.ESS.3.4	B. Mathematics and Data	CR	Analyze data to explain why a certain crop contributes the most to increasing global temperatures, explain why a certain crop allows for the greatest number of species in the ecosystem, and describe one way to reduce the environmental impact of a certain crop.	
7	11–12	<i>Earth and Space Science</i>	6.ESS.1.4	C. Evidence, Reasoning, and Modeling	SR	Analyze evidence from diagrams showing rock layers and fossils from two locations to put several events in order from earliest to most recent.	B
8	13	<i>Life Science</i>	8.LS.3.2	B. Mathematics and Data	SR	Identify the percentage of a parent's genetic material received by an offspring in asexual reproduction.	D
9	14	<i>Earth and Space Science</i>	8.ESS.1.2	C. Evidence, Reasoning, and Modeling	CR	Determine which model shows the force that keeps a planet in orbit around a star, and identify that force.	
10	15	<i>Life Science</i>	7.LS.1.4	C. Evidence, Reasoning, and Modeling	SR	Explain how different parts of plants attract animals that pollinate the plant.	C;D
11	16	<i>Physical Science</i>	8.PS.1.4	None	SR	Explain what happens to water vapor when the temperature of the air changes.	D

PBT Item No.	Page No.	Reporting Category	Standard	Science and Engineering Practice Category	Item Type*	Item Description	Correct Answer**
12	16	<i>Life Science</i>	7.LS.2.1	B. Mathematics and Data	SR	Select a time period on a population graph when the population did not have enough resources available.	C
13	17	<i>Physical Science</i>	7.PS.2.3	B. Mathematics and Data	SR	Compare the strengths of the electric forces between pairs of charges.	B
14	18	<i>Earth and Space Science</i>	8.ESS.1.1	C. Evidence, Reasoning, and Modeling	SR	Use a model of the Earth-Sun system to identify each season at two locations on Earth.	B
15	18	<i>Physical Science</i>	8.PS.2.1	C. Evidence, Reasoning, and Modeling	SR	Use Newton's third law to determine the amount of force applied to an object during a collision.	C
16	20	<i>Life Science</i>	6.LS.1.2	None	SR	Identify a plant cell part that is smaller than usual when a plant wilts due to a lack of water.	D
17	20	<i>Life Science</i>	7.LS.2.5	None	SR	Determine an action that would help organisms being negatively affected by a human activity.	B
18	21	<i>Physical Science</i>	6.PS.1.6	A. Investigations and Questioning	SR	Identify evidence of an exothermic reaction occurring in an investigation, and identify the equipment used to measure a change in average molecular kinetic energy.	D;C
19	22	<i>Physical Science</i>	7.PS.3.1	B. Mathematics and Data	SR	Interpret a kinetic energy equation to determine how the kinetic energy of a cart will change when the speed of the cart increases.	D
20	23	<i>Life Science</i>	8.LS.1.5	C. Evidence, Reasoning, and Modeling	SR	Determine that genetic differences in individuals of the same species result in different traits.	A

* 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 8 Science and Technology/Engineering Spring 2026 Unreleased Operational Items

PBT Item No.	Reporting Category	Standard	Science and Engineering Practice Category	Item Type*	Item Description
21	<i>Earth and Space Science</i>	6.ESS.2.3	C. Evidence, Reasoning, and Modeling	SR	Interpret evidence from a map showing the distribution of fossils from different species to support a claim about tectonic plate movement.
22	<i>Technology/Engineering</i>	7.ETS.3.4	C. Evidence, Reasoning, and Modeling	SR	Interpret a diagram to describe a type of force acting on a bridge.
23	<i>Earth and Space Science</i>	6.ESS.1.1	C. Evidence, Reasoning, and Modeling	SR	Analyze data to complete a model showing the Moon's position relative to Earth and the Sun on a particular day.
24	<i>Life Science</i>	8.LS.3.4	C. Evidence, Reasoning, and Modeling	SR	Determine which model shows the pairs of alleles that code for a trait in an offspring and its parents.
25	<i>Physical Science</i>	8.PS.1.2	B. Mathematics and Data	SR	Interpret data to determine whether a physical or chemical change occurred when different substances were combined.
26	<i>Physical Science</i>	8.PS.1.1	C. Evidence, Reasoning, and Modeling	SR	Determine which model shows the structure of a molecule with a given chemical formula.
27	<i>Physical Science</i>	6.PS.1.7	B. Mathematics and Data	SR	Compare the relative densities of two solutions with the same volume.
28	<i>Physical Science</i>	8.PS.1.1	C. Evidence, Reasoning, and Modeling	CR	Identify a pure substance and explain why it is a pure substance, identify a mixture and explain why it is a mixture, and explain why substances made up of the same atoms can have different properties.
29	<i>Earth and Space Science</i>	8.ESS.1.1	B. Mathematics and Data	SR	Analyze a map and a graph to explain how the angle of incoming sunlight affects temperatures throughout the year.
30	<i>Technology/Engineering</i>	7.ETS.3.3	None	SR	Identify whether different types of car problems affect the car's propulsion system or control system.
31	<i>Technology/Engineering</i>	8.ETS.2.5	C. Evidence, Reasoning, and Modeling	SR	Describe assembling, quality control, and safety processes used in the manufacturing of an object.
32	<i>Technology/Engineering</i>	7.ETS.3.4	C. Evidence, Reasoning, and Modeling	SR	Use a diagram of a structure to describe a change that would prevent the structure from collapsing.
33	<i>Life Science</i>	6.LS.1.3	None	SR	Determine the body system that directly controls when muscles contract.
34	<i>Life Science</i>	7.LS.2.2	C. Evidence, Reasoning, and Modeling	SR	Interpret a food web to determine the relationships between two organisms and to describe their roles in keeping the ecosystem stable.
35	<i>Physical Science</i>	8.PS.2.2	B. Mathematics and Data	SR	Use a model to determine the net force on an object.
36	<i>Technology/Engineering</i>	7.ETS.3.1	C. Evidence, Reasoning, and Modeling	CR	Interpret a diagram of a communication system to identify and describe a transmitter and a receiver in the system.
37	<i>Earth and Space Science</i>	6.ESS.1.5	C. Evidence, Reasoning, and Modeling	SR	Determine which diagram best models the arrangement of the universe, the Milky Way, the solar system, and Earth.

PBT Item No.	Reporting Category	Standard	Science and Engineering Practice Category	Item Type*	Item Description
38	<i>Life Science</i>	8.LS.3.4	C. Evidence, Reasoning, and Modeling	CR	Use a Punnett square to determine the flower color and alleles for each parent plant, identify and explain the percentage of offspring that are expected to have the recessive flower color, and explain how the Punnett square shows that the offspring are the result of sexual reproduction.
39	<i>Earth and Space Science</i>	7.ESS.2.4	C. Evidence, Reasoning, and Modeling	SR	Describe two ways a model could be revised to show how gravity affects the water cycle.
40	<i>Earth and Space Science</i>	8.ESS.1.2	None	SR	Explain why Earth orbits the Sun.
41	<i>Earth and Space Science</i>	8.ESS.3.5	A. Investigations and Questioning	SR	Determine which question students are trying to answer in an investigation about how carbon dioxide affects temperature.

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