

PRACTICE TEST

Science and
Technology/Engineering

Grade 8

Student Name

School Name

District Name

Grade 8 Science and Technology/Engineering Practice Test

This practice test contains 24 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.

This session is divided into sections. If you do not know the answer to a question, you may go on to the next question. When you finish a section, you may review your answers and go back to any questions you did not answer in that section only.

Go On ➡

The following section focuses on students riding electric scooters to a technology museum. The students learn about electric scooters at an exhibit.

- 1 The table shows the speed of a rider on a scooter over 4 s. The rider travels on the scooter in a straight line.

Time (s)	Speed (km/hr)
0	0
1	4
2	8
3	12
4	12

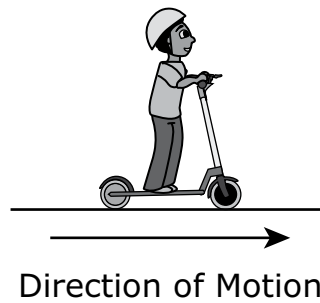
Which of the following describes the net force on the rider and the scooter at 1–2 s?

- Ⓐ The net force equals zero.
- Ⓑ The net force is in the opposite direction of the scooter's motion.
- Ⓒ The net force is in the same direction as the scooter's motion.

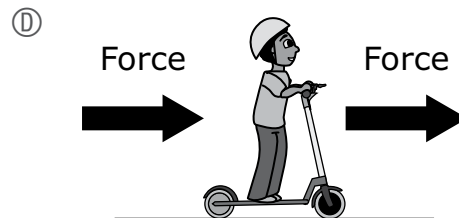
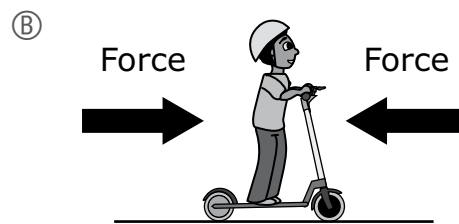
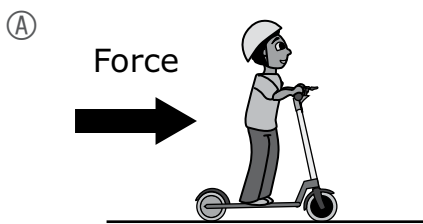
Which of the following describes the net force on the rider and the scooter at 3–4 s?

- Ⓐ The net force equals zero.
- Ⓑ The net force is in the opposite direction of the scooter's motion.
- Ⓒ The net force is in the same direction as the scooter's motion.

- 2 A rider is moving in a straight line to the right on a scooter, as shown.

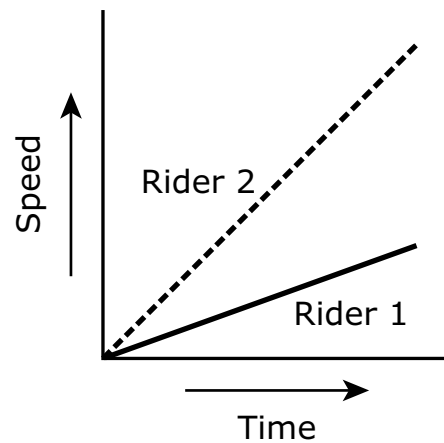


Which of the following models **best** shows the horizontal force or forces that would cause the rider to slow down?



- 3 The graph shows the speed of two riders on identical scooters over time. Both riders have the same mass and are traveling in a straight line.

Change in Speed over Time



Based on the graph, which of the following best explains the speeds of riders 1 and 2?

- Ⓐ There is a greater net force on rider 1 than on rider 2.
- Ⓑ There is a smaller net force on rider 1 than on rider 2.
- Ⓒ The forces are not balanced on rider 1 but are balanced on rider 2.
- Ⓓ The forces are balanced on rider 1 but are not balanced on rider 2.

This question has two parts.

- 4** The scooter exhibit at the museum has a simulation where the students can change the mass of a rider-scooter system to investigate the relationship between mass and kinetic energy.

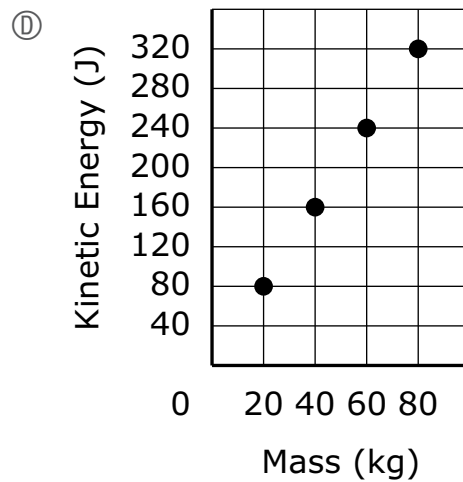
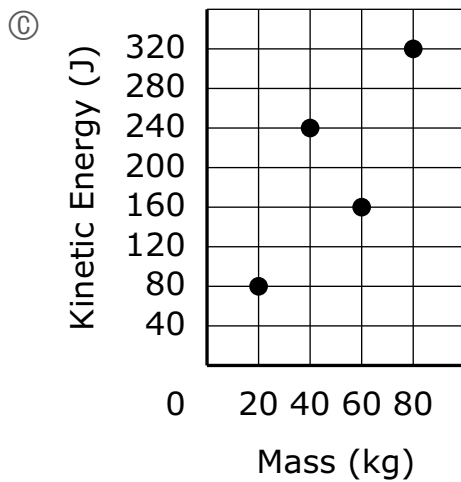
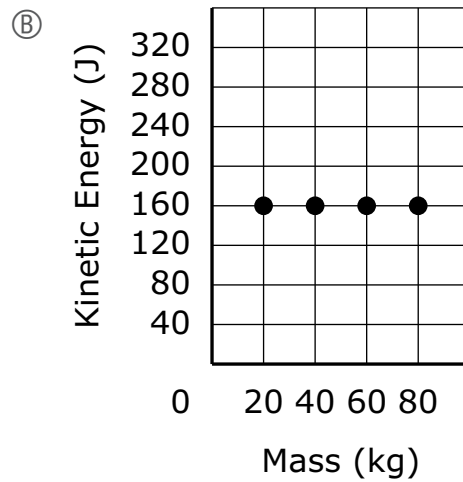
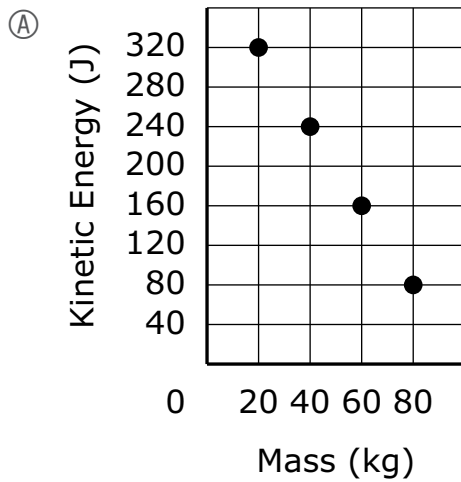
Part A

The table shows the results of the simulation when the students use different masses for the rider-scooter system. The scooter moves on a level surface and has a constant speed.

Mass (kg)	Kinetic Energy (J)
40	160
60	240
80	320

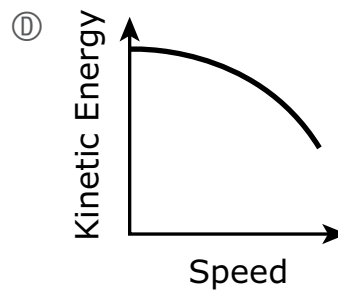
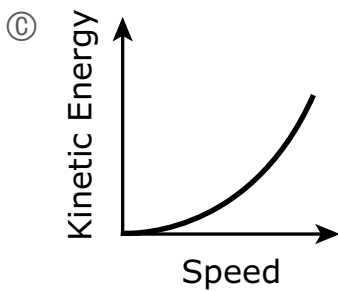
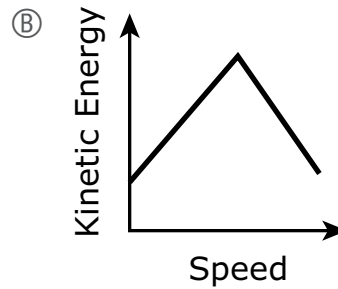
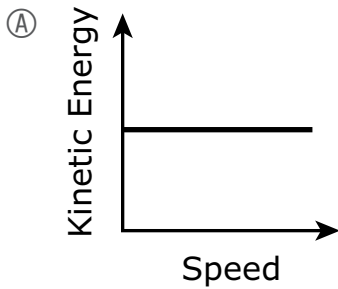
The students graph the masses and kinetic energies shown in the table. They then add a point on the graph for a rider-scooter system with a mass of 20 kg.

Which of the following best shows the students' graph?



Part B

Which of the following graphs best represents the relationship between the kinetic energy and the speed of the rider-scooter system with a mass of 40 kg?



- 5 The scooter exhibit has a simulation where students can change the mass of the rider-scooter system on a hill to investigate the relationship between mass and gravitational potential energy. The students change the mass of the rider-scooter system to 40 kg, 60 kg, and 80 kg.

The rider-scooter system that has the **greatest** gravitational potential energy has a mass of

- Ⓐ 40 kg.
- Ⓑ 60 kg.
- Ⓒ 80 kg.

The rider-scooter system has the **greatest** gravitational potential energy when it is located

- Ⓐ at the bottom of the hill.
- Ⓑ at the top of the hill.
- Ⓒ halfway up the hill.

- 6 The museum has an exhibit about four helmet designs, L, M, N, and O, used by people riding scooters. The exhibit includes a table with information about three factors: the cost of the helmet, how well the helmet fits, and how well the helmet keeps the rider’s head cool. The table is shown.

Scoring Key

Worst —————> Best

1	2	3	4
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Helmet	Cost	Fits Head	Keeps Head Cool	Total
L	1	4	4	
M	2	4	4	
N	4	3	4	
O	3	2	1	



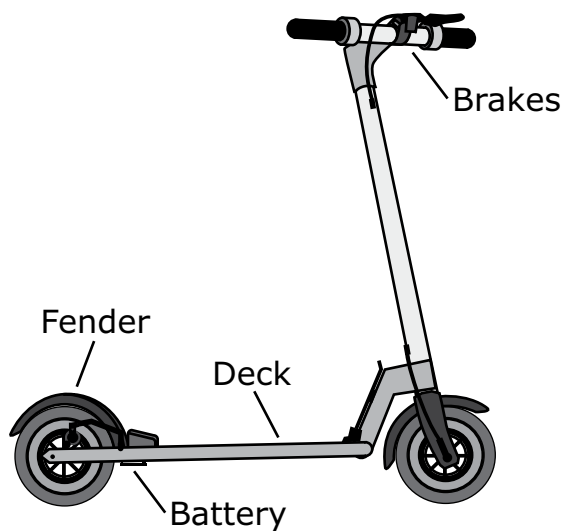
Based on the information in the table, the helmet with the best design is

- Ⓐ helmet L.
- Ⓑ helmet M.
- Ⓒ helmet N.
- Ⓓ helmet O.

This is because this design has the best

- Ⓐ Cost score.
- Ⓑ Fits Head score.
- Ⓒ Keeps Head Cool score.
- Ⓓ Total score.

- 7 A diagram of an electric scooter is shown.



Which table correctly shows whether each feature is a benefit or a limitation of the electric scooter?

Ⓐ

Feature	Benefit or Limitation
rider can control speed	benefit
deck has a rough texture	benefit
battery needs to be recharged frequently	limitation
fender prevents water from splashing on rider	benefit

Ⓑ

Feature	Benefit or Limitation
rider can control speed	limitation
deck has a rough texture	benefit
battery needs to be recharged frequently	limitation
fender prevents water from splashing on rider	benefit

Ⓒ

Feature	Benefit or Limitation
rider can control speed	benefit
deck has a rough texture	limitation
battery needs to be recharged frequently	limitation
fender prevents water from splashing on rider	benefit

Ⓓ

Feature	Benefit or Limitation
rider can control speed	benefit
deck has a rough texture	limitation
battery needs to be recharged frequently	benefit
fender prevents water from splashing on rider	benefit

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

- 8** Using a simulation of a rider-scooter system, the students investigate energy conversions.

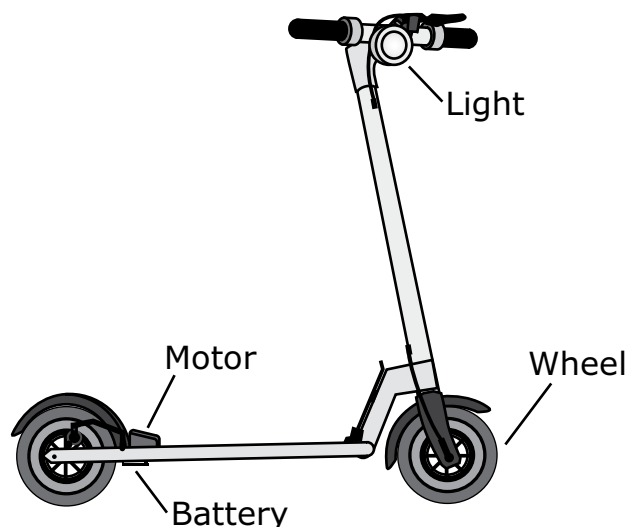
A. The rider-scooter system is going up a hill and has a mass of 40 kg.

Identify whether the gravitational potential energy (GPE) of the rider-scooter system increases, decreases, or stays the same as it moves up the hill. Explain your reasoning.

B. Two riders travel next to each other along the same path for 20 minutes on identical scooters. One rider has a mass of 40 g, and the other rider has a mass of 60 g. Both scooters started with the batteries fully charged. At the end of the ride, one scooter has a lower battery level than the other scooter.

Explain why the two scooters have different battery levels after 20 minutes. Be sure to include the energy conversions in your explanation.

C. A diagram of an electric scooter is shown.



Describe one way energy is converted from one form in the battery to another form in a different part of the scooter. Be sure to include the **two** types of energy **and** the other part of the scooter in your description.

8

Lined area for student response.



This is the end of the section. You may check your work for this section only.





**This is the end of the section. You may
check your work for this section only.**

**When you have completed Section 1,
go on to the next page.**

The following section focuses on students researching the differences in mouse populations after a field trip to a desert nature park. The students observed mice with different fur colors.

- 9** The students investigate the genetics of fur color in the mouse population they observed. A certain chromosome in mice contains the genes that determine whether a mouse has a certain fur color.

Which of the following describes where the chromosome is located in mice cells?

- Ⓐ nucleus of all body cells
- Ⓑ cytoplasm of all body cells
- Ⓒ membrane of only fur cells
- Ⓓ mitochondria of only fur cells

- 10 Different fur colors in mice were originally caused by mutations in the gene for fur color. Which of the following tables **best** shows the steps of how different fur colors appeared in mice?

Ⓐ

Step	Description
1	Different DNA sequences are produced.
2	Different traits are expressed.
3	Different proteins are made.

Ⓑ

Step	Description
1	Different proteins are made.
2	Different traits are expressed.
3	Different DNA sequences are produced.

Ⓒ

Step	Description
1	Different DNA sequences are produced.
2	Different proteins are made.
3	Different traits are expressed.

Ⓓ

Step	Description
1	Different proteins are made.
2	Different DNA sequences are produced.
3	Different traits are expressed.

- 11 Offspring are produced by sexual reproduction in mice populations. Which of the following is the main advantage of sexual reproduction over asexual reproduction?
- Ⓐ Sexual reproduction greatly increases the number of offspring produced.
 - Ⓑ Sexual reproduction provides for more genetic variation among offspring.
 - Ⓒ Sexual reproduction guarantees that only the best traits will be passed on.
 - Ⓓ Sexual reproduction happens only when favorable environmental conditions exist.

- 12 The students use information about parent mice and their offspring to determine the alleles of two mice.

Two gray male mice, R and S, were crossed with a tan female mouse and a gray female mouse. The percentages of offspring with tan or gray fur are shown in the table.

Cross	Tan Offspring (%)	Gray Offspring (%)
male R × tan female	42	58
male R × gray female	20	80
male S × tan female	0	100
male S × gray female	0	100

The students use **G** to represent the allele that codes for gray fur and **g** to represent the allele that codes for tan fur. The allele for gray fur color (**G**) is dominant to the allele for tan fur color (**g**).

What is the allele pair for male mouse R?

- Ⓐ **GG**
- Ⓑ **Gg**
- Ⓒ **gg**

What is the allele pair for male mouse S?

- Ⓐ **GG**
- Ⓑ **Gg**
- Ⓒ **gg**

This question has two parts.

- 13** The students use information about parent mice and their offspring to determine the best evidence that tan fur in mice is a result of recessive alleles.

A gray female mouse was crossed with three male mice, R, S, and T. The table shows the fur colors of the male mice and the percentages of offspring with tan or gray fur.

Mouse and Fur Color	Tan Offspring (%)	Gray Offspring (%)
male R, gray fur	23	77
male S, gray fur	0	100
male T, tan fur	67	33

Part A

The genetic cross that provides the best evidence that tan fur in mice is the result of recessive alleles is the cross between the gray female mouse and male

- Ⓐ mouse R.
- Ⓑ mouse S.
- Ⓒ mouse T.

This is because

- Ⓐ all of the offspring have tan fur.
- Ⓑ most of the offspring have tan fur.
- Ⓒ some of the offspring have tan fur.
- Ⓓ none of the offspring have tan fur.

Part B

Which of the following best explains why the cross you selected in Part A provides evidence that tan fur is a result of recessive alleles?

- Ⓐ Tan fur can be observed in offspring when neither parent has tan fur.
- Ⓑ Tan fur can be observed in offspring only when both parents have tan fur.
- Ⓒ All offspring will have gray fur when one parent has gray fur and the other parent has tan fur.
- Ⓓ Most of the offspring will have tan fur when one parent has gray fur and the other parent has tan fur.

- 14** Owls are the main predators of the mice that live in the desert. When mice see owls flying in the sky, they run away from them to avoid being eaten.

Select the **two** body systems in a mouse that directly interact to allow the mouse to see the owl and run from it.

- Ⓐ circulatory system
- Ⓑ digestive system
- Ⓒ muscular system
- Ⓓ nervous system
- Ⓔ respiratory system

- 15 A diagram shows the relationships among parts of the desert ecosystem where the mice live.

Sun → Plants → Mice → Owl

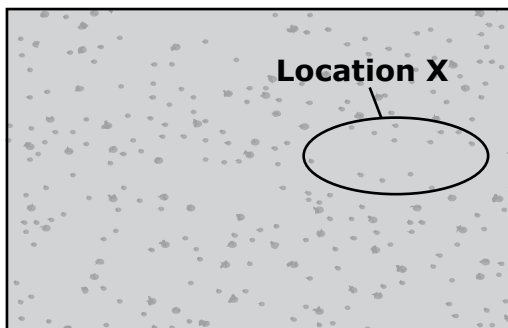
Which of the following do all three arrows in the diagram represent?

- Ⓐ carbon
- Ⓑ energy
- Ⓒ light
- Ⓓ oxygen

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

- 16** Around 1,000 years ago, volcanic eruptions resulted in dark-colored rocks forming in the desert where mice and owls lived. Before the volcanic eruptions, the desert ground was light-colored. The pictures show what scientists think the desert looked like 1,200 years ago and what it looks like today. One area within the desert is labeled location X.

**Overhead View of Desert
1,200 Years Ago**



**Overhead View of
Desert Today**



At location X today, owls prey on both dark-colored gray mice and light-colored tan mice. Scientists think that owls also preyed on dark-colored gray mice and light-colored tan mice at location X 1,200 years ago.

- A. Identify whether there would have been more dark-colored gray mice or more light-colored tan mice at the area labeled location X 1,200 years ago, before the volcanic eruptions. Explain your reasoning.
- B. Describe how the numbers of dark-colored gray mice and light-colored tan mice changed at the area labeled location X after the volcanic eruptions. Explain your reasoning using your knowledge of natural selection.

16

Lined area for student response.



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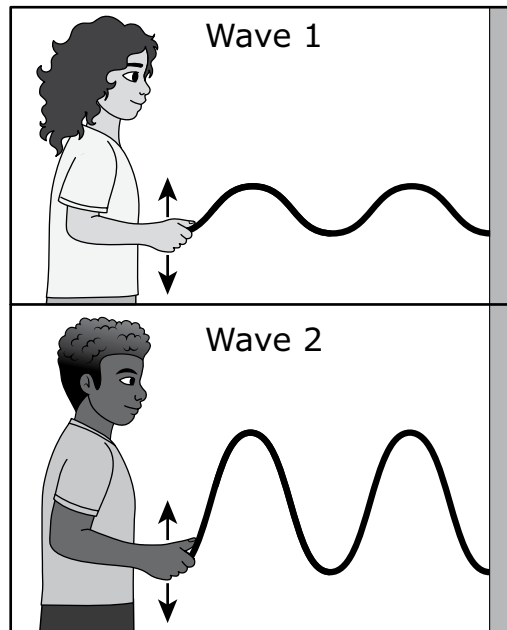


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check your work for this section only.**

**When you have completed Section 2,
go on to the next page.**

The following section focuses on students investigating Earth's surface, the layers of Earth, and how geological events have changed Earth over time.

- 17 The students use ropes to create models of waves to learn about earthquakes. Each student attaches one end of a rope to the classroom wall and holds on to the other end of the rope. Then each student makes a wave by moving a hand up and down, as shown.



Each wave is traveling at the same speed.

Compared to wave 1, wave 2 has a larger

- Ⓐ amplitude.
- Ⓑ frequency.
- Ⓒ wavelength.

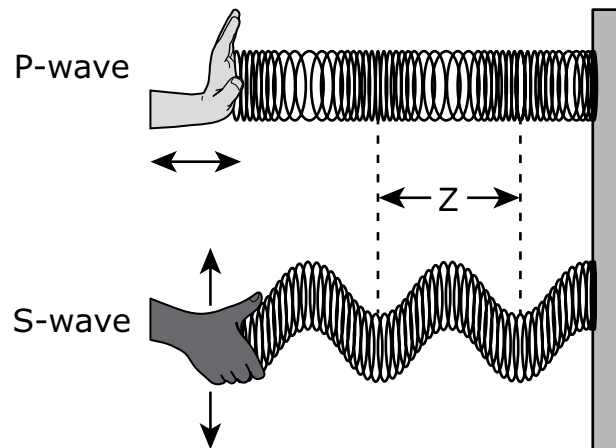
This is because wave 2 transfers

- Ⓐ less energy than wave 1.
- Ⓑ more energy than wave 1.

- 18** Seismic waves from an earthquake can travel to different places around the world.

The students use springs to make models of two types of seismic waves, called P-waves and S-waves, that occur during earthquakes. Each student attaches one end of a spring to the classroom wall and holds the other end of the spring.

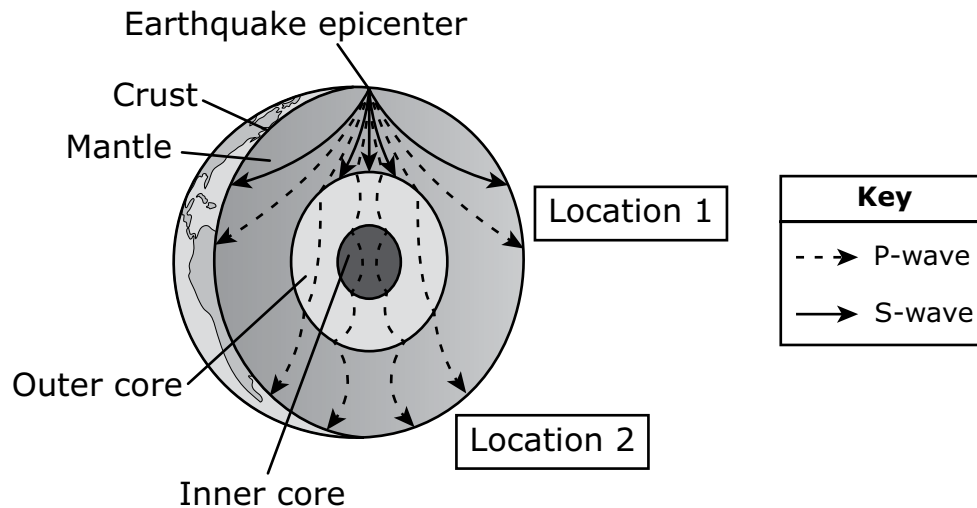
One spring is moved back and forth to make a model of a P-wave, and one spring is moved up and down to make a model of an S-wave. The resulting waves are shown. A characteristic of both waves is labeled Z.



Which wave characteristic is represented by Z?

- Ⓐ amplitude
- Ⓑ frequency
- Ⓒ speed
- Ⓓ wavelength

- 19 The epicenter of an earthquake is the location where an earthquake starts. The diagram shows how P-waves and S-waves move from the epicenter through the layers of Earth.



Waves from the epicenter of the earthquake were detected at location 1 and at location 2. At location 1, both P-waves and S-waves were detected. At location 2, only P-waves were detected.

At the boundaries of Earth's layers, P-waves

- (A) bend.
- (B) reflect.

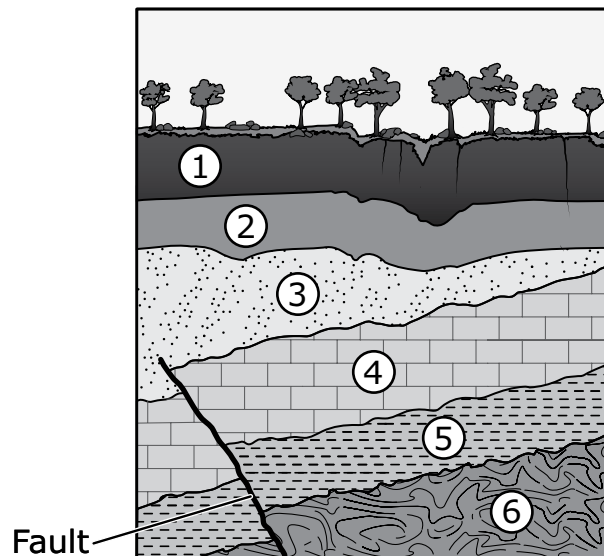
This happens because P-waves are moving

- (A) away from the epicenter.
- (B) into different materials.
- (C) toward the inner core.

Only P-waves were detected at location 2 because S-waves were

- (A) absorbed by the outer core.
- (B) reflected by the outer core.
- (C) transmitted by the outer core.

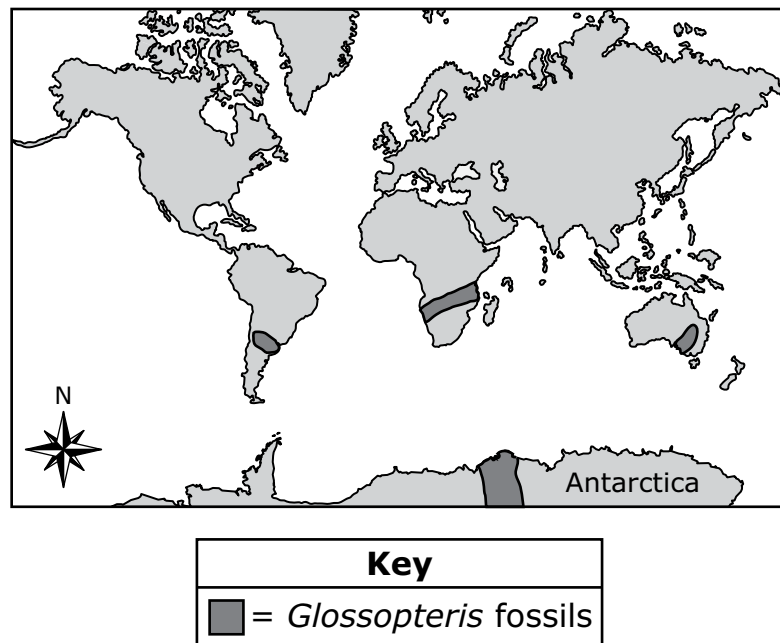
- 20 The students explore how rock layers can provide evidence of how the surface of Earth has changed over time. The diagram shows several rock layers, labeled 1–6, and a fault.



Which of the following claims is best supported by the diagram?

- Ⓐ Rock layer 4 is older than the fault.
- Ⓑ Rock layer 5 is younger than the fault.
- Ⓒ Rock layer 2 is older than rock layer 3.
- Ⓓ Rock layer 6 is younger than rock layer 1.

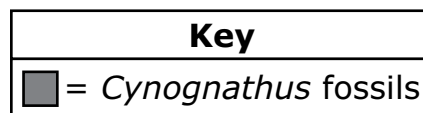
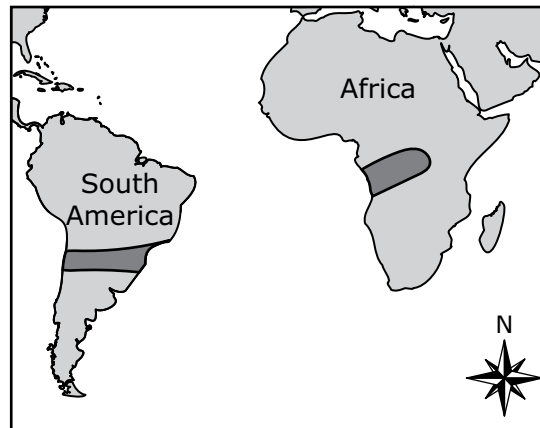
- 21 Students learn about fossils of *Glossopteris*, an extinct plant species that once lived on Antarctica. The map shows the Antarctica location and several other locations where the plant fossils were found by scientists.



Which of the following best explains why fossils of the extinct plant species were found on Antarctica?

- Ⓐ Millions of years ago, Antarctica had many animals that ate many plants.
- Ⓑ Millions of years ago, Antarctica was closer to the Arctic and had cooler temperatures.
- Ⓒ Millions of years ago, Antarctica was closer to the equator and had a warm, moist climate.
- Ⓓ Millions of years ago, Antarctica had more storms, which carried plant seeds across the continent.

- 22 The students learn that *Cynognathus* is a type of reptile that lived on Earth over 240 million years ago. The map shows the locations where *Cynognathus* fossils have been found.



Which of the following best explains why *Cynognathus* fossils were found on both the South American and African continents?

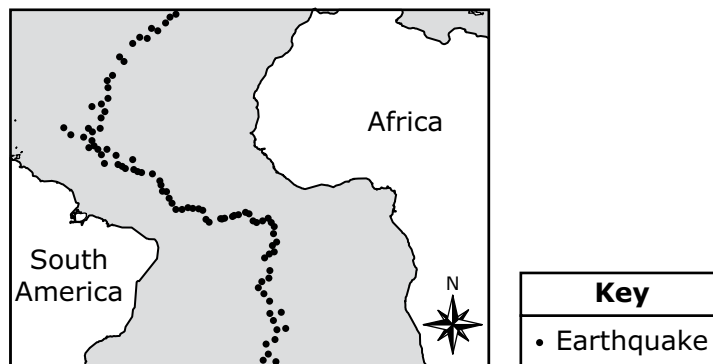
- Ⓐ Some *Cynognathus* individuals swam across the ocean to the other continent to find food.
- Ⓑ The continents were part of the same landmass when *Cynognathus* populations were living.
- Ⓒ *Cynognathus* populations evolved independently on each continent and responded to similar environmental conditions.
- Ⓓ The fossils of some dead *Cynognathus* individuals from one continent were carried by ocean currents to the other continent.

This question has two parts.

- 23** The students use models to learn more about plate movement.

Part A

The map shows where earthquakes have occurred along a plate boundary.

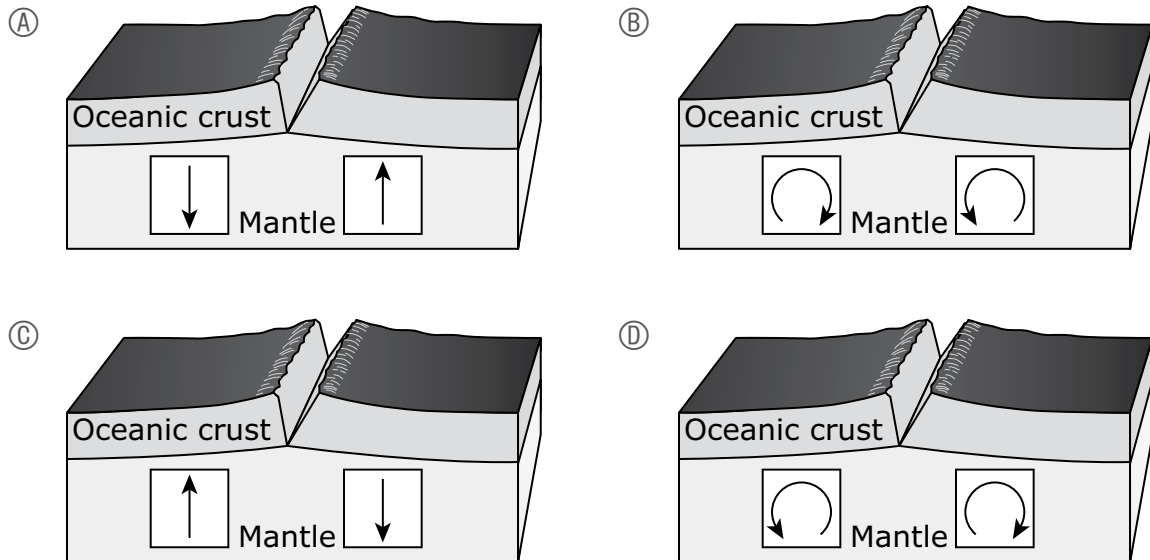


Which of the following best describes Earth's crust along the plate boundary?

- Ⓐ New crust is being made as tectonic plates move toward each other.
- Ⓑ New crust is being made as tectonic plates move away from each other.
- Ⓒ Old crust is being destroyed as tectonic plates move toward each other.
- Ⓓ Old crust is being destroyed as tectonic plates move away from each other.

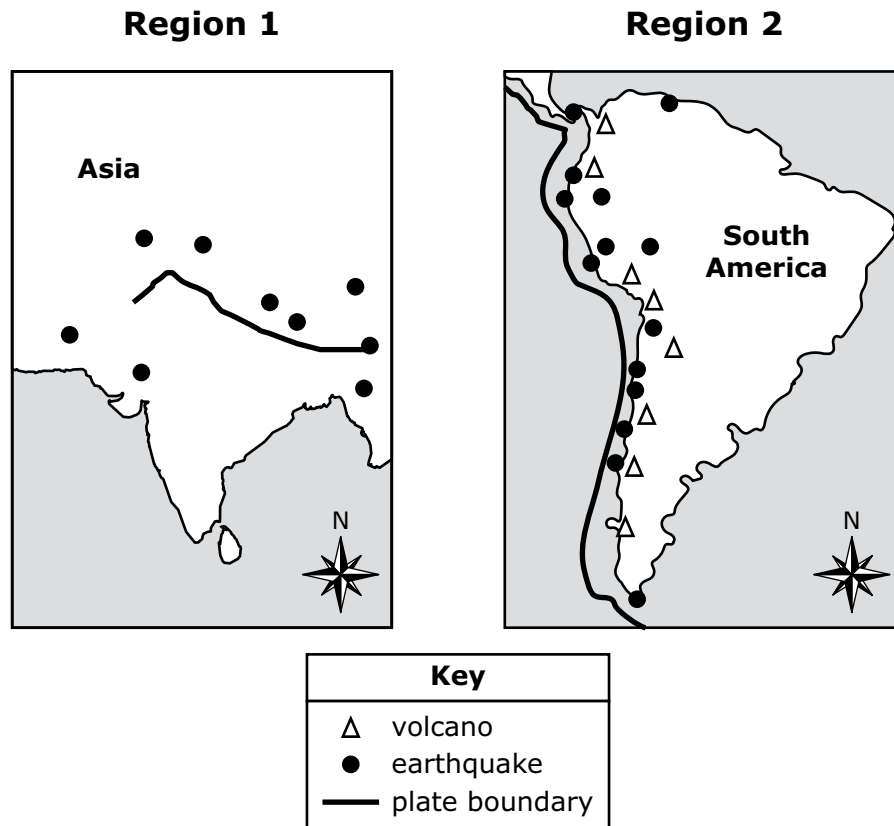
Part B

Students are making a model that shows why the tectonic plates described in Part A are moving. Which of the following models best shows how currents in the mantle cause the crust to move?



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

- 24 The maps show two regions with some volcanoes, some earthquakes, and parts of plate boundaries. Region 1 is located on the continent of Asia, and region 2 is located on the western edge of South America.



- A. At plate boundaries, tectonic plates can move toward each other, move away from each other, or slide past each other. The plates are moving in similar ways in both region 1 and region 2.

Describe how the plates move at the boundaries shown on the maps.

- B. Describe how the movement of the plates in region 1 causes the land in that region to change.
- C. Explain why volcanoes occurred near the plate boundary in region 2.

24

Lined area for student response.



This is the end of the session. You may check your work for this section only.





**This is the end of the session. You may
check your work for this section only.**