XVII. Science and Technology/Engineering, Grade 8

Grade 8 Science and Technology/Engineering Test

The spring 2018 grade 8 Science and Technology/Engineering test was administered in two formats: a computer-based version and a paper-based version. The test included both operational items, which count toward a student's score, and matrix items. The matrix portion of the test consisted of field-test and equating questions that do not count toward a student's score. All students were administered the same operational items, regardless of whether they took the computer-based test or the paper-based test.

This document displays the **paper-based versions** of the 2018 operational items that have been released. The **computer-based versions** of the released items are available on the MCAS Resource Center website at mcas.pearsonsupport.com/released-items.

Test Sessions and Content Overview

The grade 8 Science and Technology/Engineering test was made up of two separate test sessions. Each session included multiple-choice and open-response questions.

Standards and Reporting Categories

The grade 8 Science and Technology/Engineering test was based on overlapping learning standards in the four major content strands in the October 2006 and April 2016 versions of the *Massachusetts Science and Technology/Engineering Curriculum Framework*. The four content strands are listed below.

- Earth and Space Science
- Life Science (Biology)
- Physical Sciences (Chemistry and Physics)
- Technology/Engineering

The 2006 and 2016 versions of the *Massachusetts Science and Technology/Engineering Curriculum Framework* are available on the Department website at www.doe.mass.edu/frameworks/.

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

The tables at the conclusion of this chapter indicate each released and unreleased operational item's reporting category and the learning standard it assesses. The correct answers for released multiple-choice questions are also displayed in the released item table.

Reference Materials

During both Science and Technology/Engineering test sessions, the use of bilingual word-to-word dictionaries was allowed for current and former English learner students.

Grade 8
Science and Technology/Engineering
SESSION 1

This session contains 9 questions.

Directions

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

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

2 Which of the following describes the proper use of a tool?

A. A screwdriver is used to bend a thick wire.

B. A pair of pliers is used to cut thin sheets of metal.

C. A wrench is used to push a nail into a piece of wood.

D. A drill press is used to make a hole at a precise angle.

4 Which of the following processes created the high mountains of the Himalayas?

A. glacial erosion

B. physical weathering

C. the deposition of sediments

D. the collision of tectonic plates

7 Which of the following provides the **best** evidence that a chemical change is taking place?

A. A liquid forms as a solid object melts.

B. A flame burns on the surface of a solid.

C. Steam rises from the surface of a liquid.

D. A metal object becomes shorter when it is cooled.

8 An astronaut drops a hammer on the Moon, and a scientist drops an identical hammer on Earth. Both hammers are dropped from the same height. The hammer dropped on Earth falls to the ground faster than the hammer dropped on the Moon.

Why does the hammer on Earth fall faster than the hammer on the Moon?

A. Earth has a stronger magnetic field than the Moon because Earth orbits the Sun.

B. Earth has a stronger magnetic field than the Moon because Earth has an iron core.

C. Gravitational attraction is stronger on Earth than on the Moon because Earth rotates on its axis.

D. Gravitational attraction is stronger on Earth than on the Moon because Earth has a larger mass.

13 In a house, cracks are forming in the walls, around the corners of several doors, and around the windows. The cracks are forming because the house is constructed on unstable ground.

Which of the following parts of the house should be strengthened to prevent the cracks from getting worse?

A. the decking

B. the foundation

C. the roofing

D. the siding

15 Which of the following **best** describes a mixture?

A. a material that is made up of many molecules

B. a substance that can be changed into another substance

C. a material that contains two or more different substances

D. a substance that has been broken down into its smallest parts

16 A computer touch screen allows users to enter information. Users have complained that the touch screen is too difficult to operate because the system does not indicate when a choice has been selected.

The complaints are which element of the universal systems model?

A. feedback

B. goal

C. inputs

D. processes

19 Millions of years ago, a small population of birds lived on the Hawaiian Islands. Over time, this population evolved into more than 54 separate species, each with different colors, beak shapes, and food sources.

Which of the following **best** explains why the original population of birds evolved into so many different species?

A. Many of the birds were killed each time a volcano erupted on the Hawaiian Islands.

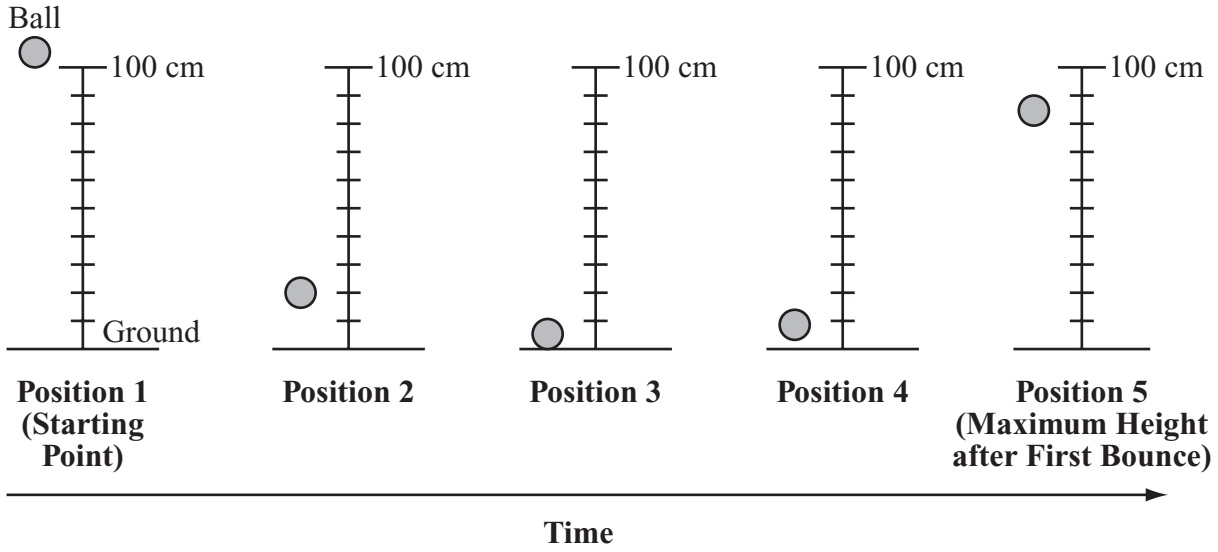
B. The Hawaiian Islands had few predator species to decrease the lifespan of the birds.

C. The bird population moved into and adapted to many different environments on the Hawaiian Islands.

D. The climate of the Hawaiian Islands rarely changed, which helped the bird population to increase in size.

This question has four parts.

21 A student releases a ball from a height of 100 cm above the ground. The ball bounces to a height of 80 cm. The diagram below shows the ball's position at five different times from its starting point to its maximum height after the first bounce.



Part A

Explain why the ball has kinetic energy at positions 2 and 4.

Part B

Explain why the ball has potential energy at positions 2 and 4.

Part C

Describe the energy transformation that occurs from position 1 to position 2 **and** the energy transformation that occurs from position 4 to position 5.

Part D

As the ball falls from position 1 to position 3, determine the height at which the ball has approximately equal amounts of kinetic energy and potential energy. Include units in your answer.

Grade 8
Science and Technology/Engineering
SESSION 2

This session contains 12 questions.

Directions

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

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

24 A science museum wants to demonstrate some processes of Earth's tectonic plates. Wooden blocks will be used to represent the tectonic plates.

Which of the following demonstrations would **best** show how Earth's tectonic plates interact with the layer directly beneath the plates?

A. gluing the blocks onto solid rock

B. burying the blocks in a bed of dry sand

C. sliding the blocks along the top of warm solid metal

D. floating the blocks on a slowly moving pool of thick mud

25 Lake Ontario, one of the Great Lakes, usually receives heavy snowfall during the winter. Snow often falls after a cold air mass passes through the area. This air mass tends to be colder than the lake water.

Which of the following **best** explains why snow falls over the lake after the air mass passes over it?

A. The air mass pushes clouds over the lake, and snow falls from the clouds.

B. Snow falls when sinking air from the air mass is warmed by the lake water.

C. The air mass cools the surface of the lake, causing condensation to occur and snow to fall.

D. Snow falls from clouds that form when rising water vapor from the lake is cooled by the air mass and condenses.

26 Strawberry plants can reproduce both sexually and asexually. Strawberry farmers use both kinds of reproduction, depending on the desired outcome.

In which of the following situations would a farmer **most likely** want the strawberry plants to reproduce sexually?

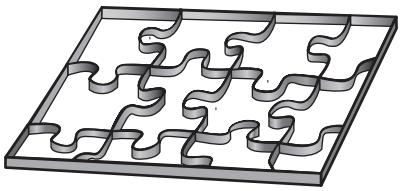
A. when developing new varieties of fruit

B. when making identical copies of a plant

C. when producing fruit that is all the same size

D. when growing many new plants from cuttings

32 The picture below shows a group of sharp steel strips arranged in a pattern that is used to manufacture cardboard jigsaw puzzles.



What is the purpose of the group of steel strips?

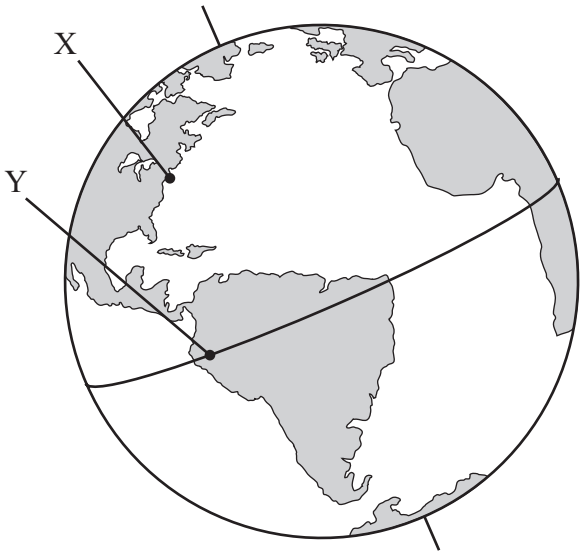
A. to cut the puzzle pieces out of cardboard

B. to join the puzzle pieces together for packaging

C. to assemble the puzzle pieces for store displays

D. to finish the puzzle pieces by smoothing the cardboard

34 The figure below represents Earth with two locations identified as X and Y.



Which of the following **best** explains why seasonal variations in temperature are more extreme at location X than at location Y?

A. The gravitational force is less at location X than at location Y.

B. The rotation of Earth has less effect on location X than on location Y.

C. The angle of incoming solar radiation varies more at location X than at location Y.

D. The ocean moderates the average temperature more at location X than at location Y.

35 Which of the following statements **best** explains why helicopters are usually more effective than airplanes for search-and-rescue operations in mountainous regions?

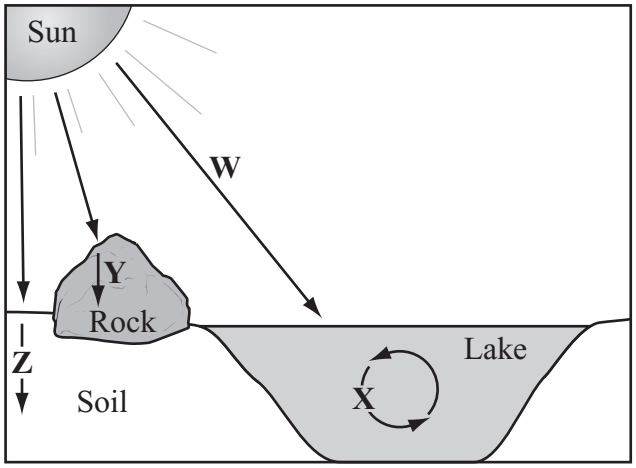
A. Helicopters can land safely in smaller areas.

B. Helicopters can fly faster to reach their destination.

C. Helicopters can fly longer distances without refueling.

D. Helicopters can stay in the air longer in bad weather conditions.

36 The labeled arrows in the diagram below represent some of the ways that heat is transferred in an ecosystem.



Which arrow represents heat being transferred **mainly** by convection?

A. arrow W

B. arrow X

C. arrow Y

D. arrow Z

37 A city street must be widened. The street cannot be too close to the buildings on it.

Which of the following would **best** show how close the widened street would be to the buildings?

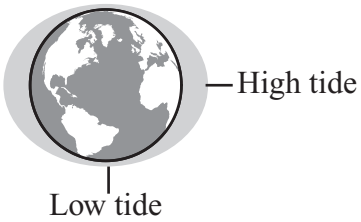
A. floor plans of each building

B. photographs of each building

C. site plans of the areas in front of each building

D. photographs of the views from the front doors of each building

38 The diagram below shows the relative heights of ocean tides on Earth at a particular time.



Which diagram shows one possible location of the Moon at the time when these tides occur?

A.

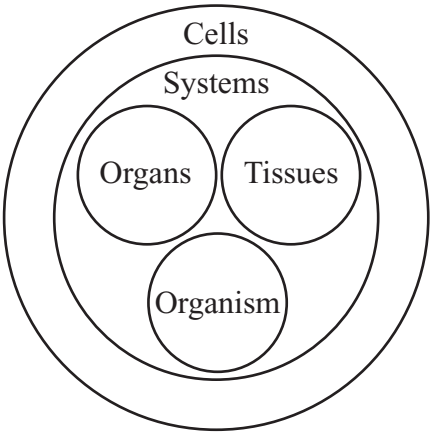
B.

C.

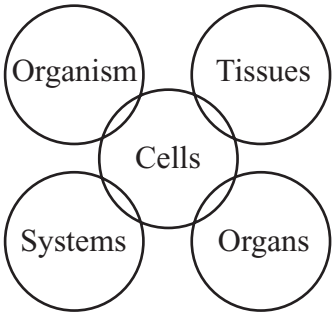
D.

39 Which of the following diagrams **best** represents the levels of organization of multicellular organisms?

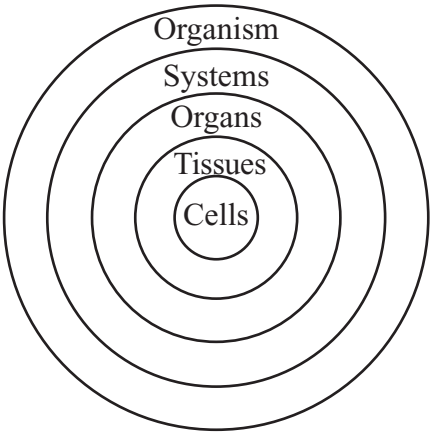
A.



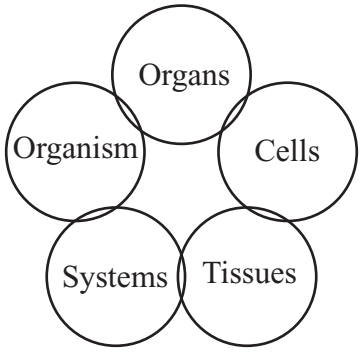
B.



C.



D.



40 Methane and propane are two compounds that are composed only of carbon and hydrogen atoms. The table below shows some of the properties of these two compounds.

	Compound	
	Methane	**Propane**
Formula	CH_4	C_3H_8
Boiling Point (°C)	–161.6	–42.1
Gas Density at 15°C (kg/m³)	0.68	1.9

Which of the following conclusions is **best** supported by the information in the table?

A. When two elements combine, the mass of each element changes.

B. When two compounds are mixed, the state of matter of the mixture changes.

C. Two elements can combine to produce different substances with different properties.

D. Two compounds can be mixed together to produce different materials with different properties.

This question has three parts.

42 Grass clippings from a city park were being collected and sent to a landfill. The city now wants to conserve space in the landfill. To do this, the city plans to use a mulching lawnmower that grinds up grass clippings and then spreads the clippings on the park's lawn.

Part A

Identify the process that happens over time to grass clippings that are ground up and spread over the lawn.

Part B

Describe the process you identified in Part A. Be sure to include the organisms involved in this process.

Part C

Other than conserving space in the landfill, describe **two** advantages of spreading ground-up grass clippings on the lawn.

Grade 8 Science and Technology/Engineering
Spring 2018 Released Operational Items:
Reporting Categories, Standards, and Correct Answers

PBT Item No.*	Page No.	Reporting Category	2006 Standard	2016 Standard	Correct Answer (MC)**
2	362	*Technology/Engineering*	1.3	6.MS-ETS2-3(MA)	D
4	362	*Earth and Space Science*	5	8.MS-ESS2-1	D
7	362	*Physical Science*	10	8.MS-PS1-2	B
8	363	*Earth and Space Science*	8	8.MS-ESS1-2	D
13	364	*Technology/Engineering*	5.1	7.MS-ETS3-4(MA)	B
15	364	*Physical Science*	8	8.MS-PS1-1	C
16	364	*Technology/Engineering*	2.6	7.MS-ETS3-5(MA)	A
19	365	*Life Science*	10	8.MS-LS4-4	C
21	366	*Physical Science*	13	7.MS-PS3-7(MA)	
24	368	*Earth and Space Science*	2	8.MS-ESS2-1	D
25	368	*Earth and Space Science*	4	8.MS-ESS2-5	D
26	369	*Life Science*	9	8.MS-LS3-2	A
32	369	*Technology/Engineering*	4.4	8.MS-ETS2-5(MA)	A
34	370	*Earth and Space Science*	11	8.MS-ESS1-1b	C
35	370	*Technology/Engineering*	6.1	7.MS-ETS3-3(MA)	A
36	371	*Earth and Space Science*	3	7.MS-PS3-6(MA)	B
37	371	*Technology/Engineering*	2.2	6.MS-ETS1-5(MA)	C
38	372	*Earth and Space Science*	9	8.MS-ESS1-2	B
39	373	*Life Science*	5	6.MS-LS1-3	C
40	374	*Physical Science*	5	8.MS-PS1-1	C
42	375	*Life Science*	15	7.MS-LS2-3	

* "PBT Item Number" refers to the position of the item on the operational paper-based test. This is the item number that DESE refers to when reporting student results for a PBT item.

** Answers are provided here for multiple-choice items only. Sample responses and scoring guidelines for open-response items, which are indicated by the shaded cells, will be posted to the Department's website later this year.

Grade 8 Science and Technology/Engineering
Spring 2018 Unreleased Operational Items:
Reporting Categories and Standards

PBT Item No.*	Reporting Category	2006 Standard	2016 Standard
1	*Physical Science*	14	7.MS-PS3-4
3	*Life Science*	11	6.MS-LS4-2
5	*Earth and Space Science*	12	6.MS-ESS1-5(MA)
6	*Life Science*	8	8.MS-LS3-3(MA)
9	*Life Science*	7	8.MS-LS3-4(MA)
10	*Technology/Engineering*	3.1	7.MS-ETS3-1(MA)
11	*Life Science*	2	6.MS-LS1-1
12	*Technology/Engineering*	2.1	6.MS-ETS1-1
14	*Earth and Space Science*	6	7.MS-ESS2-2
17	*Life Science*	6	6.MS-LS1-3
18	*Physical Science*	7	8.MS-PS1-1
20	*Earth and Space Science*	7	6.MS-ESS2-3
22	*Physical Science*	15	8.MS-PS1-4
23	*Life Science*	13	7.MS-LS2-3
27	*Physical Science*	4	8.MS-PS1-5
28	*Technology/Engineering*	2.3	7.MS-ETS1-7(MA)
29	*Physical Science*	9	8.MS-PS1-4
30	*Life Science*	12	7.MS-LS2-4
31	*Physical Science*	2	6.MS-PS1-7(MA)
33	*Physical Science*	16	7.MS-PS3-6(MA)
41	*Technology/Engineering*	1.1	6.MS-ETS2-2(MA)

* "PBT Item Number" refers to the position of the item on the operational paper-based test. This is the item number that DESE refers to when reporting student results for a PBT item.