LEAP 2025

Science

Practice Test

Grade 6

DEPARTMENT of EDUCATION

Louisiana Believes

Session 1

Directions:

Today, you will take Session 1 of the Grade 6 Science Practice Test.

Read each stimulus and question. Then, follow the directions to answer each question. Mark your answers by circling the correct choice. If you need to change an answer, be sure to erase your first answer completely. You may look back at the stimuli when needed.

Some of the questions may ask you to write a response. Write your response in the space provided in your test booklet. Only responses written within the provided space will be scored.

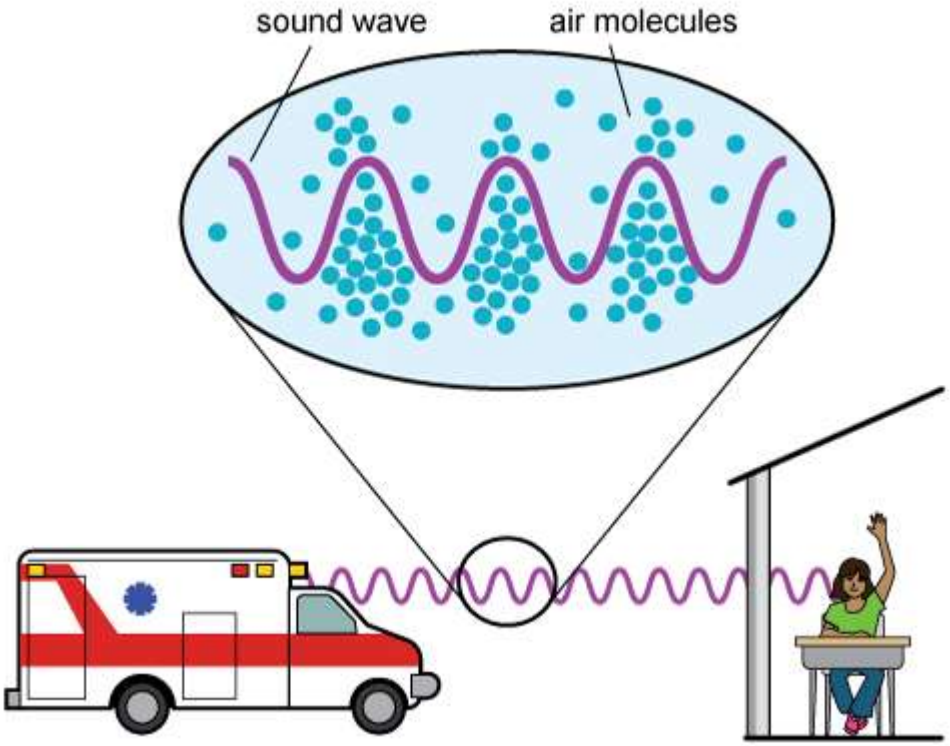
If you do not know the answer to a question, you may go on to the next question. If you finish early, you may review your answers and any questions you did not answer in this session **ONLY**. Do not go past the stop sign.

Use the information about properties of light and sound waves and your knowledge of science to answer the questions.

Properties of Light and Sound Waves

A group of students is learning about the sounds and lights used by emergency vehicles. An ambulance and a fire truck are in the school parking lot. The students can hear the sound made by the sirens of each vehicle, but do not see the flashing lights until they can see each vehicle. This is because the walls of the school affect sound waves and light waves differently. Figure 1 shows a model of a sound wave traveling through the air. The sound wave causes the air molecules to vibrate. This movement of the air molecules, along with a transfer of energy, results in the sound wave traveling through the air.

Figure 1. Sound Wave from an Emergency Vehicle



Different types of materials can affect how sound waves travel. Table 1 shows how different materials affect the speed of sound waves.

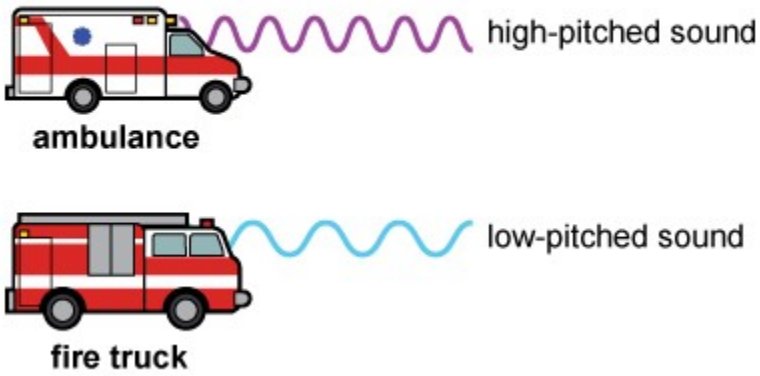
Table 1. Speed of Sound in Different Materials

Material	Speed of Sound (m/s)
air at 20°C	343
water at 20°C	1,482
brick	3,650
aluminum	5,100

Source: Brooks/Cole.

The students observe that the pitches of the sounds from the fire truck and the ambulance siren are different. The siren for each vehicle has a different pitch, as shown in Figure 2. The ambulance siren has sound waves with a higher pitch than sound waves from the fire truck siren.

Figure 2. Pitches of Emergency Sirens



1. Based on the information in Figure 1 and Table 1, which statement **best** compares a sound wave in a vacuum to a sound wave in air?

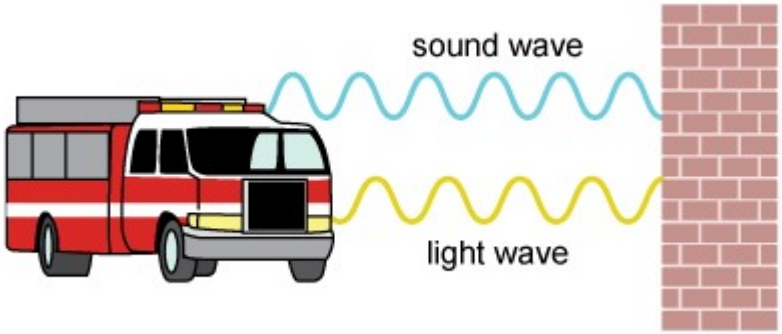
   A. A sound wave in a vacuum travels much faster than a sound wave in air because there are no molecules to slow it down.

   B. A sound wave in air travels much slower than a sound wave in a vacuum because of the number of molecules in air.

   C. A sound wave cannot travel in a vacuum because there are no molecules to transfer the energy.

   D. A sound wave travels at the same speed in a vacuum as a sound wave in air does.

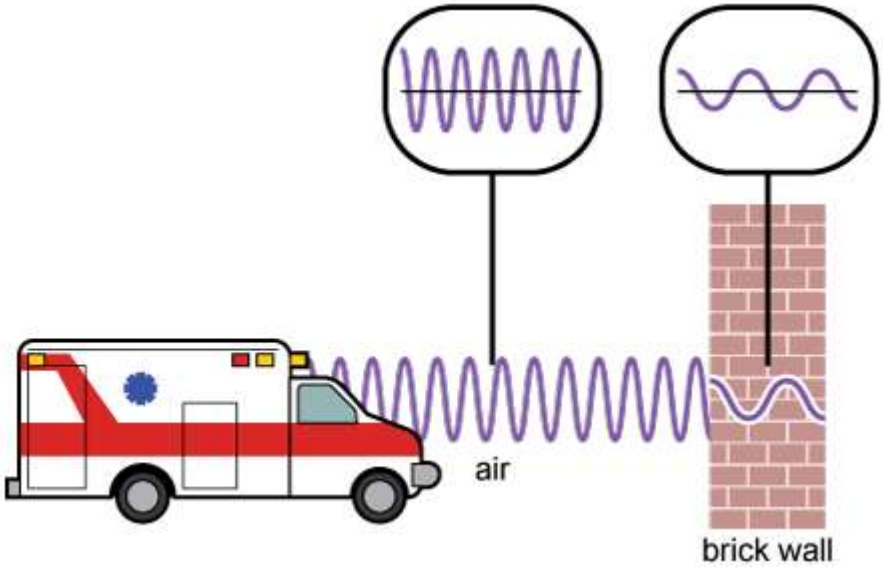
2. The diagram shows sound and light waves from an emergency vehicle traveling toward a brick wall. The brick wall has both smooth and rough surfaces.



Circle the correct bolded answer in **each** bracket to complete the sentences about how each wave is affected by the brick wall.

The sound waves from the siren will **[only reflect off; only pass through; pass through and reflect off]** the smooth surface of the wall. The light waves from the emergency vehicle will **[only reflect off; only pass through; pass through and reflect off]** the smooth surface of the wall. Rougher sections of the wall surface will cause the **[sound waves; light waves; sound and light waves]** from the emergency vehicle to scatter.

3. The diagram shows how a sound wave from an emergency vehicle changes as it moves through air and then through a brick wall.



Which statement **best** describes how the amplitude and energy of a sound wave are affected as the wave travels through air and as the wave travels through a brick wall?

A. The sound wave has less energy and a larger amplitude when traveling through a brick wall than when traveling through air.

B. The sound wave has more energy and a smaller amplitude when traveling through a brick wall than when traveling through air.

C. The sound wave has more energy and a larger amplitude when traveling through a brick wall than when traveling through air.

D. The sound wave has less energy and a smaller amplitude when traveling through a brick wall than when traveling through air.

4. **Part A**

Based on Figure 2, which statement **best** describes how the pitch and the frequency of sound waves are related?

A. Sound waves with a higher frequency have a higher pitch.

B. Sound waves with a lower frequency have a higher pitch.

C. Sound waves with a higher frequency have a lower pitch.

D. Sound waves with higher and lower frequencies can have the same pitch.

Part B

Which evidence from Figure 2 **best** supports the answer to Part A?

A. The ambulance sound waves have fewer waves and a longer wavelength.

B. The fire truck sound waves have fewer waves and a shorter wavelength.

C. The ambulance sound waves have more waves and a shorter wavelength.

D. The fire truck sound waves have more waves and a longer wavelength.

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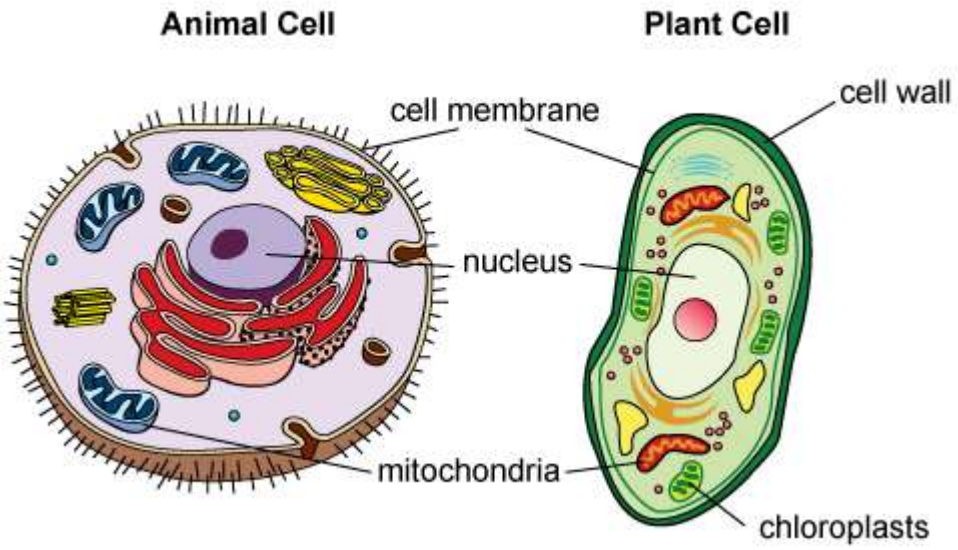
Use the information about organelles and your knowledge of science to answer the questions.

Organelles

Scientists are designing an investigation to study how each part of a cell affects how the entire cell works. Cells often use specialized structures called organelles. These structures perform very specific functions. The scientists have decided to compare two different types of cells. They will look at different types of cells from different organisms, such as animals and plants. Figure 1 shows the basic structures of animal cells and plant cells.

Figure 1. Animal and Plant Cells

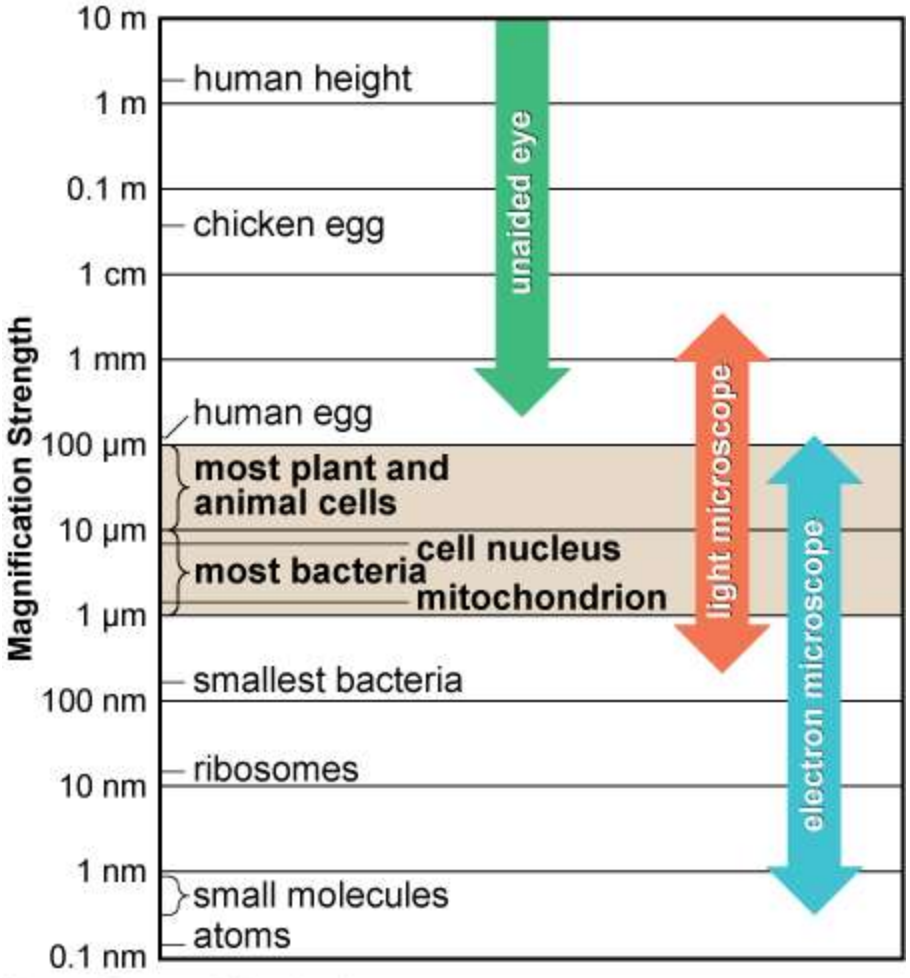


Each organelle has a unique role within the cell. Some organelles are used to make energy for the cell. Other organelles can control the growth of the cell. Many organelles, such as the nucleus and mitochondria, also have membranes.

The scientists have identified two instruments that can help them collect data on different cells. They will use a light microscope and an electron microscope. Both instruments will help the scientists see cell details using magnification. Light microscopes use visible light and lenses to magnify images. Electron microscopes use a beam of small particles to help increase the magnification of the images.

The magnification strength of each instrument is shown in Figure 2. The figure also shows how the magnification range for both instruments compares to the human eye. Each magnification range includes the sizes of different objects that can be seen within that range.

Figure 2. Magnification Strength



Source: Pearson Education, Inc.

5. The scientists are planning an experiment using a light microscope to collect data.

   Which statement **best** describes how the scientists can identify nonliving samples?

   A. The scientists should look for samples that have objects that look bigger when viewed under the microscope.

   B. The scientists should look for samples that do not have a nucleus or cell membrane when viewed under the microscope.

   C. The scientists should look for samples that have carbon atoms when viewed under the microscope.

   D. The scientists should look for samples that do not have a regular pattern of shapes when viewed under the microscope.

6. Write **each** label in the boxes to describe the function of each organelle and to complete the model of a plant cell.

Each label will be used once.

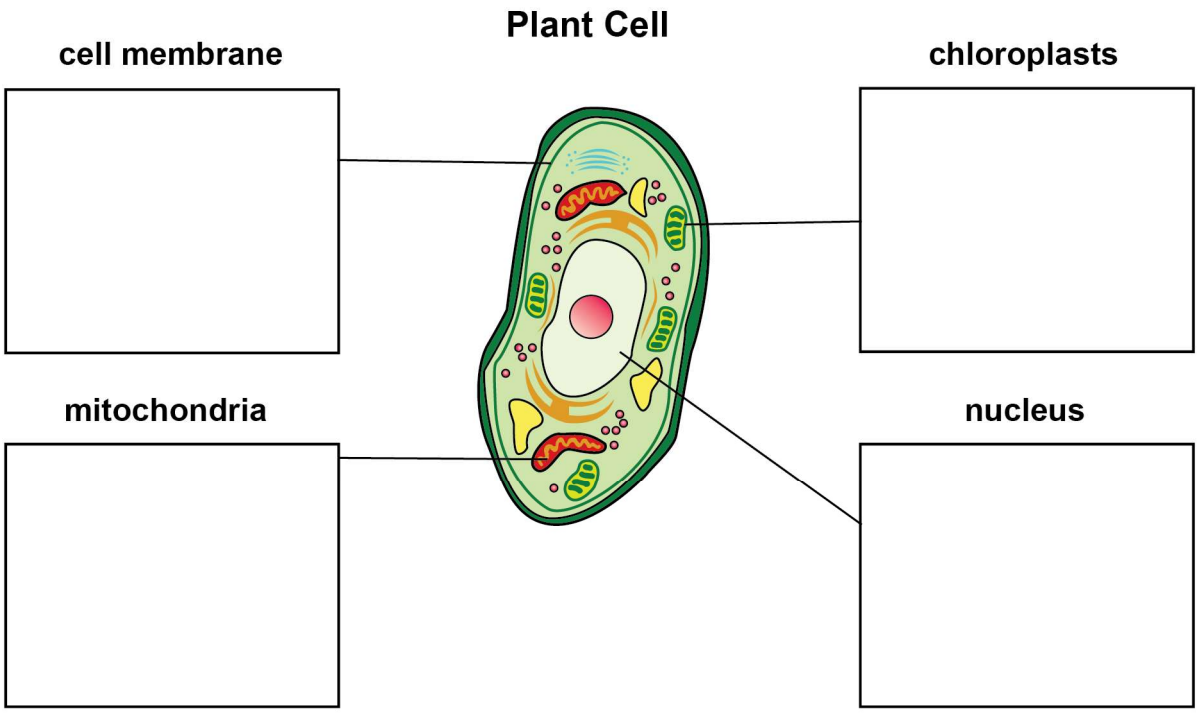
Labels:

controls many cell functions

produces energy for the cell

controls what substances enter and leave cells and organelles

converts light energy to chemical energy



7. A scientist views different objects using a light microscope. Which features would the scientist **most likely** see for samples from multicellular organisms?

   Circle the **three** correct answers.

   A. large cell size

   B. small organelle features

   C. different types of cells

   D. smaller number of cells

   E. cells organized into tissues

8. The scientists are designing an experiment to study the small, hairlike organelles on the outsides of some cells found in humans. They want to compare the structures of these organelles to cells from other multicellular organisms, such as plants. These organelles can have features with sizes as small as 50 to 100 nanometers (nm).

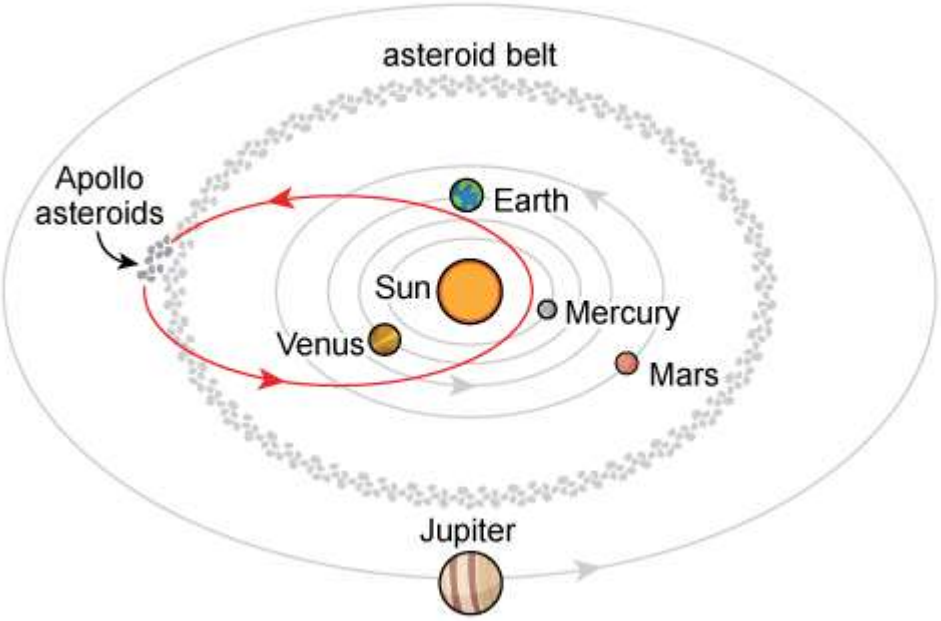
   Use Figure 2 to describe which type of microscope the scientists should use to study the features of the hairlike organelles. Explain **one** possible function for these organelles based on where the organelles are located in the cell model in Figure 1.

Use the information about asteroids in the solar system and your knowledge of science to answer the questions.

Asteroids in the Solar System

Asteroids are rocky objects that orbit the Sun. They can be as small as a meter across or as big as a few hundred kilometers across. Most asteroids have orbits in the asteroid belt, a region located between Mars and Jupiter. Some asteroids, called Apollo asteroids, have orbits that actually cross Earth's orbit. Figure 1 shows the orbits of some Apollo asteroids.

Figure 1. Apollo Asteroid Orbits



Scientists monitor Apollo asteroids to predict how close they will come to Earth. A collision of an Apollo asteroid with Earth is extremely unlikely. Nonetheless, the accuracy of these predictions is important because scientists need as much time as possible to plan for a potential asteroid collision. Predicting the exact path of an Apollo asteroid is difficult because nearby planets and other asteroids all have an effect on the asteroid.

Table 1 shows the masses of some of the largest objects in the solar system.

Table 1. Solar System Mass Data

Object	Mass ($\times 10^{24}$ kg)
Sun	1,988,500.00
Mercury	0.33
Venus	4.87
Earth	5.97
Mars	0.64
Jupiter	1,898.00

Source: NASA.

Scientists are also studying ways to change the path of an Apollo asteroid to avoid a collision with Earth. One method uses a spacecraft to gently push the asteroid. This can affect the orbital path of the asteroid. This spacecraft method must be used far in advance of a possible impact in order to be successful.

9. Which observation from Figure 1 can **best** be used as evidence to support the claim that the Sun has a gravitational pull on asteroids in the solar system?

   A. Most of the asteroids in the solar system are between Jupiter and the Sun.

   B. All of the planets and asteroids in the solar system orbit around the Sun.

   C. Apollo asteroids have orbits closer to the Sun than other asteroids in the solar system.

   D. Only the planets with the largest masses in the solar system orbit around the Sun.

10. Based on Figure 1, circle the correct bolded answer in **each** bracket to complete the sentence.

    As Apollo asteroids approach Earth, the **[rotation; atmosphere; mass; shape]** of Earth can affect the **[shape; orbit; mass; gravity]** of the asteroids.

11. **Part A**

Based on evidence in Figure 1 and Table 1, which planet has the **greatest** effect on the orbit of most asteroids?

A. Mercury

B. Earth

C. Mars

D. Jupiter

Part B

Which property of the planet identified in the answer to Part A has the **greatest** effect on an asteroid?

A. the shape of the planet's orbit

B. the planet's distance from the Sun

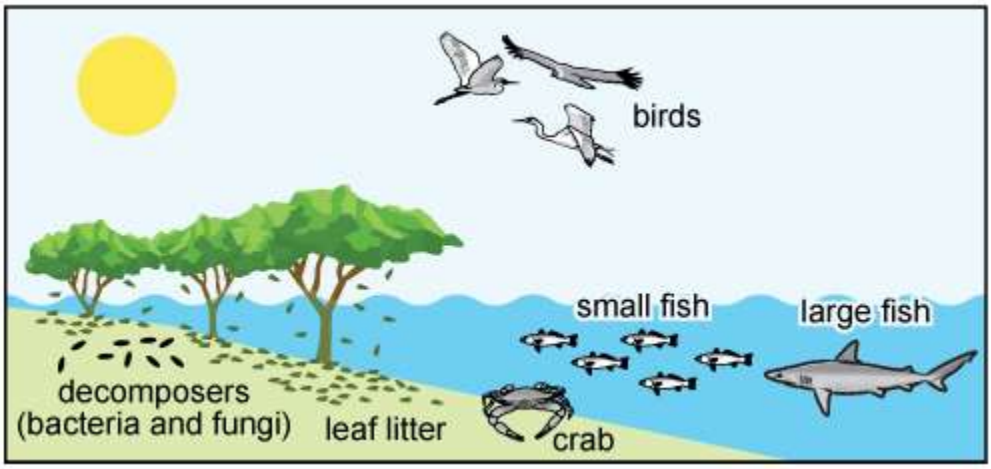
C. the mass of the planet

D. the size of the planet's orbit

12. Scientists must consider many factors when using a spacecraft to change the path of asteroids traveling close to Earth. Using Figure 1, describe how the force of gravity from Earth could affect nearby Apollo asteroids and explain how the effect of Earth's gravity could change the orbital motion of an Apollo asteroid.

13. **Use the information and your knowledge of science to answer the question.**

Mangroves are small trees and shrubs that often grow in coastal areas near the Equator. Mangrove trees can even survive in salt water, with roots and trunks that grow below the surface of the water. Mangrove forest ecosystems support a large number of different organisms, as shown in the model.



Based on the model, which changes would **most likely** increase the flow of energy through the mangrove forest ecosystem?

Circle the **two** correct answers.

A. an increase in the number of decomposers

B. a decrease in the amount of sunlight

C. an increase in the amount of leaf litter

D. an increase in the number of birds

E. a decrease in the number of mangrove trees

14. **Use the information and your knowledge of science to answer the question.**

A student is designing an experiment to test how different types of surfaces affect the size of the force needed to move an object. The student will use a spring scale to measure the size of the force needed to drag a brick across different flat surfaces.

Write the correct label in **each** box in the table to identify the independent variable, dependent variable, and control variable in the experiment.

Not all labels will be used.

Labels:

mass of brick

surface material

height of flat surface

size of the force needed to move brick

Independent Variable	
Dependent Variable	
Control Variable	

GO ON TO NEXT PAGE

15. **Use the information and your knowledge of science to answer the questions.**

Crude oil, also known as petroleum, is a liquid that is found within the earth. This liquid can be refined to form products such as gasoline, rubber, and different plastics. The oil is made up of different types of hydrocarbon molecules, which often contain repeating units of hydrogen and carbon atoms. The hydrocarbon molecules removed from crude oil can then be used to produce other large molecules.

Part A

Write the molecule pieces in the correct boxes to complete the partial model of the two molecules formed from hydrocarbon molecules.

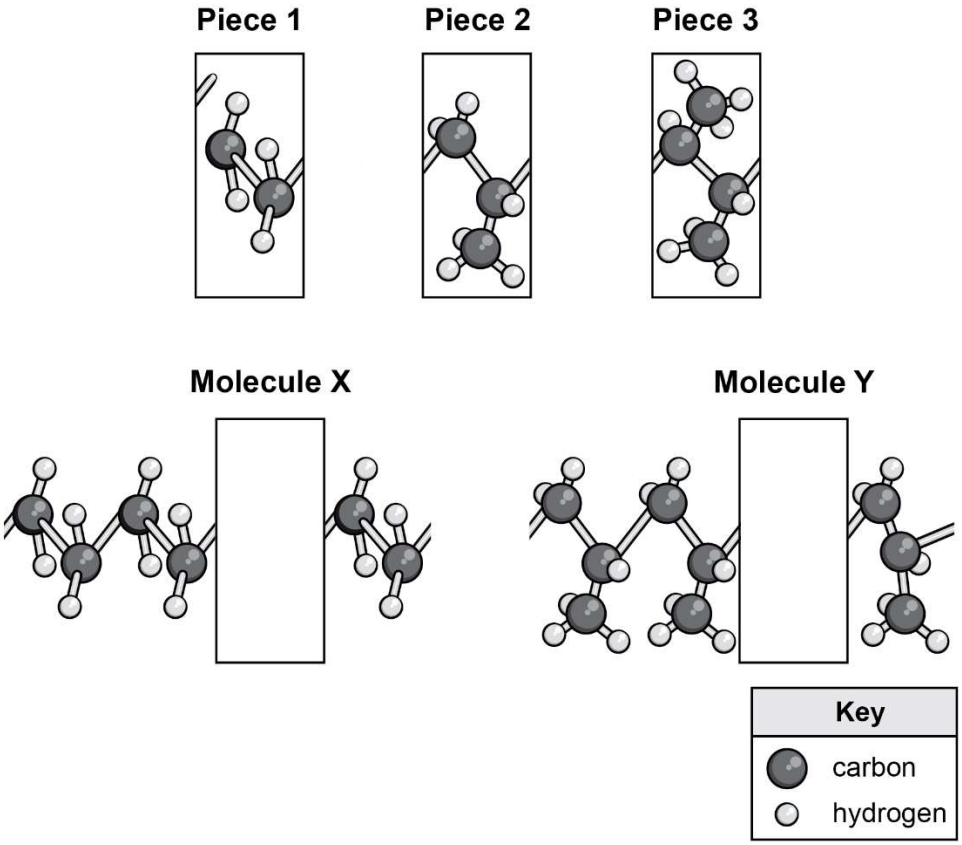
Each molecule piece may be used more than once. Not all molecule pieces will be used.

Molecule Pieces:

Piece 1

Piece 2

Piece 3



Part B

Which structural feature of the two molecules **best** explains the answer to Part A?

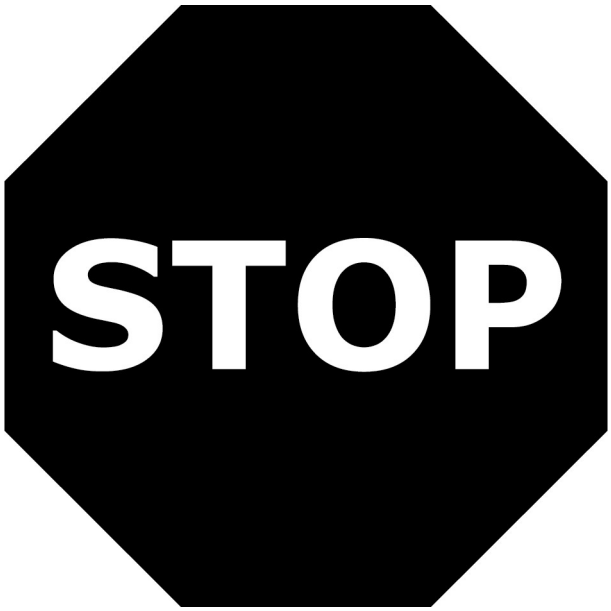
A. Both molecules should contain carbon and hydrogen atoms.

B. The arrangement of carbon and hydrogen atoms should repeat in a regular pattern.

C. The hydrogen atoms should be smaller than the carbon atoms.

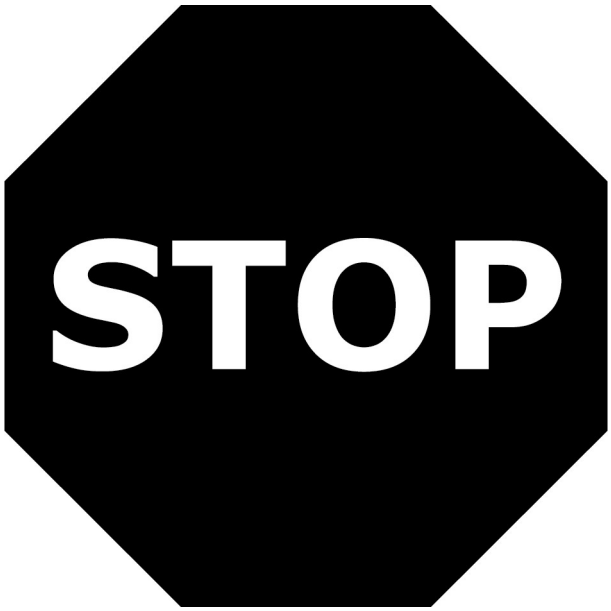
D. The number of hydrogen atoms should be greater than the number of carbon atoms.

STOP



You have come to the end of Session 1 of the test.

- **Review your answers from Session 1 only.**
- **Then, close your test booklet and sit quietly or read silently.**


STOP

NO TEST MATERIALS

Session 2

Directions:

Today, you will take Session 2 of the Grade 6 Science Practice Test.

Read each stimulus and question. Then, follow the directions to answer each question. Mark your answers by circling the correct choice. If you need to change an answer, be sure to erase your first answer completely. You may look back at the stimuli when needed.

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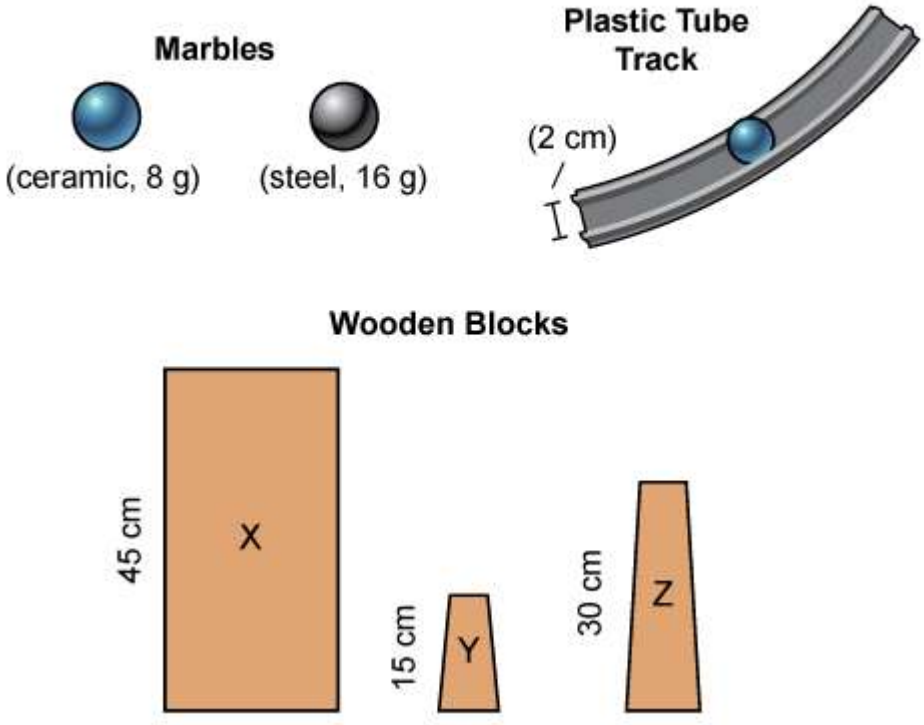
Use the information about marbles and your knowledge of science to answer the questions.

Marbles

A group of students is building a marble track. They plan to investigate how the potential and kinetic energies of different types of marbles change as the marbles move through the track. Figure 1 shows the two types of marbles and the different materials the students will use in the investigation.

Figure 1. Marbles and Track Materials



The two types of marbles are identical in size, but are made of different materials and have different masses. The students run several trials using each marble. The students begin each trial by placing a marble at the starting position and then observing the marble until it reaches the end position on the track.

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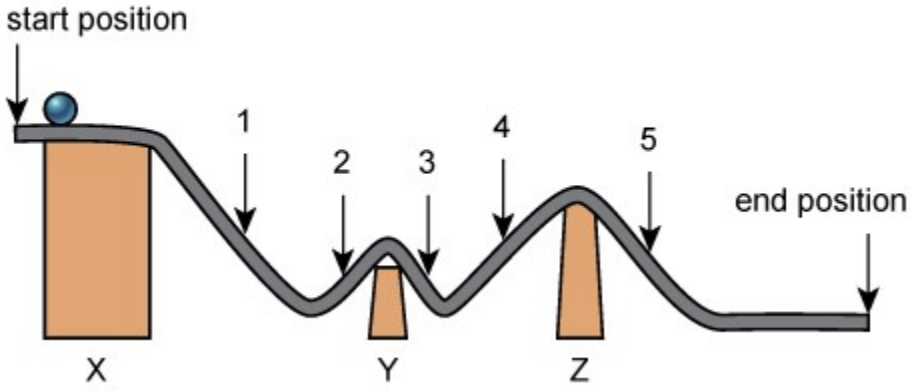
The marble track is shown in Figure 2.

Figure 2. Marble Track Design

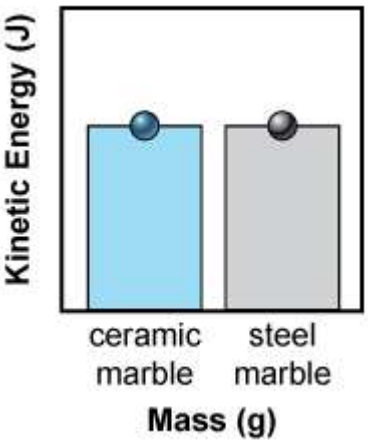


The students measure how each marble's potential and kinetic energies change at five different points as each marble moves along the track.

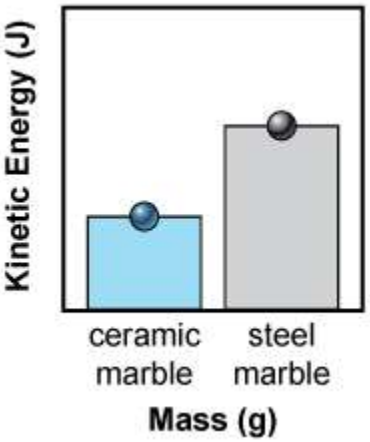
16. The students decide to investigate how the mass of each marble affects its kinetic energy. The students will roll each marble down the first hill on the track. They will then compare the results for the kinetic energy of both the ceramic marble and the steel marble.

Which figure **best** compares the kinetic energy of each marble when the marbles roll down the hill on the track?

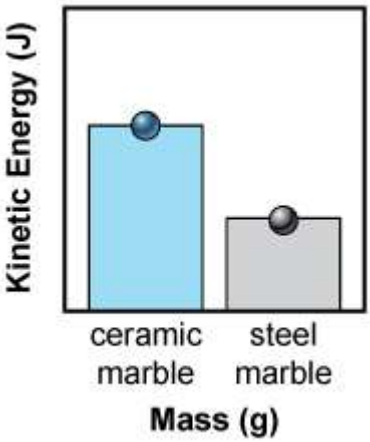
A.



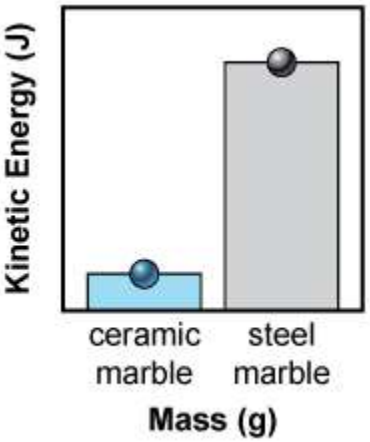
B.



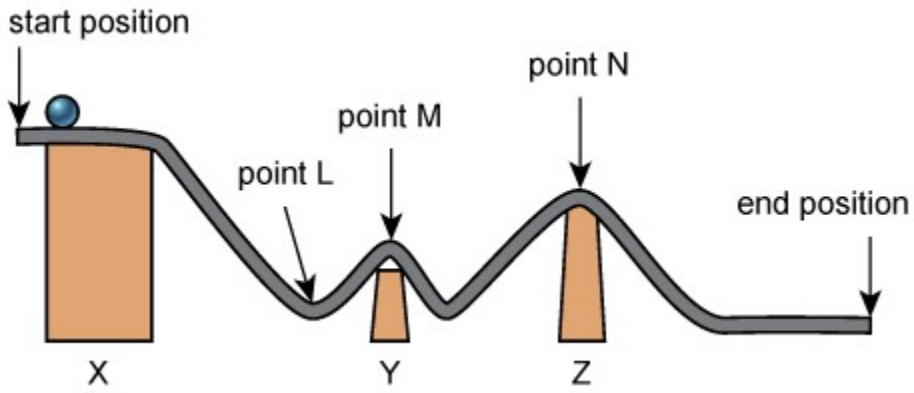
C.



D.



17. The students measure the speed of one of the marbles at the three points shown in the figure.

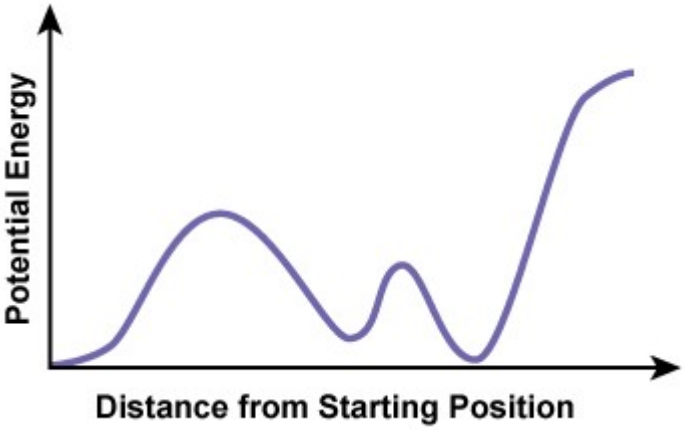


Circle the correct bolded answer in **each** bracket to complete the paragraph.

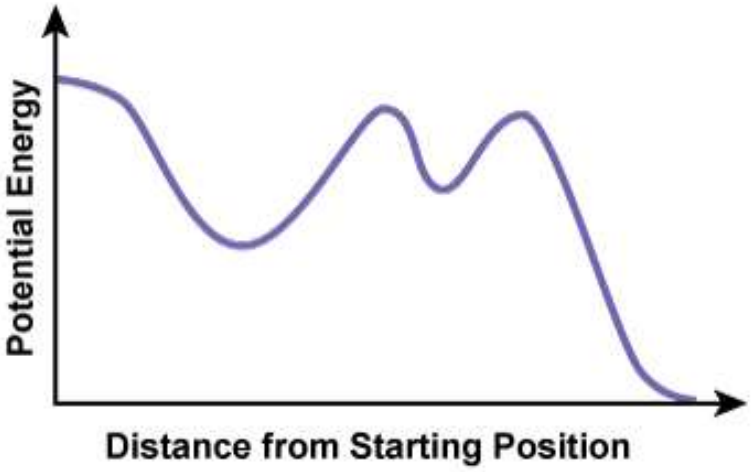
The speed of the marble at point L will be **[faster than; slower than; the same as]** the speed of the marble at point M. The speed of the marble at point N will be **[faster than; slower than; the same as]** the speed of the marble at point M. For the three points measured on the track, the marble will have the most kinetic energy at **[point L; point M; point N]** and the least kinetic energy at **[point L; point M; point N]**.

18. Which figure **best** shows how the potential energy of a marble changes as the marble travels along the track?

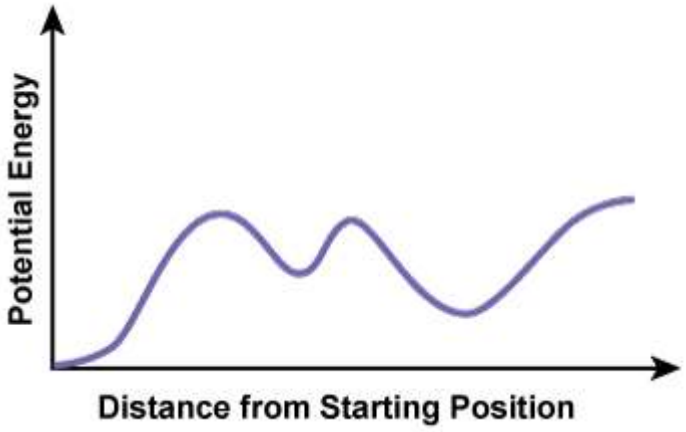
A.



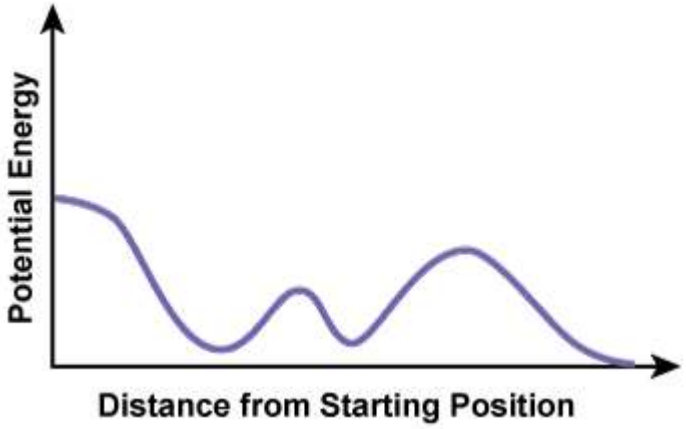
B.



C.


Potential Energy
Distance from Starting Position

D.


Potential Energy
Distance from Starting Position

19. **Part A**

Based on Figure 2, at which points along the marble track is the potential energy of the marble increasing?

Circle the **two** correct answers.

A. point 1

B. point 2

C. point 3

D. point 4

E. point 5

Part B

The students determine that the total energy of the marble decreases slightly as the marble travels along the track. Which statement describes the **most likely** cause of this decrease in total energy?

A. Some of the marble's energy is destroyed by the wooden blocks as the marble rolls along the track.

B. Some of the marble's energy is transferred to the surface of the track as the marble rolls along the track.

C. Some of the marble's energy is transferred to the wooden blocks as the marble rolls along the track.

D. Some of the marble's energy is destroyed by the surface of the track as the marble rolls along the track.

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20. The students want to see how changes to the design of the marble track will affect the energy of the marbles.

As you respond to Part A, Part B, and Part C, follow the directions below.

- Address all of the instructions in each prompt.
- Use evidence from the information provided and your own knowledge of science to support your responses.

Part A

One student wants to increase the potential energy of the marble at the starting position. Explain one way the students can adjust the track to increase the marble's potential energy. In your explanation,

- describe the dimensions of any materials used to adjust the track and
- explain why the adjustment to the track would increase the marble's potential energy.

20. (continued)

Part B

Another student wants to use another marble that will have a greater kinetic energy than either the ceramic marble or the steel marble at each point along the track. Explain how the mass and size of the third marble should compare to the masses and sizes of the ceramic and steel marbles. Explain the reasoning for your answer.

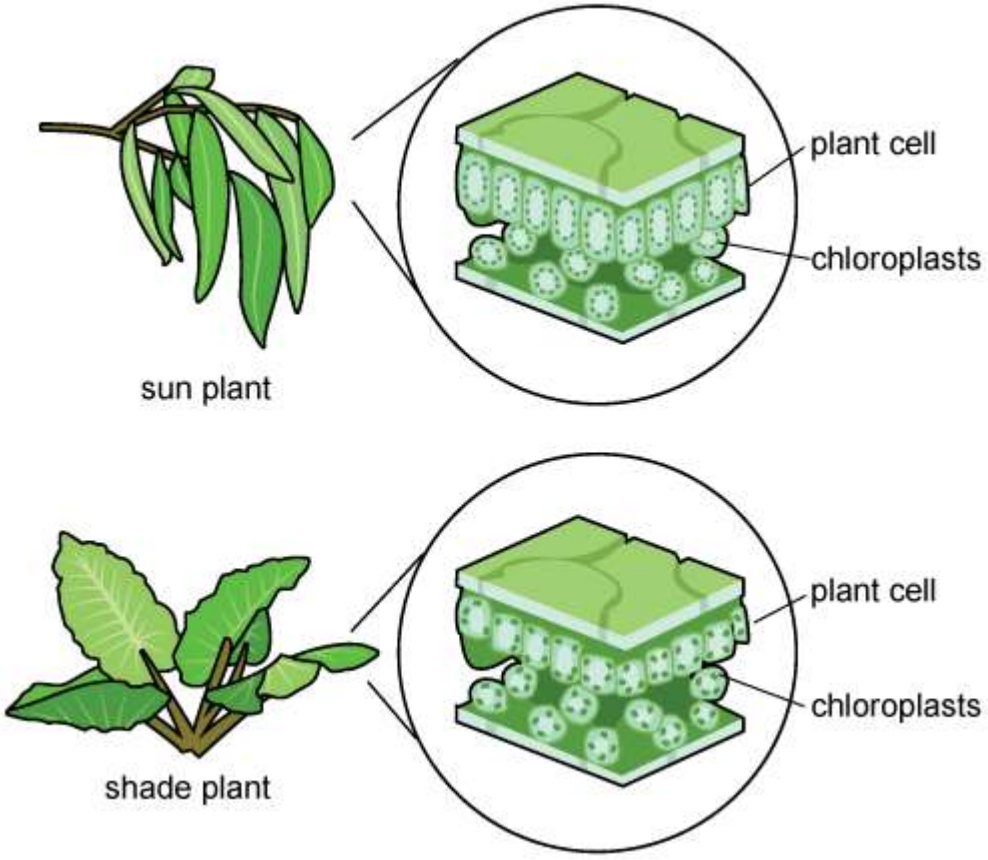
20. (continued)

Part C

One student wants to change the track so that the potential energy of the marble from point 1 to point 5 is constant. Explain how the student could change the track so that the potential energy of the marble is constant and explain why that change will keep the potential energy constant.

21. **Use the information and your knowledge of science to answer the question.**

A group of students is comparing cells from plants that grow better in sunlight to cells from plants that grow better in shade. The plant leaf cells for both types of plants are shown in the model.



Which plant feature shown in the model allows the shade plants to **better** convert sunlight during photosynthesis in shaded areas?

A. fewer leaves

B. vertical leaf position

C. larger chloroplasts

D. smaller plant cells

22. **Use the information and your knowledge of science to answer the questions.**

The Red Bayou project in northwest Louisiana allows farmers to use river water diverted from the Red River when irrigating their crops.

Part A

Circle the correct bolded answer in **each** bracket to complete the sentences.

The amount of groundwater used for irrigation most likely **[increased; decreased; stayed the same]** as more diverted river water became available. The amount of surface water used for irrigation most likely **[increased; decreased; stayed the same]** as more diverted river water became available.

Part B

Which change would **most likely** occur after diverting river water for use in irrigation?

A. an increase in soil erosion in the river
B. an increase in flooding in the river
C. an increase in the amount of water needed to water crops
D. an increase in sediment, nutrients, and salts on crop soil

23. **Use the information and your knowledge of science to answer the questions.**

Part A
Observers from Earth see different phases of the Moon over time as the Moon orbits around Earth.

Write the phases of the Moon in the correct boxes to complete the model showing how the phases of the Moon look from Earth.

Not all phases of the Moon will be used.

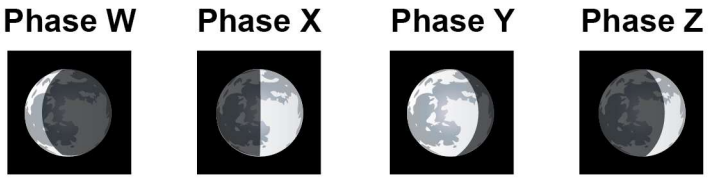
Phases:

Phase W

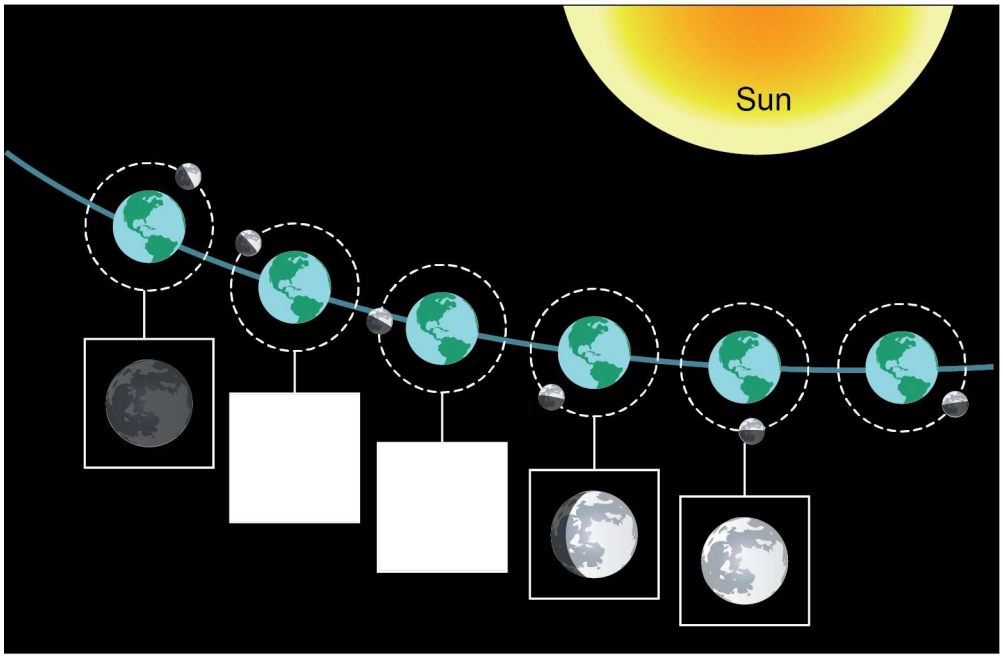
Phase X

Phase Y

Phase Z



Moon Phases as Seen from Earth



Note: Not to scale

Part B

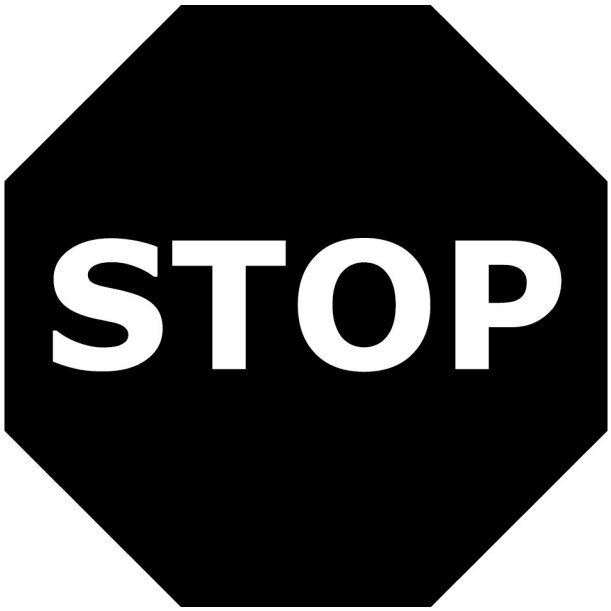
Based on the information in the Moon phase model, which statement **best** predicts how the phases of the Moon will look as the Moon continues its orbit around Earth in the model?

A. The Moon will become brighter with no dark areas as the Moon moves closer to the Sun.

B. The Moon will again appear completely dark and the dark area will decrease in size until the Moon is completely bright.

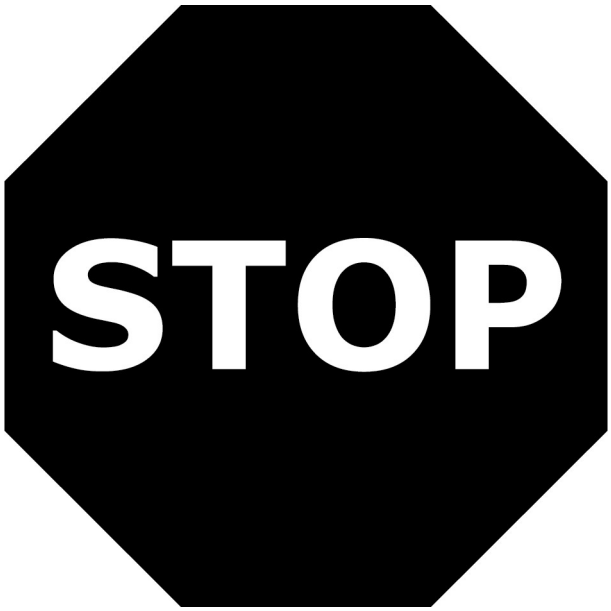
C. A dark area will start to appear on the right side of the Moon and will slowly increase in size until the Moon is completely dark.

D. A dark area will start to appear on the left side of the Moon and will slowly increase in size until the Moon is completely dark.



You have come to the end of Session 2 of the test.

- **Review your answers from Session 2 only.**
- **Then, close your test booklet and sit quietly or read silently.**


STOP

NO TEST MATERIALS

Session 3

Directions:

Today, you will take Session 3 of the Grade 6 Science Practice Test.

Read each stimulus and question. Then, follow the directions to answer each question. Mark your answers by circling the correct choice. If you need to change an answer, be sure to erase your first answer completely. You may look back at the stimuli when needed.

Some of the questions may ask you to write a response. Write your response in the space provided in your test booklet. Only responses written within the provided space will be scored.

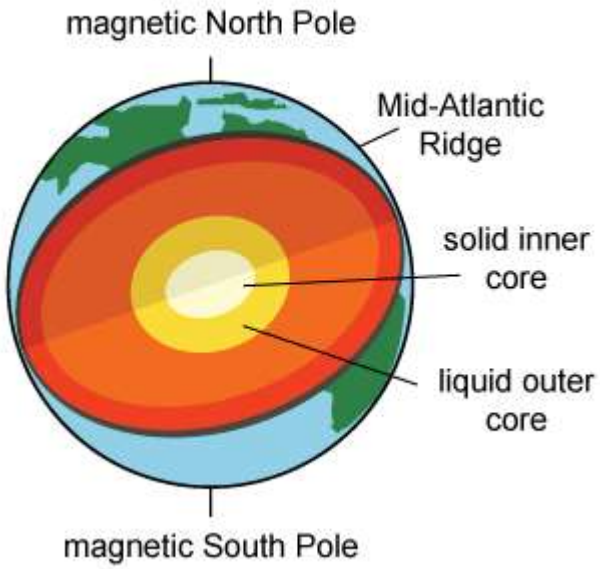
If you do not know the answer to a question, you may go on to the next question. If you finish early, you may review your answers and any questions you did not answer in this session **ONLY**. Do not go past the stop sign.

Use the information about changes in Earth's magnetic field and your knowledge of science to answer the questions.

Changes in Earth's Magnetic Field

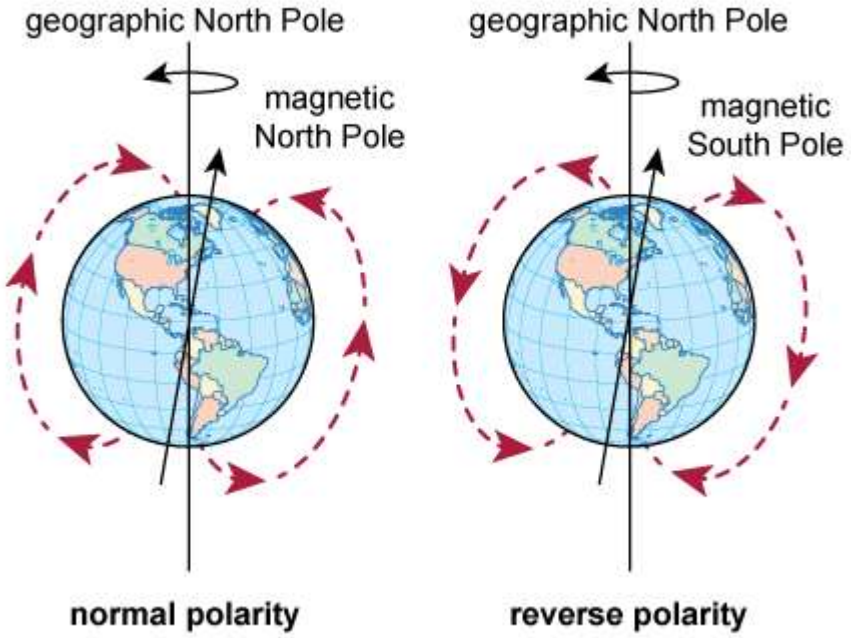
Earth has a magnetic field that extends from the North and South Poles of the planet and out into space. Many scientists suggest that Earth's magnetic field size, strength, and direction are related to the liquid iron outer core. Figure 1 shows a model of Earth's core.

Figure 1. Earth's Core



Scientists discovered that the locations of Earth's North and South Poles can switch every so often. About every few hundred thousand years, Earth's magnetic poles reverse. This is a result of Earth's magnetic field changing direction, as shown by the dotted magnetic field lines in Figure 2.

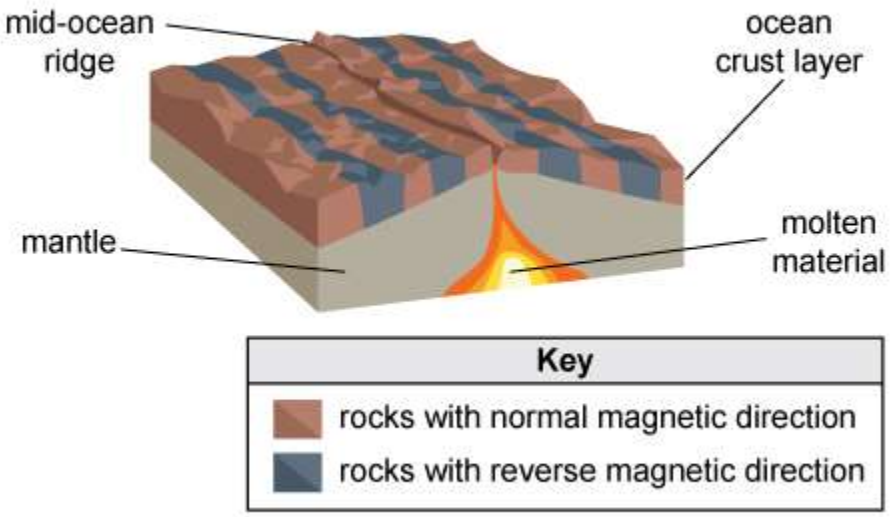
Figure 2. Pole Reversal of Earth's Magnetic Field



Source: Houghton Mifflin Company.

Evidence of the reversal of Earth's magnetic field is found in the rocks along the ocean floor. The ocean floor moves away slowly from the ridge on either side. As lava from the ridge erupts, tiny fragments in the lava align with the direction of Earth's magnetic field before the lava cools to become solid rock. Some of these fragments have a normal magnetic direction, while other fragments have a reverse magnetic direction. Figure 3 shows the location of rocks with a normal magnetic direction or a reverse magnetic direction.

Figure 3. Magnetic Direction of Ocean Floor Rocks



Source: United States Geological Survey.

24. Use Figure 1 and Figure 2 to answer the question.

Scientists suggest that the movement of Earth's liquid iron core results in electrical currents. These currents would then result in Earth's magnetic field.

Recent satellite data suggest that the strength of Earth's magnetic field has weakened by about 3.5 percent in some areas. In other areas, Earth's magnetic field strength has increased by about 2 percent.

Which statement **best** explains the differences in Earth's magnetic field strength based on the movement of Earth's liquid iron core?

A. The movement of Earth's liquid iron core stopped in both locations.
B. The movement of Earth's liquid iron core changes direction in some locations.
C. The movement of Earth's liquid iron core is the same in all locations.
D. The movement of Earth's liquid iron core increased in speed in both locations.

25. Based on Figure 2 and Figure 3, circle the correct bolded answer in **each** bracket to complete the paragraph.

A magnetic compass needle is able to detect the direction of Earth's magnetic North Pole. Over hundreds of thousands of years, the direction in which a compass needle points would **[stay the same; change]**. During a normal polarity period, a compass needle points mostly in the direction of the **[geographic North Pole; Equator; geographic South Pole]**. After a magnetic pole reversal, a compass needle points mostly in the direction of the **[geographic North Pole; Equator; geographic South Pole]**.

26. Scientists will study how Earth's magnetic field changes as distance from Earth changes. Satellites will be placed at different distances from Earth and will be used to measure the strength of Earth's magnetic field.

    Write the correct label in **each** box in the table to identify the dependent and independent variables in the investigation.

    Not all labels will be used.

    Labels:

    magnetic field strength

    distance from Earth

    size of satellite

    mass of satellite

    gravitational force of Earth

Variable	Property
dependent variable	
independent variable	

27. Scientists are planning an investigation to collect evidence to help predict future magnetic pole reversals of Earth's magnetic field. Using the information in Figure 3, describe how scientists can collect data on changes in Earth's magnetic poles and explain how this data can be used to predict future magnetic pole reversals.

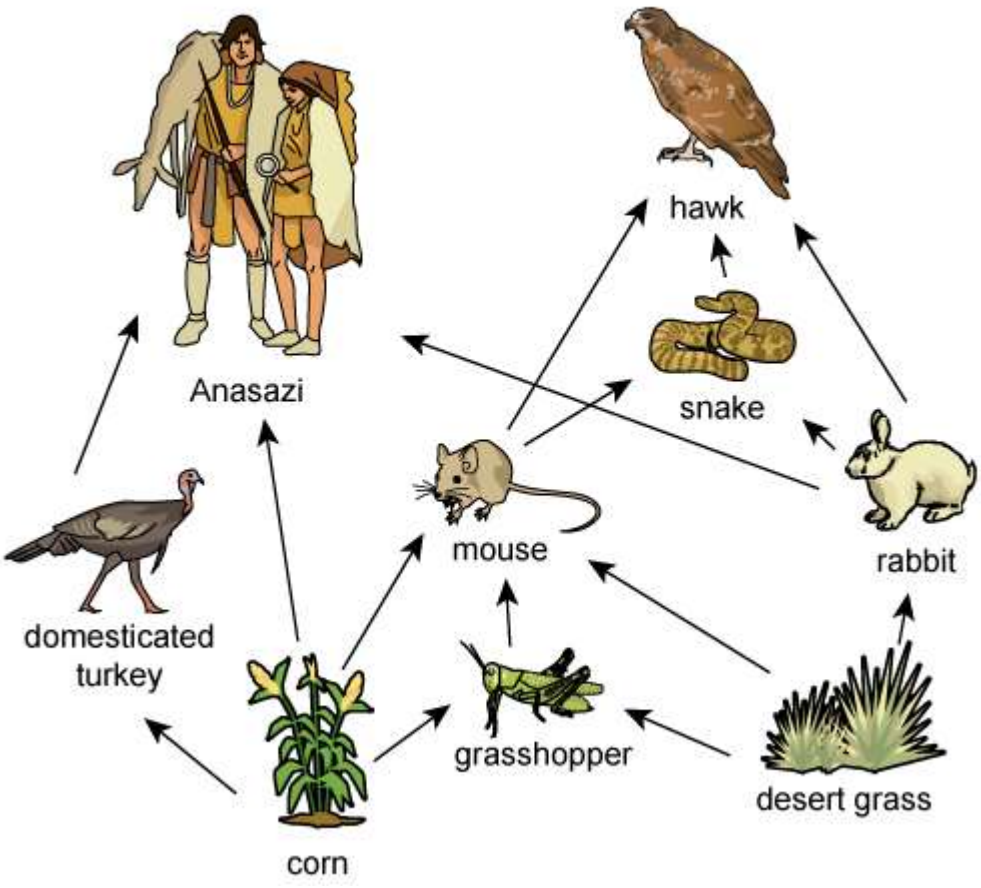
Use the information about the Anasazi and the Great Drought and your knowledge of science to answer the questions.

The Anasazi and the Great Drought

The Anasazi were a Native American people who settled areas that are now known as Arizona, New Mexico, Colorado, and Utah. Evidence suggests that the Anasazi suddenly moved from their settlements in about A.D. 1300. Scientists have recently looked at what may have caused the Anasazi to move and relocate much farther south in Arizona and New Mexico.

The Anasazi set up complex farming communities in the years A.D. 100 through 1300. They built irrigation structures such as reservoirs, stone dams, and low stone walls. These structures helped the Anasazi store and use water for their crops. The Anasazi primarily raised corn, beans, and domesticated turkeys. Figure 1 shows a typical food web for the ecosystem in which the Anasazi people lived.

Figure 1. Food Web of Anasazi Ecosystem



A period known as the Great Drought occurred from A.D. 1276 through 1299. Scientists suggest that this drought may explain why the Anasazi suddenly left their communities. Scientists have collected evidence of the drought by studying tree rings. Trees produce growth rings during annual growing seasons. The widths of the annual rings depend on the available precipitation and average temperatures. Table 1 shows evidence collected from tree ring studies. These studies show how the West was affected by droughts from A.D. 850 through 1400. In years with normal precipitation levels, 38 percent of the West was affected by droughts. Drier years occurred when more than 38 percent of the West was affected by droughts.

Table 1. Percentage of the West Affected by Droughts over Time

Years (A.D.)	Percentage of the West Affected by Droughts
850–1050	more than 38%
1050–1100	less than 38%
1100–1300	more than 38%
1300–1350	less than 38%
1350–1400	more than 38%

Source: E. R. Cook et al., Earth-Science Reviews.

GO ON ▶

28. Scientists claim that tree growth slowed during the period from A.D. 1100 to 1300, resulting in thinner tree rings.

    Based on the information in Table 1, which statement can **best** be used as evidence to support the claim?

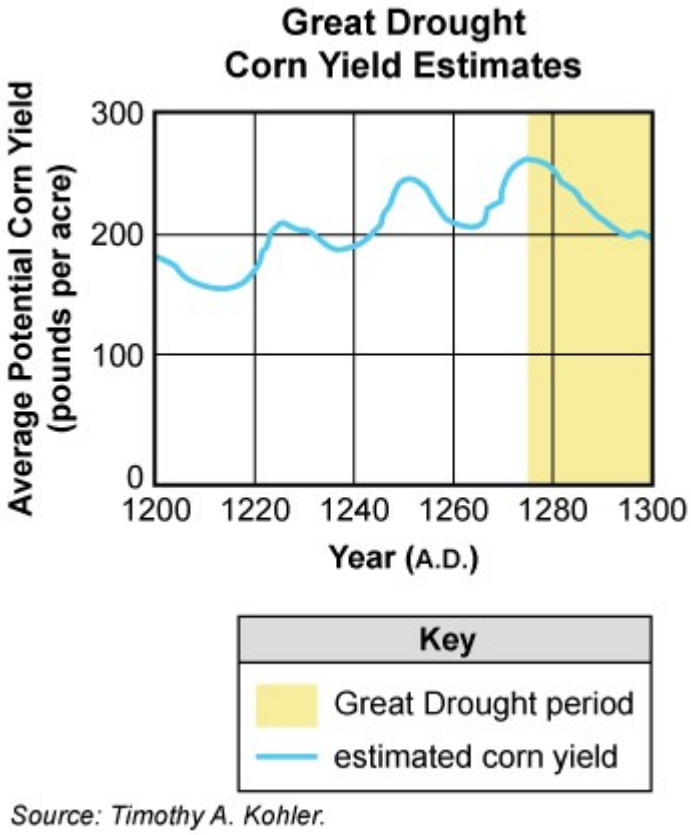
    A. More than 40 percent of the West is typically affected during dry periods.

    B. The average precipitation in the West significantly increased during this period.

    C. A large percentage of the West was affected by dry conditions during this period.

    D. The average precipitation in the West increased after A.D. 1300.

29. Scientists have estimated how much corn could be grown in areas where the Anasazi lived, based on typical growing conditions. The graph shows the estimated amount of corn produced in each year between A.D. 1200 and 1300.



Source: Timothy A. Kohler.

What evidence from the graph **best** shows how the availability of corn likely affected the farming of domesticated turkeys in Figure 1?

A. An increase in corn production during the Great Drought increased the domestic turkey population.

B. An increase in corn production during the Great Drought decreased the domestic turkey population.

C. A decrease in corn production during the Great Drought decreased the domestic turkey population.

D. A decrease in corn production during the Great Drought increased the domestic turkey population.

Session 3

30. Circle the correct bolded answer in **each** bracket to complete each sentence.

During the Great Drought, a decrease in the **[growth of corn; rabbit population; growth of grass]** had the greatest impact on the survival of the Anasazi people. As conditions changed, the Anasazi relied **[more; less]** on domesticated turkeys and **[snakes; mice; rabbits]** for food.

31. **Part A**

Which statement **best** describes how the organisms shown in Figure 1 compete for resources?

A. Rabbits, grasshoppers, and mice all compete with snakes for food.

B. The Anasazi, mice, and domesticated turkeys all compete for corn.

C. Hawks, rabbits, and the Anasazi all compete for grass.

D. Snakes, hawks, and domesticated turkeys all compete with the Anasazi for food.

Part B

Based on the information in Table 1, which statements **best** describe the competition in the answer to Part A during dry and wet periods?

Circle **all** that apply.

A. Competition for corn increased during drier periods.

B. Competition for grass increased during wetter periods.

C. Competition between domesticated turkeys and grasshoppers stayed the same during wetter and drier periods.

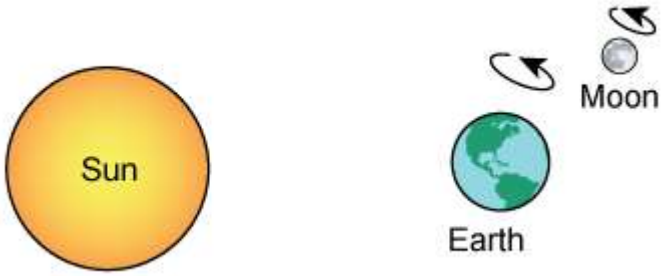
D. Competition for resources between rabbits and mice decreased during wetter periods.

E. Competition for resources stayed the same during wetter and drier periods.

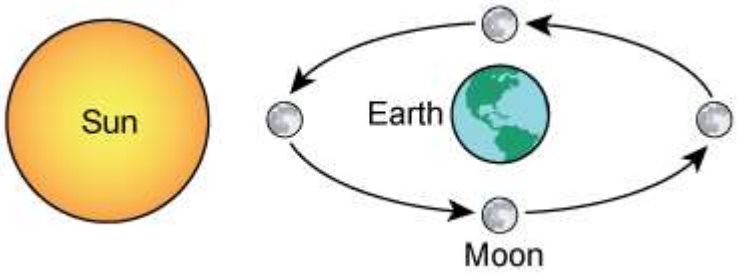
32. **Use your knowledge of science to answer the question.**

Which model of the Sun, Earth, and Moon **best** supports why Earth has different seasons?

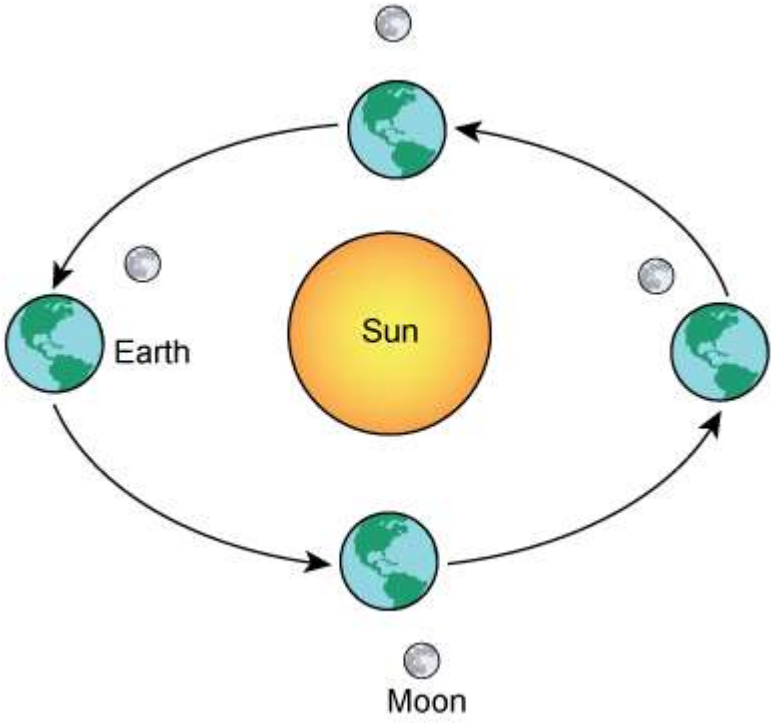
A.



B.



C.



D.

33. **Use the information and your knowledge of science to answer the question.**

A student is investigating how natural rock formations known as balancing rocks occur. These rock formations often have one large rock that appears to be barely balanced on top of other rocks, as shown in the figure. Despite looking like separate rocks, the large rock and the rocks beneath it are firmly connected.

Which statement about the forces acting on the balancing rock **best** explains the stability of the rock over time?

A. No forces are acting on the rock.

B. The sum of the forces acting on the rock is zero.

C. The force of gravity is not acting on the rock.

D. The force of gravity is the only force acting on the rock.

34. **Use the information and your knowledge of science to answer the question.**

Students from a science class are taking a field trip to a local river. They plan on collecting these specimens from the riverbank and the river:

- leaf
- soil
- water
- insect
- rock

The teacher asks the students how they can determine which specimens are living and which are nonliving. Which statements from the students will **best** help the class identify the living and nonliving specimens?

Circle the **two** correct answers.

A. All of the specimens are living because they are all part of the same ecosystem.

B. A microscope can be used to show how only living specimens contain cells.

C. Only the living specimens can be seen using a microscope.

D. Nonliving specimens will not show signs of growth over time.

E. Nonliving specimens will only have one type of cell and living specimens will have many types of cells.

35. **Use the information and your knowledge of science to answer the question.**

The model shows a hammer and a nail in two positions. The first position shows the hammer in a resting position above the nail. The second position shows when the hammer makes contact with the nail.

Write the labels in the correct boxes in the model to **best** describe each position of the hammer and the nail.

Not all labels will be used.

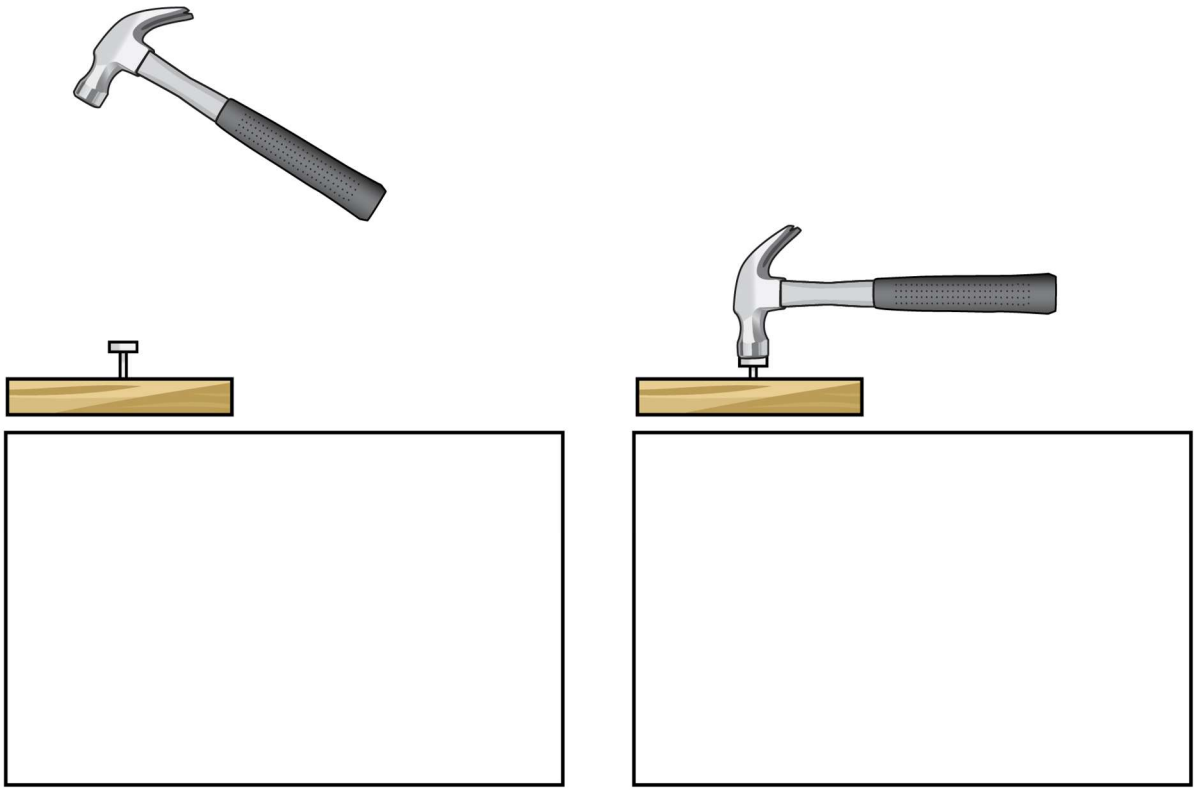
Labels:

maximum potential energy

increasing kinetic energy

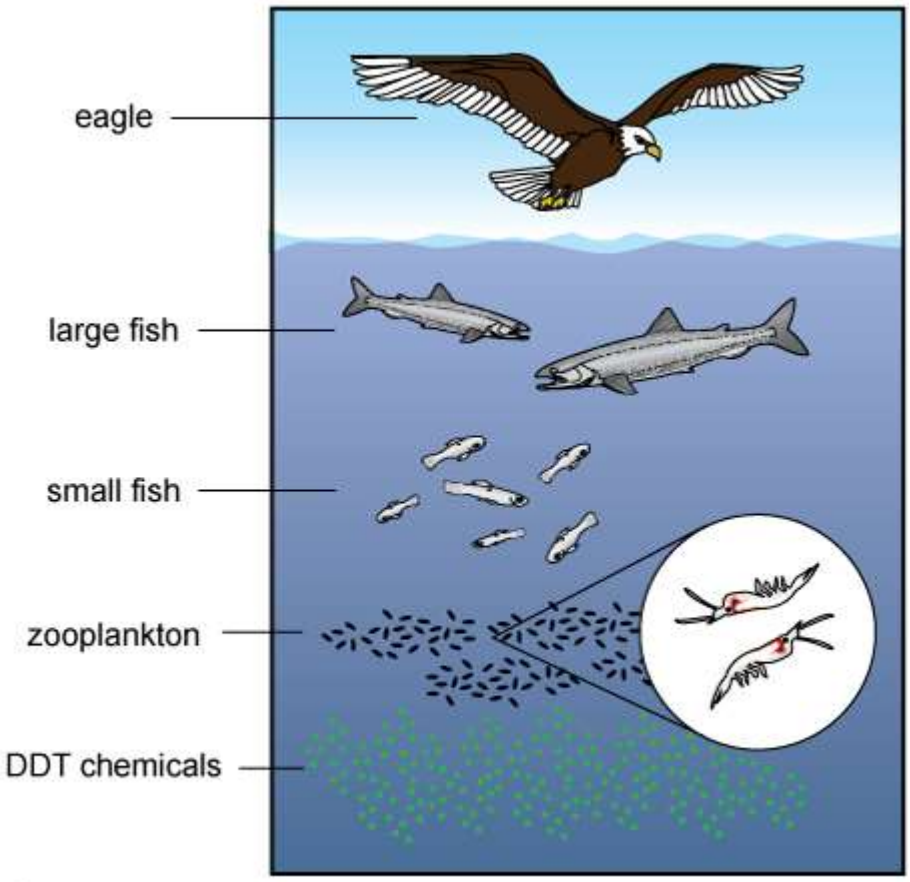
energy transfer

no energy



36. **Use the information and your knowledge of science to answer the question.**

In the 1940s, the chemical DDT was used as a pesticide to control mosquito populations in different areas of the world. The use of this chemical contributed to a decrease in eagle populations due to weak egg shells that broke or eggs that did not hatch. An example of an ecosystem that includes eagles is shown in the model.



Source: Pearson Education, Inc.

Based on information in the model, which statement **best** explains how DDT was introduced into eagle populations?

A. The eagles absorbed the DDT directly from the air.

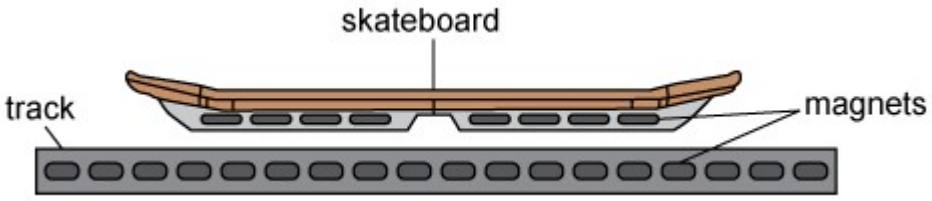
B. The eagles absorbed the DDT directly from the water.

C. The eagles absorbed the DDT after eating large fish.

D. The eagles absorbed the DDT after eating zooplankton.

37. **Use the information and your knowledge of science to answer the question.**

Engineers have recently designed skateboards that use magnets to float along a track, as shown in the figure.

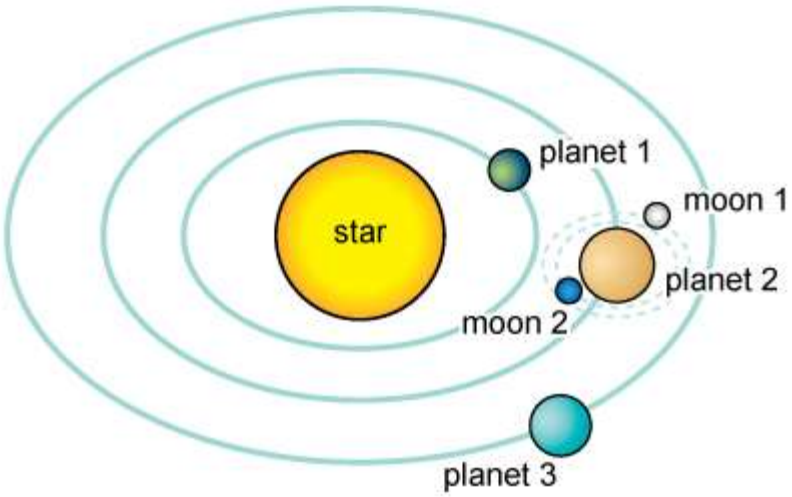


Circle the correct bolded answer in **each** bracket to complete the paragraph about the design of these skateboards.

The engineers observed that the skateboard floats above the track because the magnets on the skateboard **[attract; repel; make contact with]** the magnets on the track. When a rider steps onto the skateboard, the force between the skateboard and the track **[increases; decreases; stays the same]**. If the magnets are removed from the skateboard, the height of the skateboard should **[increase; decrease; stay the same]**.

38. **Use the information and your knowledge of science to answer the question.**

A scientist is designing a model for a system of planets outside the solar system. The model includes a star, three planets, and two moons, as shown in the figure.



Which property of the objects in the model has a **larger** effect on the motion of moon 1?

A. the orbital paths of planet 1 and planet 3

B. the rotational speed of moon 2

C. the force of gravity from planet 2

D. the force of gravity from planet 3

Session 3

39. **Use the information and your knowledge of science to answer the question.**

The properties of five different objects in the solar system are shown in the table.

Object	Orbital Period (Earth years)	Distance from Sun (Earth = 1)	Surface Gravity (Earth = 1)
object 1	0.2	0.39	0.38
object 2	0.6	0.72	0.90
object 3	11.9	5.20	2.53
object 4	29.5	9.58	1.06
object 5	164.4	30.05	1.13

Source: NASA.

Which claim about the mass of the different objects is **best** supported by the data in the table?

A. Object 1 has the greatest mass because it is closest to the Sun.

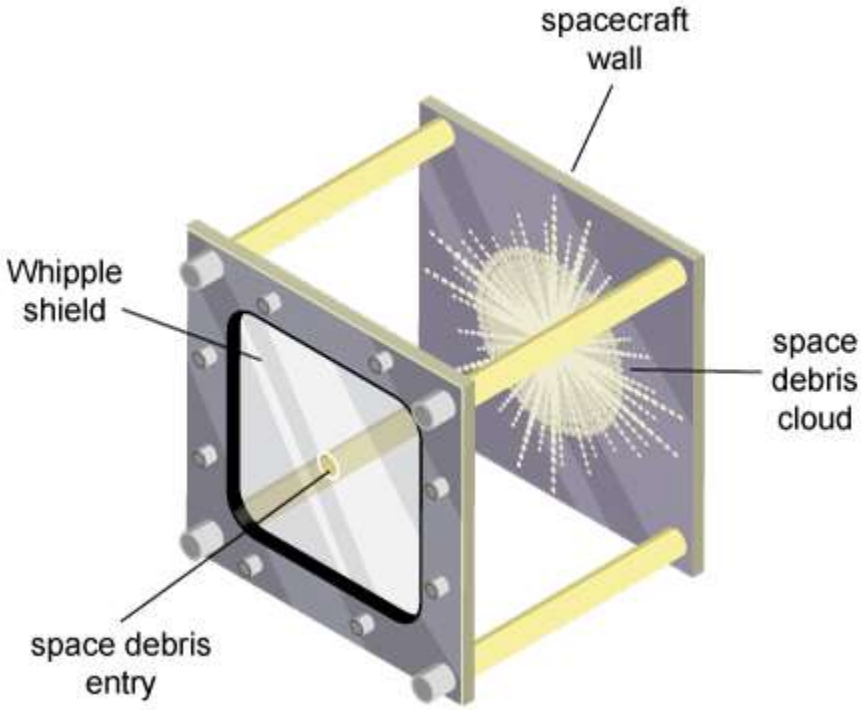
B. Object 2 has the greatest mass because its orbital period and distance from the Sun are most similar.

C. Object 3 has the greatest mass because it has the largest surface gravity.

D. Object 5 has the greatest mass because it has the longest orbital period.

40. **Use the information and your knowledge of science to answer the question.**

Whipple shields are used to protect spacecraft from collisions with smaller pieces of space debris, as shown in the image. The shield uses a layer of aluminum to break up pieces of incoming space debris into much smaller pieces before they collide with the spacecraft.



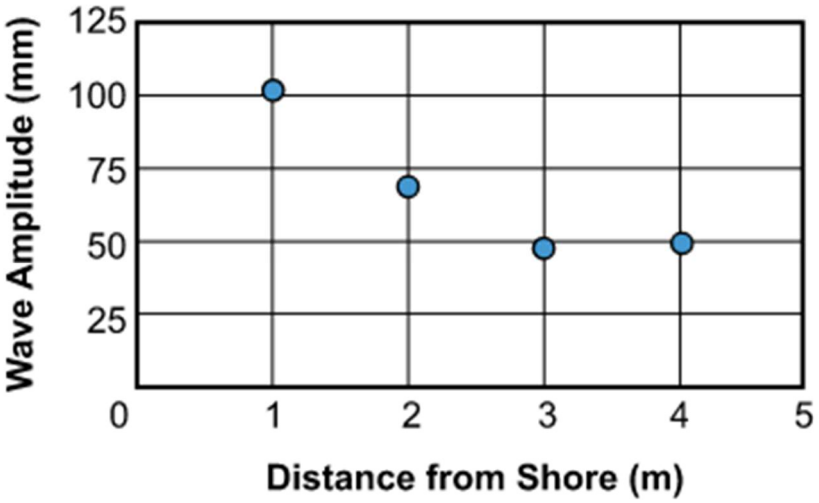
Circle the correct bolded answer in **each** bracket to complete the paragraph.

During a collision between a smaller space debris piece and the spacecraft wall, the force of the space debris piece is **[less than; greater than; equal to]** the force of the spacecraft wall. The force of the space debris piece is directed **[up; down; toward the wall; away from the wall]**. The force of the spacecraft wall is directed **[up; down; toward the piece; away from the piece]**. Engineers can further reduce the force of incoming space debris on the spacecraft by slightly **[increasing; decreasing]** the thickness of the aluminum layer.

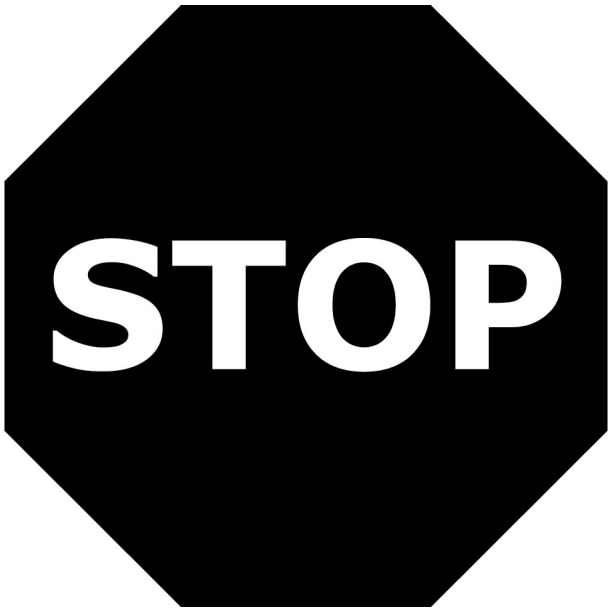
41. **Use the information and your knowledge of science to answer the question.**

An observer standing on the shore of a lake noticed that boats traveling through the water produce waves of different sizes. The observer collected data on how the amplitude of waves from a boat changes as the waves move closer to the shore. The data from these observations are shown in the graph.

Circle the data point that shows when the waves from the boat have the **most** energy.



Source: New Zealand Hydrological Society.



You have come to the end of Session 3 of the test.

- **Review your answers from Session 3 only.**
- **Then, close your test booklet and sit quietly or read silently.**

STATE BOARD OF ELEMENTARY AND SECONDARY EDUCATION
TEST SECURITY POLICY[1]

The State Board of Elementary and Secondary Education approved a Test Security Policy on December 10, 1998. This has been periodically revised.

The Board of Elementary and Secondary Education holds the test security policy to be of utmost importance and deems any violation of test security to be serious.

The State Superintendent of Education may disallow test results that may have been achieved in a manner that is in violation of test security.

In cases in which test results are not accepted because of a breach of test security or action by the Louisiana Department of Education, any programmatic, evaluative, or graduation criteria dependent upon the data shall be deemed not to have been met.

Any teachers or other school personnel who breach test security or allow breaches in test security shall be disciplined in accordance with the provisions of R.S. 17:416 et seq., R.S. 17:441 et seq., R.S. 17:81.6 et seq., policy and regulations adopted by the Board of Elementary and Secondary Education, and any and all laws that may be enacted by the Louisiana Legislature.

1 Excerpts from *Bulletin 118*

This project is made possible through a grant awarded by the State Board of Elementary and Secondary Education from the Louisiana Quality Education Support Fund—8(g).

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DEPARTMENT of EDUCATION

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Grade 6 Science Practice Test Answer Key

This document contains the answer keys, rubrics, and Scoring Notes for items on the Grade 6 Science Practice Test. Additional Practice Test resources are available in the LDOE Practice Test Library.

Session	Set	Sequence	Item Type	Key	Point Value	Alignment
1	Properties of Light and Sound Waves	1	MC	C	1	PE: 6-MS-PS4-2 SEP: 2. Developing and using models DCI: MS.PS4A.b
1		2	TEI	See Rubric	2	PE: 6-MS-PS4-2 SEP: 2. Developing and using models DCI: MS.PS4B.a
1		3	MC	D	1	PE: 6-MS-PS4-1 SEP: 5. Using mathematics and computational thinking DCI: MS.PS4A.a CCC: Patterns
1		4	TPD: MC/ MC	A/C	2	PE: 6-MS-PS4-1 SEP: 5. Using mathematics and computational thinking DCI: MS.PS4A.a CCC: Patterns
1	Organelles	5	MC	B	1	PE: 6-MS-LS1-1 SEP: 3. Planning and carrying out investigations DCI: MS.LS1A.a CCC: Scale, Proportion and Quantity
1		6	TEI	See Rubric	2	PE: 6-MS-LS1-2 SEP: 2. Developing and using models DCI: MS.LS1A.b CCC: Structure and Function
1		7	MS	A, C, E	1	PE: 6-MS-LS1-1 SEP: 3. Planning and carrying out investigations DCI: MS.LS1A.a CCC: Scale, Proportion and Quantity
1		8	CR	See Rubric	2	PE: 6-MS-LS1-2 SEP: 2. Developing and using models DCI: MS.LS1A.b CCC: Structure and Function
1	Asteroids in the Solar System	9	MC	B	1	PE: 6-MS-ESS1-2 SEP: 2. Developing and using models DCI: MS.ESS1B.a CCC: Systems and System Models
1		10	TEI	See Rubric	1	PE: 6-MS-ESS1-3 DCI: MS.ESS1B.a CCC: Scale, Proportion and Quantity
1		11	TPD: MC/ MC	D/C	2	PE: 6-MS-ESS1-3 SEP: 4. Analyzing and interpreting data DCI: MS.ESS1B.a CCC: Scale, Proportion and Quantity

Session	Set	Sequence	Item Type	Key	Point Value	Alignment
1	Asteroids in the Solar System	12	CR	See Rubric	2	PE: 6-MS-ESS1-2 SEP: 2. Developing and using models DCI: MS.ESS1B.a CCC: Systems and System Models
1	Standalone Items	13	MS	A, C	1	PE: 6-MS-LS2-3 SEP: 2. Developing and using models DCI: MS.LS2B.a CCC: Energy and Matter
1		14	TEI	See Rubric	2	PE: 6-MS-PS2-2 SEP: 3. Planning and carrying out investigations DCI: MS.PS2A.b
1		15	TPD: TE/ MC	See Rubric	2	PE: 6-MS-PS1-1 SEP: 2. Developing and using models DCI: MS.PS1.A.a
2	Marbles	16	MC	B	1	PE: 6-MS-PS3-1 SEP: 4. Analyzing and interpreting data DCI: MS.PS3A.a CCC: Scale, Proportion and Quantity
2		17	TEI	See Rubric	2	PE: 6-MS-PS3-1 DCI: MS.PS3A.a CCC: Scale, Proportion and Quantity
2		18	MC	D	1	PE: 6-MS-PS3-2 SEP: 2. Developing and using models DCI: MS.PS3A.b CCC: Systems and System Models
2		19	TPI: MS/ MC	B, D/ B	2	PE: 6-MS-PS3-2 SEP: 2. Developing and using models DCI: MS.PS3C.a CCC: Systems and System Models
2		20	ER	See Rubric	9	PE: 6-MS-PS3-2 SEP: 2. Developing and using models DCI: MS.PS3A.b CCC: Systems and System Models
2	Standalone Items	21	MC	C	1	PE: 6-MS-LS1-2 SEP: 2. Developing and using models DCI: MS.LS1A.b CCC: Structure and Function
2		22	TPI: TE/ MC	See Rubric	2	PE: 6-MS-ESS3-4 SEP: 7. Engaging in argument from evidence DCI: MS.ESS3C.b
2		23	TPI: TE/ MC	See Rubric	2	PE: 6-MS-ESS1-1 SEP: 2. Developing and using models DCI: MS.ESS1A.a CCC: Patterns
3	Changes in Earth's Magnetic Field	24	MC	B	1	PE: 6-MS-PS2-3 DCI: MS.PS2B.a CCC: Cause and Effect

Session	Set	Sequence	Item Type	Key	Point Value	Alignment
3	Changes in Earth's Magnetic Field	25	TEI	See Rubric	2	PE: 6-MS-PS2-3 DCI: MS.PS2B.a CCC: Cause and Effect
3		26	TEI	See Rubric	1	PE: 6-MS-PS2-5 SEP: 3. Planning and carrying out investigations DCI: MS.PS2B.c
3		27	CR	See Rubric	2	PE: 6-MS-PS2-5 SEP: 3. Planning and carrying out investigations DCI: MS.PS2B.c CCC: Cause and Effect
3	Anasazi and the Great Drought	28	MC	C	1	PE: 6-MS-LS2-1 SEP: 4. Analyzing and interpreting data DCI: MS.LS2A.b CCC: Cause and Effect
3		29	MC	C	1	PE: 6-MS-LS2-1 SEP: 4. Analyzing and interpreting data DCI: MS.LS2A.c CCC: Cause and Effect
3		30	TEI	See Rubric	2	PE: 6-MS-LS2-2 SEP: 6. Constructing explanations (for science) and designing solutions (for engineering) DCI: MS.LS2A.d CCC: Patterns
3		31	TPD: MC/ MS	B/ A, D	2	PE: 6-MS-LS2-2 SEP: 6. Constructing explanations (for science) and designing solutions (for engineering) DCI: MS.LS2A.d CCC: Patterns
3	Standalone Items	32	MC	D	1	PE: 6-MS-ESS1-1 SEP: 2. Developing and using models DCI: MS.ESS1B.b
3		33	MC	B	1	PE: 6-MS-PS2-2 DCI: MS.PS2A.b CCC: Stability and Change
3		34	MS	B, D	1	PE: 6-MS-LS1-1 DCI: MS.LS1A.a CCC: Scale, Proportion and Quantity
3		35	TEI	See Rubric	1	PE: 6-MS-PS3-2 SEP: 2. Developing and using models DCI: MS.PS3A.b CCC: Systems and System Models
3		36	MC	C	1	PE: 6-MS-LS2-3 SEP: 2. Developing and using models DCI: MS.LS2B.a

Session	Set	Sequence	Item Type	Key	Point Value	Alignment
3	Standalone Items	37	TEI	See Rubric	2	PE: 6-MS-PS2-5 DCI: MS.PS2B.c CCC: Cause and Effect
3		38	MC	C	1	PE: 6-MS-ESS1-2 DCI: MS.ESS1A.b CCC: Systems and System Models
3		39	MC	C	1	PE: 6-MS-PS2-4 SEP: 7. Engaging in argument from evidence DCI: MS.PS2B.b
3		40	TEI	See Rubric	2	PE: 6-MS-PS2-1 SEP: 6. Constructing explanations (for science) and designing solutions (for engineering) DCI: MS.PS2A.a
3		41	TEI	See Rubric	1	PE: 6-MS-PS4-1 SEP: 5. Using mathematics and computational thinking DCI: MS.PS4A.a CCC: Patterns

Item Types and Scoring:

- Multiple-choice (MC) questions with four answer options and only one correct answer. All MC items are worth one point each.

  Multiple-select (MS) questions with five to seven answer options and more than one correct answer. For MS items, the question identifies the number of correct answers, unless it is part of a Two-part Dependent (TPD). In a TPD, the question in Part B will then be worded to "select all that apply." All MS items are worth one point each.

- Technology Enhanced Items (TEI): uses technology to capture student comprehension in authentic ways, previously difficult to score by machine for large-scale assessments. TE items are worth up to two points and may include item types such as, but not limited to, drag and drop, dropdown menus, and hot spots.

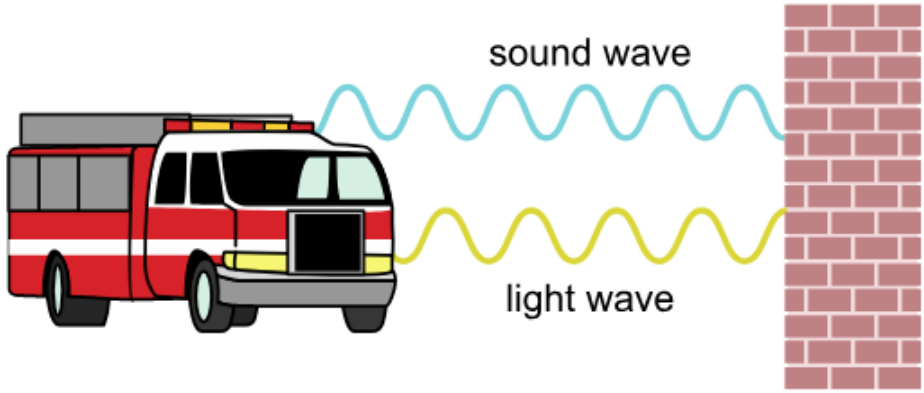
- Two-part Items: require students to answer two related questions, worth a total of two points. Two-part items may combine MC, MS, and/or TE item types.
  - Two-part Dependent (TPD): the first part must be correct in order to earn credit for the second part. TPDs are scored as follows:
    - If both parts are correct, score is 2.
    - If Part A is correct and Part B is incorrect or partially correct, score is 1.
    - If Part A is incorrect, score is 0 regardless of Part B.
  - Two-part Independent (TPI): each part is scored independently, with each part worth one point.

- Constructed Response (CR): requires a brief response provided by the student and will be scored using a 2-point rubric. These items may require a brief paragraph, a few sentences, and/or completion of a chart.

- Extended Response (ER): asks students to write an in-depth response that expresses the students' ability to apply all three dimensions of the LSS for Science and will be scored using a 9-point rubric.

Session 1 Item 2 (TEI) - Rubric

The diagram shows sound and light waves from an emergency vehicle traveling toward a brick wall. The brick wall has both smooth and rough surfaces.



Select the correct answer from **each** drop-down menu to complete the sentences about how each wave is affected by the brick wall.

The sound waves from the siren will [pass through and reflect off ▾] the smooth surface of the wall. The light waves from the emergency vehicle will [only reflect off ▾] the smooth surface of the wall. Rougher sections of the wall surface will cause the [sound and light waves ▾] from the emergency vehicle to scatter.

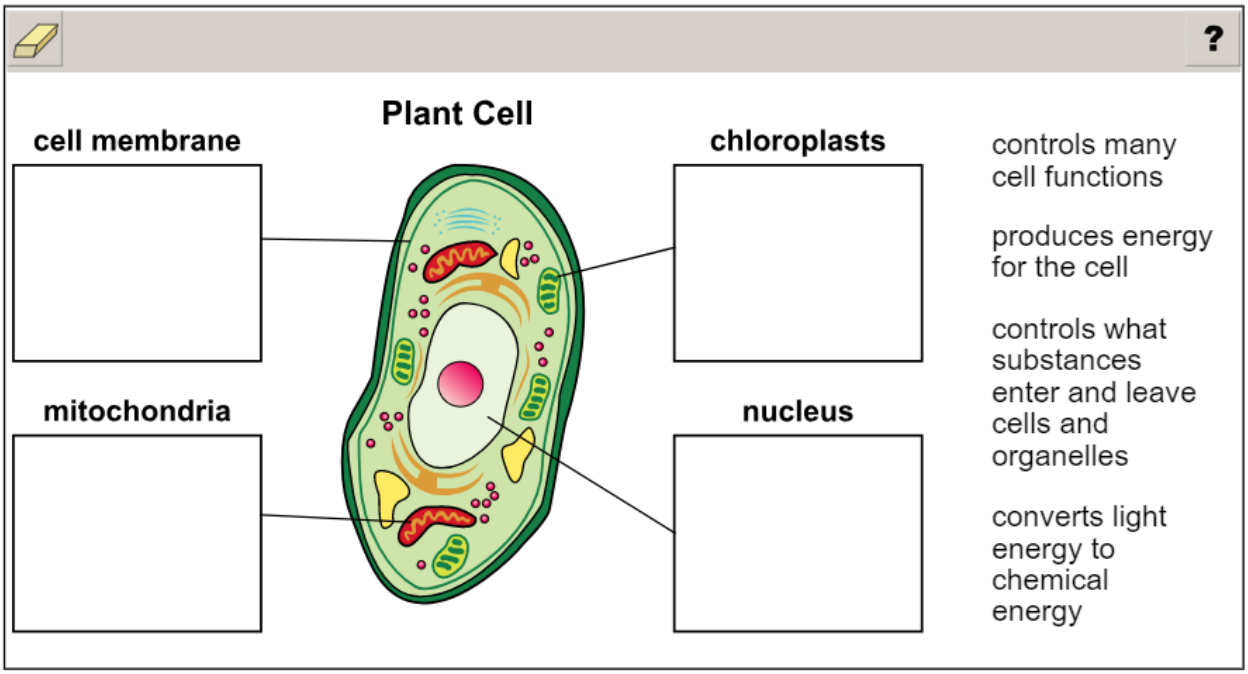
Scoring Notes:

This item is worth 2 points. Partial credit (1 point) will be awarded if half or more of the student responses are correct. For this item, the key contains 3 correct responses; therefore 1 point will be awarded if the student selects 2 correct responses.

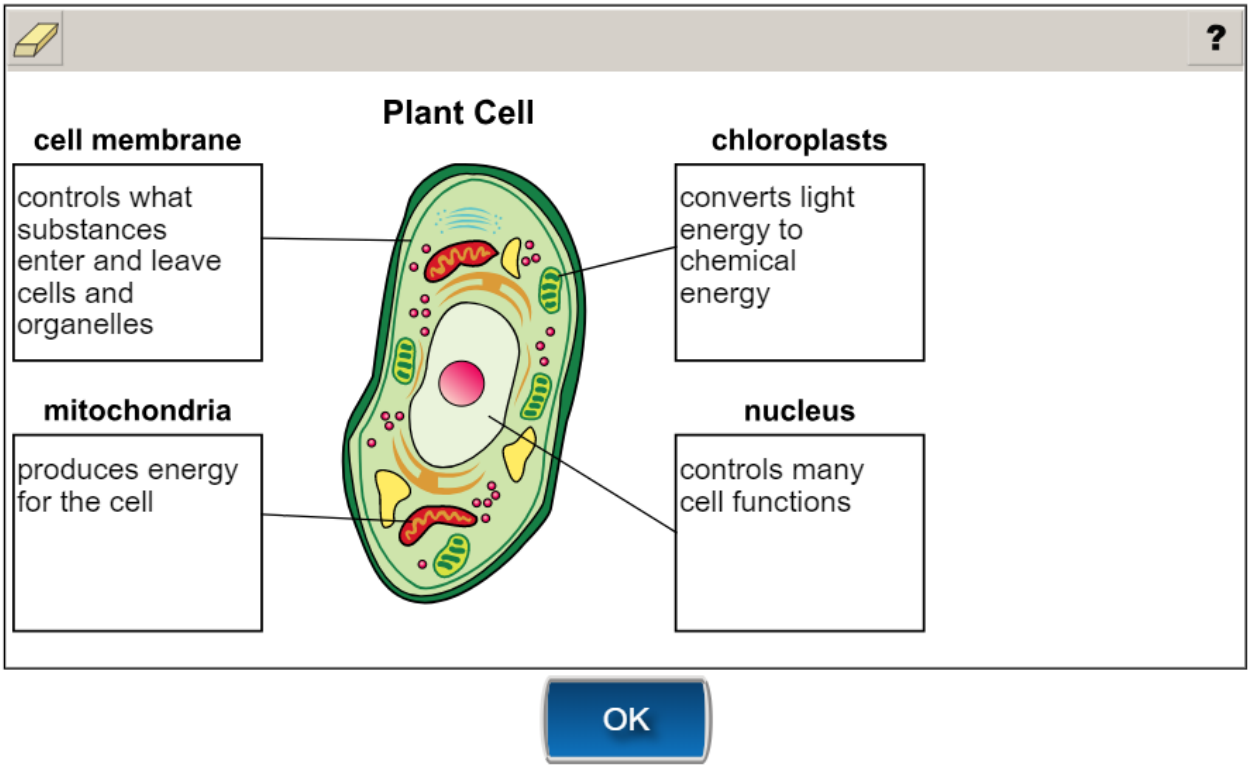
Session 1 Item 6 (TEI)

Drag **each** label describing the function of each organelle into the boxes to complete the model of a plant cell.

Each label will be used once.



Session 1 Item 6 (TEI) - Rubric



Scoring Notes:

This item is worth 2 points. Partial credit (1 point) will be awarded if half or more of the student responses are correct. For this item, the key contains 4 correct responses; therefore 1 point will be awarded if the student selects 2 or more correct responses.

Session 1 Item 8 (CR)

The scientists are designing an experiment to study the small, hairlike organelles on the outsides of some cells found in humans. They want to compare the structures of these organelles to cells from other multicellular organisms, such as plants. These organelles can have features with sizes as small as 50 to 100 nanometers (nm).

Use Figure 2 to describe which type of microscope the scientists should use to study the features of the hairlike organelles. Explain **one** possible function for these organelles based on where the organelles are located in the cell model in Figure 1.

Scoring Information	
Score	**Description**
2	Student's response correctly describes why the scientists should use an electron microscope AND explains at least one possible function for the hairlike organelles on the outside of some human cells.
1	Student's response correctly describes why the scientists should use an electron microscope OR explains at least one possible function for the hairlike organelles on the outside of some human cells.
0	Student's response does **not** correctly describe why the scientists should use an electron microscope or explain at least one possible function for the hairlike organelles on the outside of some human cells. **OR** Student's response is blank, irrelevant, or too brief to evaluate.

Scoring Notes:

- Description of why the features of the organelles being studied are too small to see with a light microscope based on the size range given (1 point)
- Explanation for at least one possible function for the hairlike organelles on the outside of some human or animal cells (1 point)

Examples include:

- An electron microscope should be used because the organelle details are too small for a light microscope, which cannot see details at 50-100 nm. The hairlike organelles could help the cell to move.
- An electron microscope should be used because the organelle features are smaller than the lower limit of a light microscope. The hairlike organelles could help protect the cell from harmful objects.

Accept other reasonable answers.

Session 1 Item 10 (TEI) - Rubric

Based on Figure 1, select the correct answer from **each** drop-down menu to complete the sentence.

As Apollo asteroids approach Earth, the [mass ▼] of Earth can affect the [orbit ▼] of the asteroids.

Session 1 Item 12 (CR)

Scientists must consider many factors when using a spacecraft to change the path of asteroids traveling close to Earth. Using Figure 1, describe how the force of gravity from Earth could affect nearby Apollo asteroids and explain how the effect of Earth's gravity could change the orbital motion of an Apollo asteroid.

Scoring Information	
Score	**Description**
2	Student's response correctly describes how the force of gravity from Earth could affect nearby Apollo asteroids AND correctly explains how the effect of Earth's gravity could change the orbital motion of an Apollo asteroid.
1	Student's response correctly describes how the force of gravity from Earth could affect nearby Apollo asteroids OR correctly explains how the effect of Earth's gravity could change the orbital motion of an Apollo asteroid.
0	Student's response does **not** correctly describe how the force of gravity from Earth could affect nearby Apollo asteroids or correctly explains how the effect of Earth's gravity could change the orbital motion of an Apollo asteroid. **OR** Student's response is blank, irrelevant, or too brief to evaluate.

Scoring Notes:

- Description of how the force of gravity from Earth affects nearby Apollo asteroids (1 point)
- Explanation of how the effect of Earth's gravity can change the orbital motion of nearby Apollo asteroids (1 point)

Examples include:

- Apollo asteroids traveling close to Earth could be pulled closer to Earth by Earth's gravitational force causing the asteroid to now orbit Earth.
- Figure 1 shows that the Apollo asteroids orbit the Sun. If an Apollo asteroid gets too close to Earth, Earth's gravitational force can pull the asteroid into Earth's orbit.

Accept other reasonable answers.

Session 1 Item 14 (TEI)

Use the information and your knowledge of science to answer the question.

A student is designing an experiment to test how different types of surfaces affect the size of the force needed to move an object. The student will use a spring scale to measure the size of the force needed to drag a brick across different flat surfaces.

Drag the correct label into **each** box in the table to identify the independent variable, dependent variable, and control variable in the experiment.

Not all labels will be used.

Independent Variable	
Dependent Variable	
Control Variable	

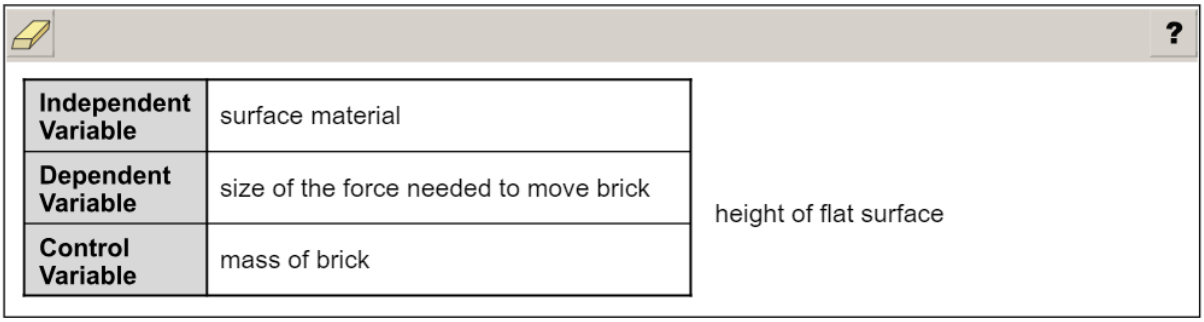
mass of brick

surface material

height of flat surface

size of the force needed to move brick

Session 1 Item 14 (TEI) - Rubric



Independent Variable	surface material
Dependent Variable	size of the force needed to move brick
Control Variable	mass of brick

height of flat surface

Scoring Notes:

This item is worth 2 points. Partial credit (1 point) will be awarded if half or more of the student responses are correct. For this item, the key contains 3 correct responses; therefore 1 point will be awarded if the student selects 2 correct responses.

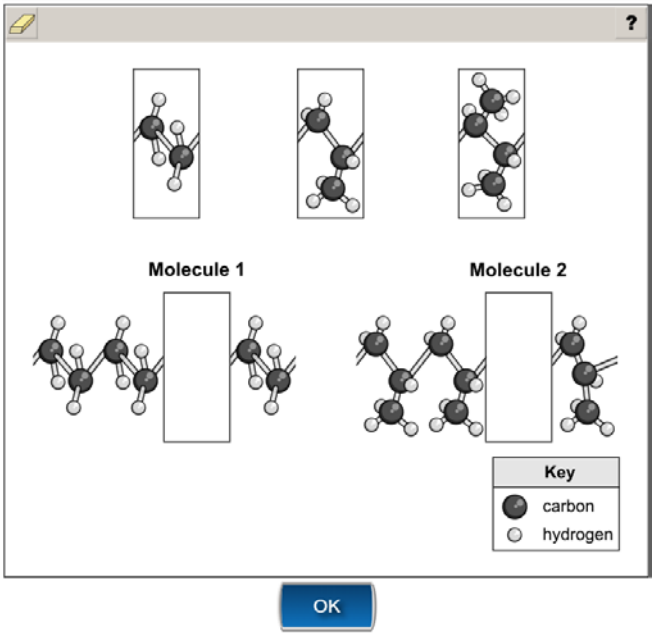
Session 1 Item 15 (TPD)

Use the information and your knowledge of science to answer the questions.
Crude oil, also known as petroleum, is a liquid that is found within the earth. This liquid can be refined to form products such as gasoline, rubber, and different plastics. The oil is made up of different types of hydrocarbon molecules, which often contain repeating units of hydrogen and carbon atoms. The hydrocarbon molecules removed from crude oil can then be used to produce other large molecules.

Part A

Drag the molecule pieces into the correct boxes that **best** complete the partial model of the two molecules formed from hydrocarbon molecules.

Each molecule piece may be used more than once. Not all molecule pieces will be used.



Part B

Which structural feature of the two molecules **best** explains the answer to Part A?

(a) Both molecules should contain carbon and hydrogen atoms.

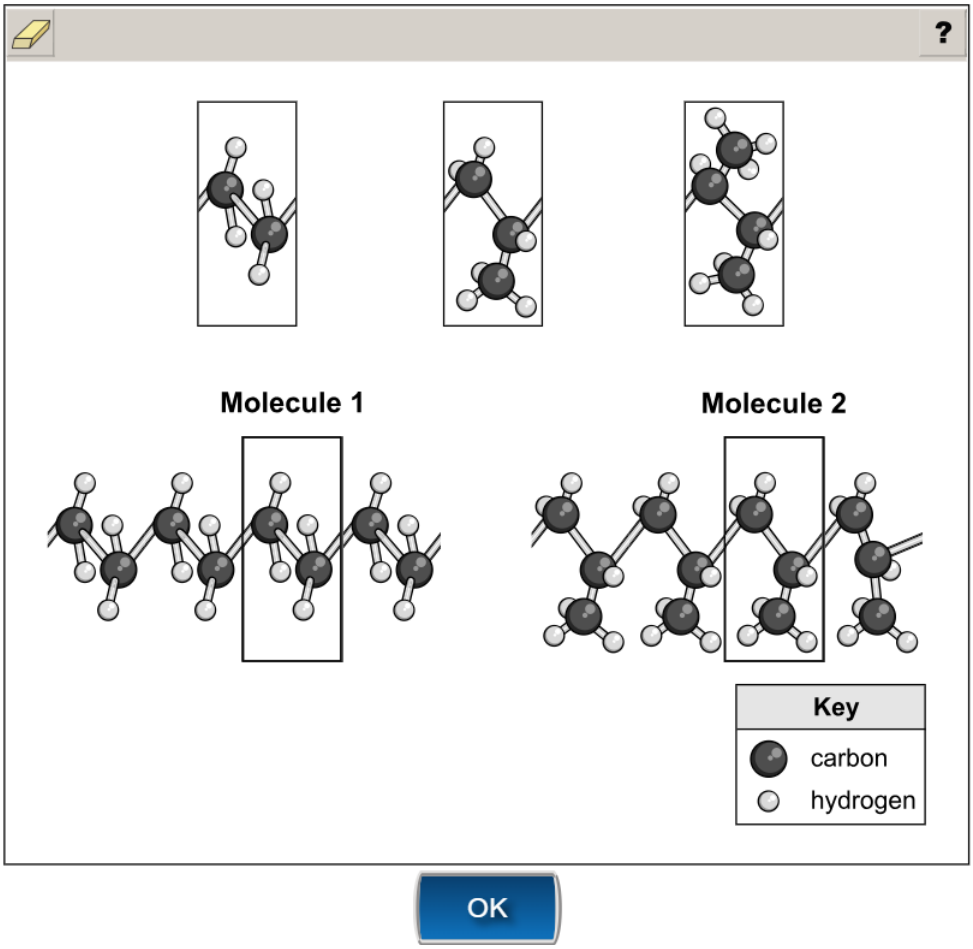
(b) The arrangement of carbon and hydrogen atoms should repeat in a regular pattern.

(c) The hydrogen atoms should be smaller than the carbon atoms.

(d) The number of hydrogen atoms should be greater than the number of carbon atoms.

Session 1 Item 15 (TPD) - Rubric

Part A



Note: In Accommodated form, Answer key will be "Piece 1 in Molecule X" and "Piece 2 in Molecule Y."

Part B

Which structural feature of the two molecules **best** explains the answer to Part A?

(a) Both molecules should contain carbon and hydrogen atoms.

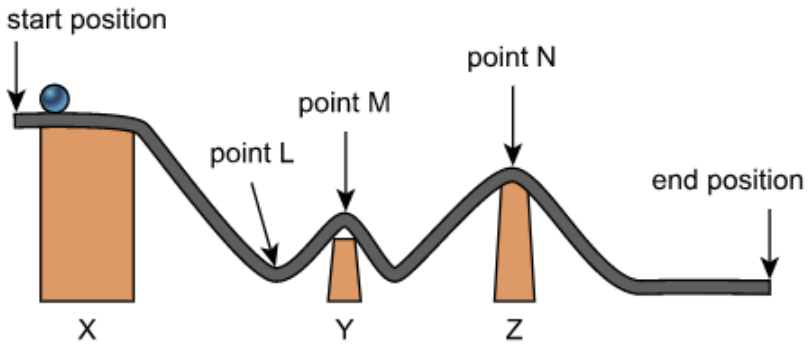
(b) The arrangement of carbon and hydrogen atoms should repeat in a regular pattern.

(c) The hydrogen atoms should be smaller than the carbon atoms.

(d) The number of hydrogen atoms should be greater than the number of carbon atoms.

Session 2 Item 17 (TEI) - Rubric

The students measure the speed of one of the marbles at the three points shown in the figure.



Select the correct answer from **each** drop-down menu to complete the paragraph.

The speed of the marble at point L will be
[faster than ▾] the speed of the marble at point M.
The speed of the marble at point N will be
[slower than ▾] the speed of the marble at point M.
For the three points measured on the track, the marble will have the most kinetic energy at [point L ▾] and the least kinetic energy at [point N ▾].

Scoring Notes:

This item is worth 2 points. Partial credit (1 point) will be awarded if half or more of the student responses are correct. For this item, the key contains 4 correct responses; therefore 1 point will be awarded if the student selects 2 or more correct responses.

Session 2 Item 20 (ER)

The students want to see how changes to the design of the marble track will affect the speed and energy of the marbles.

As you respond to Part A, Part B, and Part C, follow the directions below.

- Address all the instructions in each prompt.
- Use evidence from the information provided and your own knowledge of science to support your responses.

Part A
One student wants to increase the potential energy of the marble at the starting position. Explain one way the students can adjust the track to increase the marble's potential energy. In your explanation,

- describe the dimensions of any materials used to adjust the track and
- explain why the adjustment to the track would increase the marble's potential energy.

Part B
Another student wants to use another marble that will have a greater kinetic energy than either the ceramic marble or the steel marble at each point along the track. Explain how the mass and size of the third marble should compare to the masses and sizes of the ceramic and steel marbles. Explain the reasoning for your answer.

Part C
One student wants to change the track so that the potential energy of the marble from point 1 to point 5 is constant. Explain how the student could change the track so that that the potential energy of the marble is constant and explain why that change will keep the potential energy constant.

Score Points

- The student's score is the sum total of all the points earned across all parts (up to an item-maximum of 9 points) of the item.
- The student's score is 0 if the response is blank, incorrect, or does not address the prompt.

Session 2 Item 20 (ER), continued

PART A (0-3 points maximum)

- 1 point for describing change to track design
- 1 point for describing dimensions or relative size of materials used
- 1 point for explaining how change increases the potential energy at the starting position

PART B (0-3 points maximum)

- 1 point for explaining that the mass of the marble should be greater than the mass of the other two balls, but the size should be the same
- 1 point for explaining that kinetic energy increases as mass increases
- 1 point for explaining that keeping the size the same will not cause additional friction that could affect the speed

PART C (0-3 points maximum)

- 1 point for describing that the student should make the track the same height throughout points 1-5.
- 1 point relating potential energy to height
- 1 point for explaining that the potential energy will be the same at all points along the track if the track height is always the same

Score Information

PART A: Student explains that block X should be replaced (1 point) with a higher block (1 point) because potential energy increases with increasing height (1 point).

- Replace block X
- Use a block with a greater height than block X
- Potential energy will increase because of the increase in height for the new block

NOTE: Accept any other plausible explanation of replacing block X with a higher block to increase the potential energy of the marble.

Session 2 Item 20 (ER), continued

Part B: Student explains the mass of the marble should be increased while the size is kept the same (1 point) because the kinetic energy increases with an increase in mass (1 point) but keeping the size the same will not cause additional friction that could affect the speed (1 point).

- Marble mass should be increased; size kept the same
- Kinetic energy increases as mass increases
- Kinetic energy decreases as the speed decreases

NOTE: Accept any other plausible explanation about increasing the mass of the marble to increase the kinetic energy of the marble.

Part C:

Student describes a change to make the track height an equal height all along the track from points 1 to 5 (1 point). Student explains that potential energy depends on height (1 point) and so an equal height throughout the track will keep the potential energy constant (1 point).

- Make the track height an equal height all along the track
- Potential energy depends on height
- An equal height will result in a constant potential energy

NOTE: Accept any other plausible explanation of how to make the track height equal along the track to result in a constant potential energy.

Student Responses for Session 2 Item 20

Part A
One student wants to increase the potential energy of the marble at the starting position. Explain one way the students can adjust the track to increase the marble's potential energy. In your explanation,

- describe the dimensions of any materials used to adjust the track and
- explain why the adjustment to the track would increase the marble's potential energy.

Response 1

To increase the potential energy of the marble at the starting position, you can replace Block X with a block that has more energy, so instead of 45 cm for height, you can do 55 cm for height on Block X. The adjustment to the track would increase the marbles potential energy because the higher an object is, the more gravitational potential energy there is.

Score: 3
This response earns a 3. It fully and accurately describes that Block X should be replaced with a block of greater height and describes dimensions or relative size of the materials used, “you can replace Block X with a block that has more energy, so instead of 45 cm for height, you can do 55 cm for height on Block X.” The response provides an explanation of how this change increases the potential energy, “The adjustment to the track would increase the marbles potential energy because the higher an object is, the more gravitational potential energy there is.”

Response 2

To increase the PE, the student has to add more height because the more height the more PE. The student can do this by adding another wooden block student should add another block X because they are bigger.

Score: 2
This response earns a 2. It accurately describes the relative size of the materials used but does not accurately describe that Block X should be replaced at the starting position, “To increase the PE, the student has to add more height… The student can do this by adding another wooden block student should add another block X because they are bigger.” If the response accurately noted to place Block X at the starting position, the response would receive credit. The response provides an explanation of how this change increases the potential energy, “because the more height the more PE.”

Response 3

To increase the potential energy, you would want to have more hills and steeper ones. The higher up you go the more potential energy there will be. You would want more hills because it would have more higher points. Therefore increasing the amount od potential energy. I would say to add one more 30 cm block and one more 15 cm block in that order. This would make hills that would add more high points. Then I would a just the tubing to lay flatter to the east side of the blocks then curving them out at the bottom to male steeper hills and make the bottoms well equipped to go back up.

Score: 1

This response earns a 1. It does not accurately describe that Block X should be replaced with a block of greater height nor does it describe the dimensions or relative size of the materials used. The response provides an explanation of how the change increases the potential energy, “The higher up you go the more potential energy there will be.”

Response 4

One way that the students can adjust the track to increase the marble’s potential energy is by making the starting position way lower and that would increase the marbles potential energy because it would start off moving slow.

Score: 0

This response earns a 0. It does not describe that Block X should be replaced with a block of greater height nor does it describe the dimensions or relative size of the materials used. The response does not provide an accurate explanation of how the change increases the potential energy.

Part B

Another student wants to use another marble that will have a greater kinetic energy than either the ceramic marble or the steel marble at each point along the track. Explain how the mass and size of the third marble should compare to the masses and sizes of the ceramic and steel marbles. Explain the reasoning for your answer.

Response 1

If another marble were too have more kinetic energy than the ceramic marble or steel marble at each point on the track, the marble would have to have more mass. This is because the more mass an object has, the more kinetic energy it has. This is why you have a marble with more mass in order to have more kinetic energy than the other two marbles. If another marble were too have a different size than the ceramic marble or steel marble at each point on the track, this could affect the speed and change the kinetic energy. This is why the marble needs to stay the same size.

Score: 3

This response earns a 3. It accurately explains that the mass of the marble should be greater than the mass of the other two balls and the size of the marble should be the same, “the marble would have to have more mass. the marble needs to stay the same size.” The response provides an explanation that kinetic energy increases as mass increases, “This is because the more mass an object has, the more kinetic energy it has.” It provides an explanation that keeping the marble the same size will not affect the speed, “If another marble were too have a different size than the ceramic marble or steel marble at each point on the track, this could affect the speed and change the kinetic energy.”

Response 2

In order to increase the kinetic energy the student must increase the mass they can do this by getting heavier or different marbles. But they cannot change the size because if they do than the marbles won’t fit on the track.

Score: 2

This response earns a 2. It accurately explains that the mass of the marble should be greater than the mass of the other two balls and the size of the marble should be the same, “they can do this by getting heavier or different marbles. But they cannot change the size.” The response provides an explanation that kinetic energy increases as mass increases, “In order to increase the kinetic energy the student must increase the mass.” It does not provide an accurate explanation that keeping the marble the same size will not affect the speed, “the marbles won’t fit on the track.”

Response 3

The mass and size of the third marble should compare to the masses and sizes of the ceramic and steel marbles because the marble would have to be the same size, but it could just have a greater mass. I think this because the size doesn't really affect the kinetic energy, but speed and mass does.

Score: 1

This response earns a 1. It accurately explains that the mass of the marble should be greater than the mass of the other two balls and the size of the marble should be the same, "the marble would have to be the same size, but it could just have a greater mass." The response does not fully or accurately provide an explanation that kinetic energy increases as mass increases, nor does it fully or accurately provide an explanation that keeping the marble the same size will not affect the speed, "the size doesn't really affect the kinetic energy, but speed and mass does."

Response 4

The mass should be bigger and the size. The reason is because the more mass the faster you go. The kinetic energy is faster when lower and bigger and the mass is more.

Score: 0

This response earns a 0. It does not accurately explain that the mass of the marble should be greater than the mass of the other two balls and the size of the marble should be the same, "The mass should be bigger and the size." The response does not accurately provide an explanation that kinetic energy increases as mass increases, nor does it accurately provide an explanation that keeping the marble the same size will not affect the speed, "the more mass the faster you go. The kinetic energy is faster when lower and bigger and the mass is more."

Part C

One student wants to change the track so that the potential energy of the marble from point 1 to point 5 is constant. Explain how the student could change the track so that that the potential energy of the marble is constant and explain why that change will keep the potential energy constant.

Response 1

To get the tracks potential energy to be constant you would have to make the starting position as it is then make point 1-5 flat. You would do this because Once the marble does down hill it will keep a constant potential energy. The heigher something is the more potential energy so since the track is flat it will keep the potential energy the same.

Score: 3

This response earns a 3. It accurately describes a change to make the track equal height from points 1 to 5, “To get the tracks potential energy to be constant you would have to make the starting position as it is then make point 1-5 flat.” The response accurately explains that potential energy depends on height, “The heigher something is the more potential energy.” The response accurately provides an explanation that an equal height throughout the track will result in a constant potential energy, “since the track is flat it will keep the potential energy the same.”

Response 2

The student will have to change the track from 1 to 5 go at a great height and become a flat surface so that the ball would not go downward to create more kinetic energy but to the same amount of potential energy for a period of time.

Score: 2

This response earns a 2. It accurately describes a change to make the track equal height from points 1 to 5, “The student will have to change the track from 1 to 5 go at a great height and become a flat surface.” The response does not explain that potential energy depends on height. The response accurately provides an explanation that an equal height throughout the track will result in a constant potential energy, “to the same amount of potential energy for a period of time.”

Response 3

The student could make all of the blocks to the same height, and that would make the track so that the potential energy of the marble is constant. The change would keep the potential energy constant because if all of the blocks are at the same height, then the track will be at the same height from point 1 to point 5, so the marbles would contain the same gravitational potential energy, which would make it constant.

Score: 1

This response earns a 1. It does not accurately describe a change to make the track an equal height from only points 1 to 5, “The student could make all of the blocks to the same height.” This description does not take into account that the starting position must remain higher in order to put the marble into motion. The response does not explain that potential energy depends on height. The response accurately provides an explanation that an equal height throughout the track will result in a constant potential energy, “then the track will be at the same height from point 1 to point 5, the marbles would contain the same gravitational potential energy, which would make it constant.”

Response 4

The student would change all of the of the blocks to the same height so they could keep going at the same pace.

Score: 0

This response earns a 0. It does not accurately describe a change to make the track an equal height from only points 1 to 5, “The student would change all of the of the blocks to the same height.” This description does not take into account that the starting position must remain higher in order to put the marble into motion. The response does not explain that potential energy depends on height. The response does not accurately provide an explanation that an equal height throughout the track will result in a constant potential energy.

Session 2 Item 22 (TPI) - Rubric

Use the information and your knowledge of science to answer the questions.

The Red Bayou project in northwest Louisiana allows farmers to use river water diverted from the Red River when irrigating their crops.

Part A

Select the correct answer from **each** drop-down menu to complete the sentences.

The amount of groundwater used for irrigation most likely [decreased ▾] as more diverted river water became available. The amount of surface water used for irrigation most likely [increased ▾] as more diverted river water became available.

Part B

Which change would **most likely** occur after diverting river water for use in irrigation?

(a) an increase in soil erosion in the river

(b) an increase in flooding in the river

(c) an increase in the amount of water needed to water crops

(d) an increase in sediment, nutrients, and salts on crop soil

Session 2 Item 23 (TPI) - Rubric

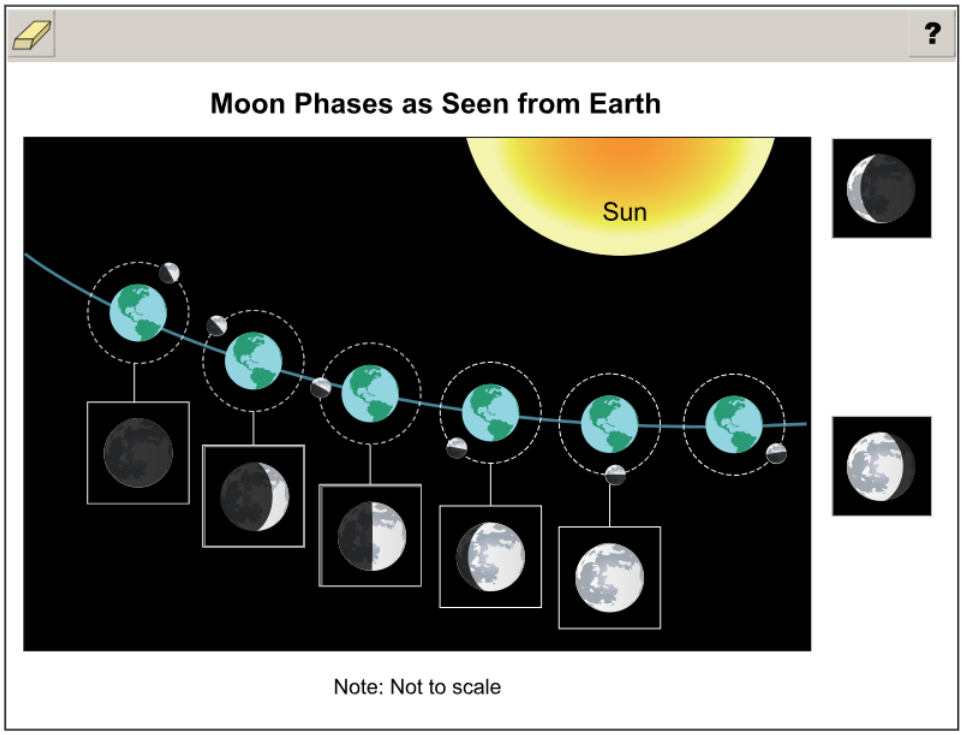
Use the information and your knowledge of science to answer the questions.

Part A

Observers from Earth see different phases of the Moon over time as the Moon orbits around Earth.

Drag the phases of the Moon into the correct boxes to complete the model showing how the phases of the Moon look from Earth.

Not all phases of the Moon will be used.



Note: In Accommodated form, Answer will be Phase Z in first box, and Phase X in second box.

Part B

Based on the information in the Moon phase model, which statement **best** predicts how the phases of the Moon will look as the Moon continues its orbit around Earth in the model?

(a) The Moon will become brighter with no dark areas as the Moon moves closer to the Sun.

(b) The Moon will again appear completely dark and the dark area will decrease in size until the Moon is completely bright.

(c) A dark area will start to appear on the right side of the Moon and will slowly increase in size until the Moon is completely dark.

(d) A dark area will start to appear on the left side of the Moon and will slowly increase in size until the Moon is completely dark.

Session 3 Item 25 (TEI) – Rubric

Based on Figure 2 and Figure 3, select the correct answer from **each** drop-down menu to complete the paragraph.

A magnetic compass needle is able to detect the direction of Earth's magnetic North Pole. Over hundreds of thousands of years, the direction in which a compass needle points would [change ▼]. During a normal polarity period, a compass needle points mostly in the direction of the [geographic North Pole ▼]. After a magnetic pole reversal, a compass needle points mostly in the direction of the [geographic South Pole ▼].

Scoring Notes:

This item is worth 2 points. Partial credit (1 point) will be awarded if half or more of the student responses are correct. For this item, the key contains 3 correct responses; therefore 1 point will be awarded if the student selects 2 correct responses.

Session 3 Item 26 (TEI)

Scientists will study how Earth's magnetic field changes as distance from Earth changes. Satellites will be placed at different distances from Earth and will be used to measure the strength of Earth's magnetic field.

Drag the correct label into **each** box in the table to identify the dependent and independent variables in the investigation.

Not all labels will be used.

Variable	Property
dependent variable	
independent variable	

magnetic field strength

distance from Earth

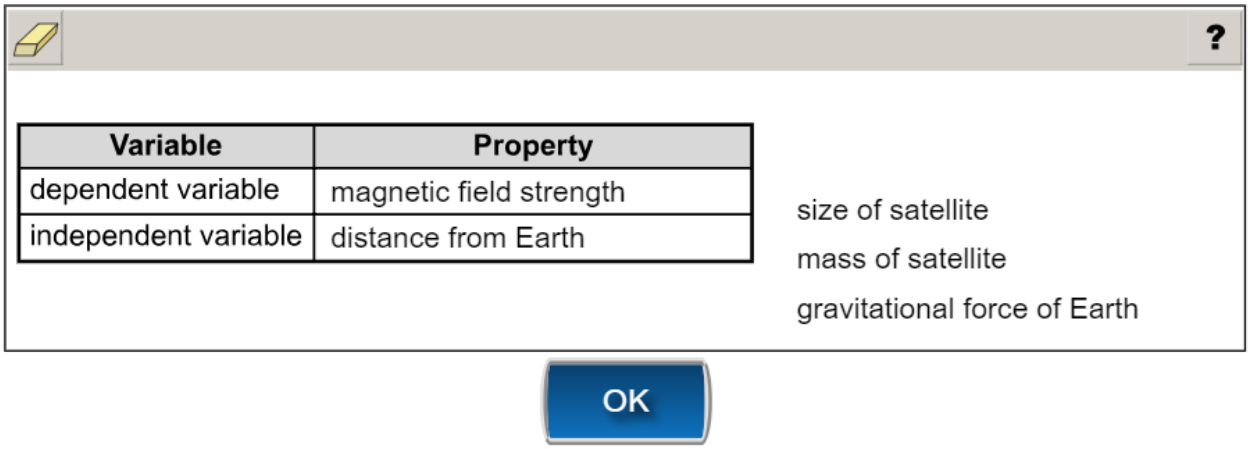
size of satellite

mass of satellite

gravitational force of Earth

OK

Session 3 Item 26 (TEI) - Rubric



Session 3 Item 27 (CR)

Scientists are planning an investigation to collect evidence to help predict future magnetic pole reversals of Earth's magnetic field. Using the information in Figure 3, describe how scientists can collect data on changes in Earth's magnetic poles and explain how this data can be used to predict future magnetic pole reversals.

Scoring Information	
Score	**Description**
2	Student's response correctly describes how scientists can collect data on changes in Earth's magnetic poles AND correctly explains how this data can be used to predict future magnetic pole reversals.
1	Student's response correctly describes how scientists can collect data on changes in Earth's magnetic poles OR correctly explains how this data can be used to predict future magnetic pole reversals.
0	Student's response does **not** correctly describe how scientists can collect data on changes in Earth's magnetic poles or correctly explain how this data can be used to predict future magnetic pole reversals. **OR** Student's response is blank, irrelevant, or too brief to evaluate.

Scoring Notes:

- Description of how scientists can collect data on changes in Earth's magnetic poles (1 point)
- Explanation of how this data can be used to predict future magnetic pole reversals (1 point)

Examples include:

- The scientists can use the ocean floor rocks to measure the amount of time between each change in direction of the magnetic fields of the rocks (1 point) and then use that data to estimate when Earth's magnetic poles will reverse in future years (1 point)

Accept other reasonable answers.

Session 3 Item 30 (TEI) - Rubric

Select the correct answer from the drop-down menus to complete each sentence.

During the Great Drought, a decrease in the [growth of corn ▾] had the greatest impact on the survival of the Anasazi people. As conditions changed, the Anasazi relied [more ▾] on domesticated turkeys and [rabbits ▾] for food.

Scoring Notes:

This item is worth 2 points. Partial credit (1 point) will be awarded if half or more of the student responses are correct. For this item, the key contains 3 correct responses; therefore 1 point will be awarded if the student selects 2 correct responses.

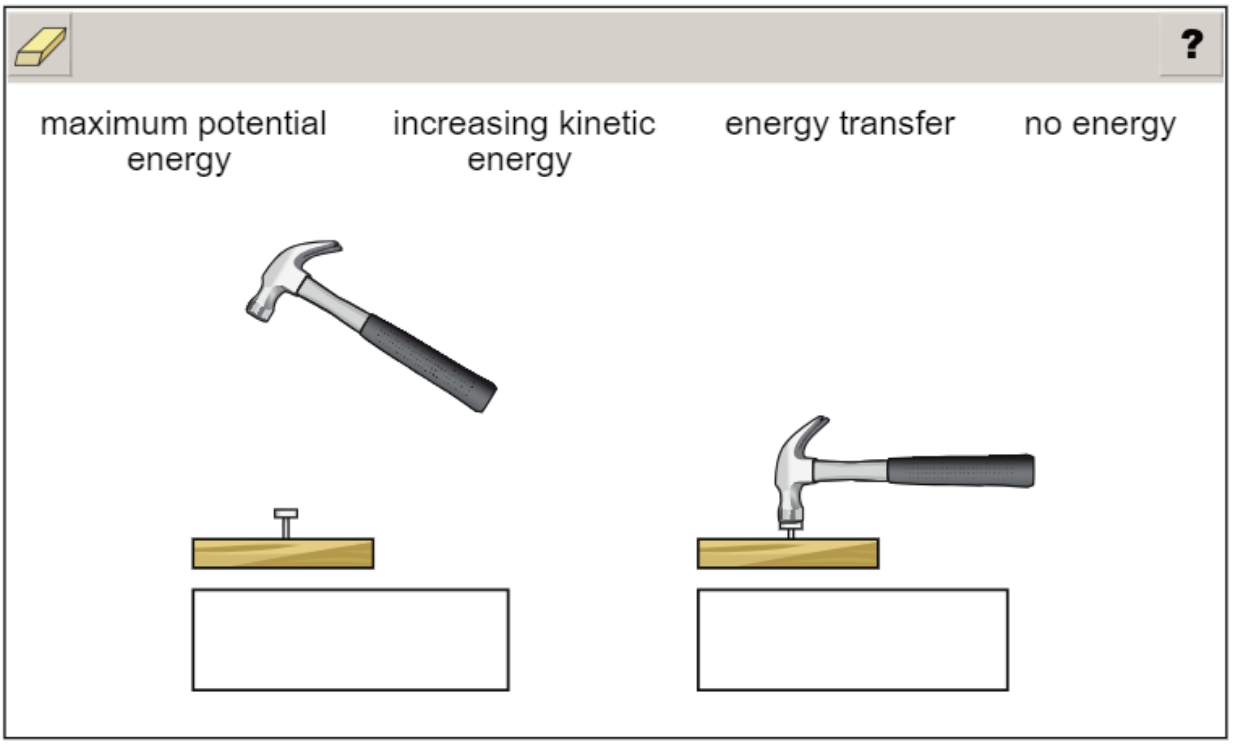
Session 3 Item 35 (TEI)

Use the information and your knowledge of science to answer the question.

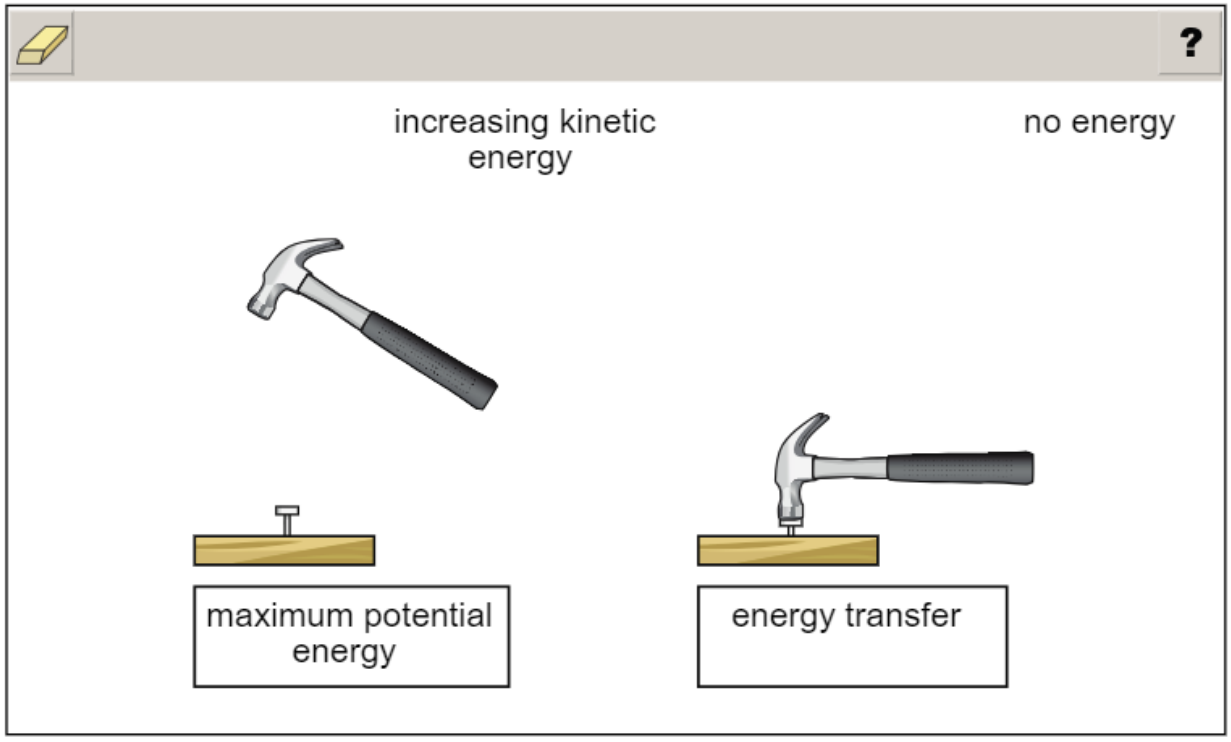
The model shows a hammer and a nail in two positions. The first position shows the hammer in a resting position above the nail. The second position shows when the hammer makes contact with the nail.

Drag the labels into the correct boxes in the model to **best** describe each position of the hammer and the nail.

Not all labels will be used.



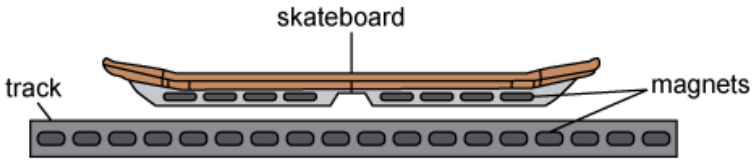
Session 3 Item 35 (TEI) - Rubric



Session 3 Item 37 (TEI) - Rubric

Use the information and your knowledge of science to answer the question.

Engineers have recently designed skateboards that use magnets to float along a track, as shown in the figure.



Select the correct answer from **each** drop-down menu to complete the paragraph about the design of these skateboards.

The engineers observed that the skateboard floats above the track because the magnets on the skateboard [repel] the magnets on the track. When a rider steps onto the skateboard, the force between the skateboard and the track [increases]. If the magnets are removed from the skateboard, the height of the skateboard should [decrease].

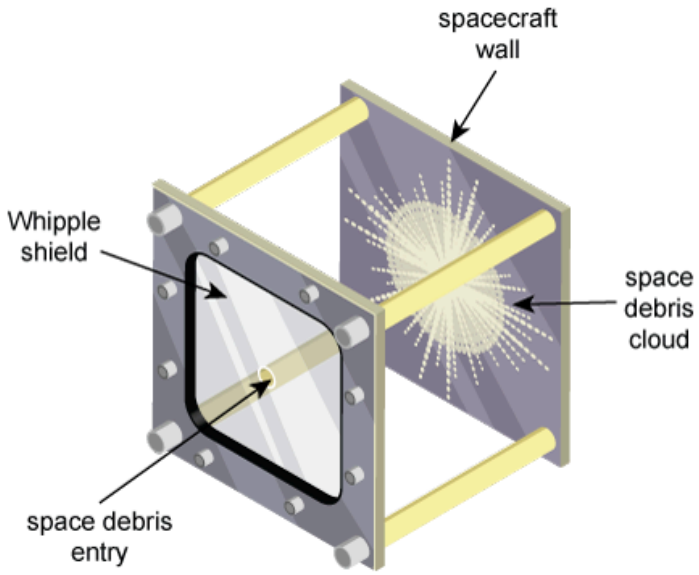
Scoring Notes:

This item is worth 2 points. Partial credit (1 point) will be awarded if half or more of the student responses are correct. For this item, the key contains 3 correct responses; therefore 1 point will be awarded if the student selects 2 correct responses.

Session 3 Item 40 (TEI) - Rubric

Use the information and your knowledge of science to answer the question.

Whipple shields are used to protect spacecraft from collisions with smaller pieces of space debris, as shown in the image. The shield uses a layer of aluminum to break up pieces of incoming space debris into much smaller pieces before they collide with the spacecraft.



Select the correct answer from **each** drop-down menu to complete the paragraph.

During a collision between a smaller space debris piece and the spacecraft wall, the force of the space debris piece is [equal to] the force of the spacecraft wall. The force of the space debris piece is directed [toward the wall]. The force of the spacecraft wall is directed [toward the piece]. Engineers can further reduce the force of incoming space debris on the spacecraft by slightly [increasing] the thickness of the aluminum layer.

Scoring Notes:

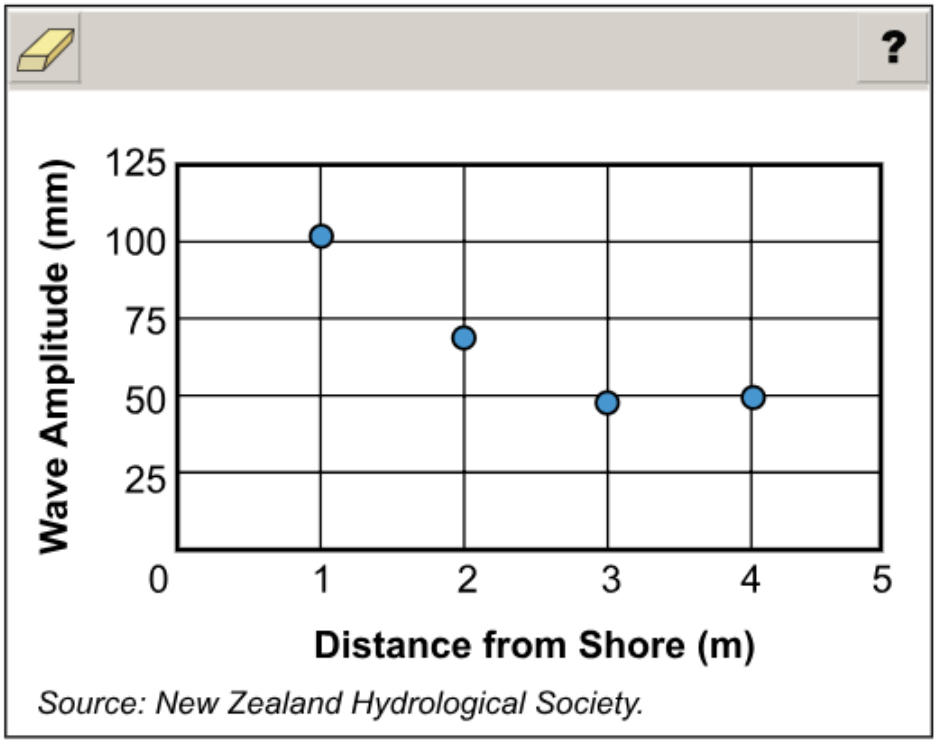
This item is worth 2 points. Partial credit (1 point) will be awarded if half or more of the student responses are correct. For this item, the key contains 4 correct responses; therefore 1 point will be awarded if the student selects 2 or more correct responses.

Session 3 Item 41 (TEI)

Use the information and your knowledge of science to answer the question.

An observer standing on the shore of a lake noticed that boats traveling through the water produce waves of different sizes. The observer collected data on how the amplitude of waves from a boat changes as the waves moves closer to the shore. The data from these observations are shown in the graph.

Select the data point that shows when the waves from the boat have the **most** energy.



Source: New Zealand Hydrological Society.

Session 3 Item 41 (TEI) - Rubric