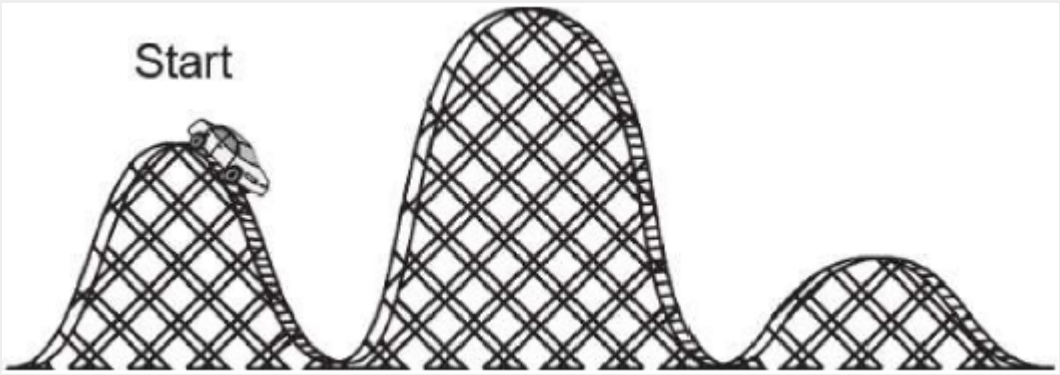
2023-2024 Gr6 Science Benchmark Unit 2

Doug builds a model roller coaster with three hills, as shown in the diagram.



Question 1.

He places a toy car at the top of the first hill and releases it. The car stops at point X. Which change to the model would allow the toy car to travel over all three hills?

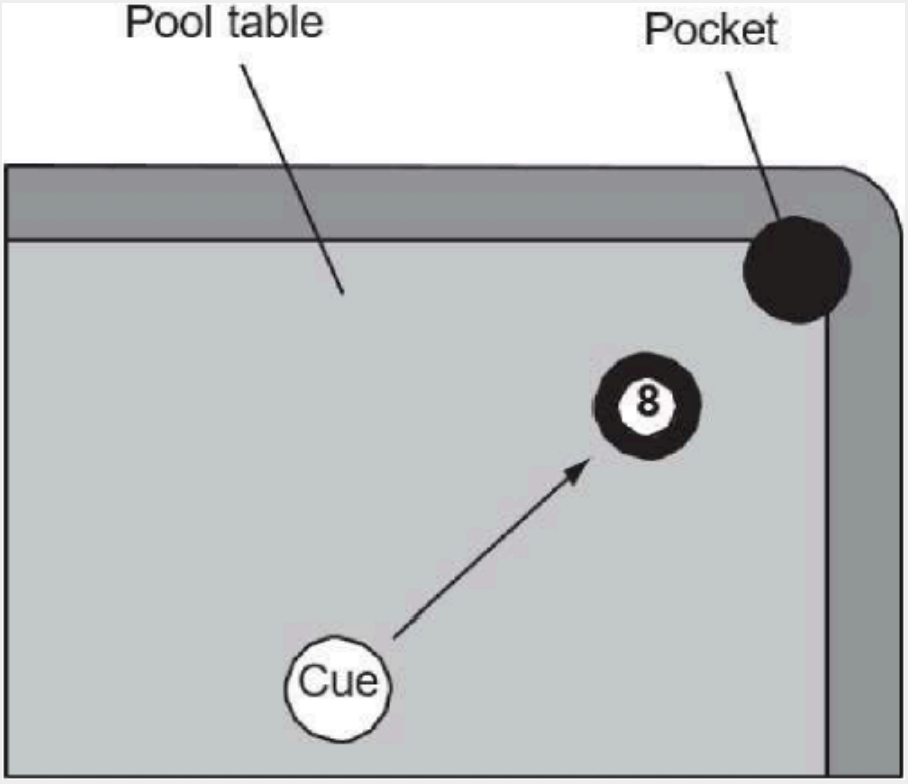
A. Add a loop before the first hill in order to maximize the kinetic energy of the car.

B. Add a loop after the tallest hill in order to maximize the kinetic energy of the car.

C. Order the three hills from shortest to tallest so that the potential energy builds up according to the height of each hill.

D. Order the three hills from tallest to shortest to provide the potential energy needed for the car to make it over each hill.

During a game of pool, the cue ball is rolling toward the eight ball which is at rest. The diagram shows a part of the pool table and the positions of the cue ball and eight ball before they collide.

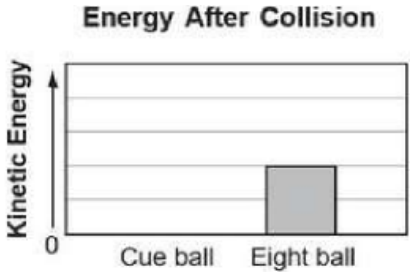


Kathleen claims that all of the kinetic energy in the cue ball will be transferred to the eight ball after they collide.

Question 2.

Which graph best supports Kathleen's claim?

A.



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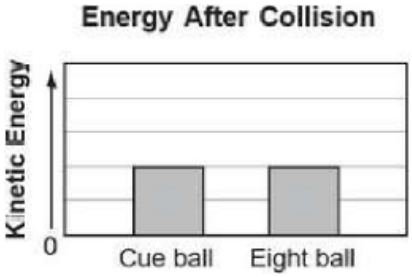

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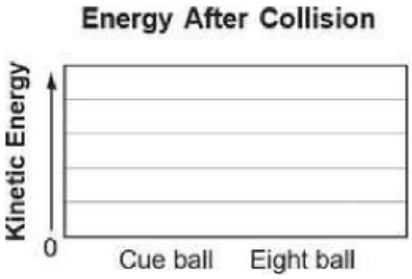
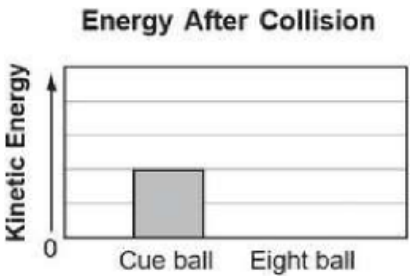


D.



Question 3.

Which would increase the kinetic energy of a wagon? Select all that apply.

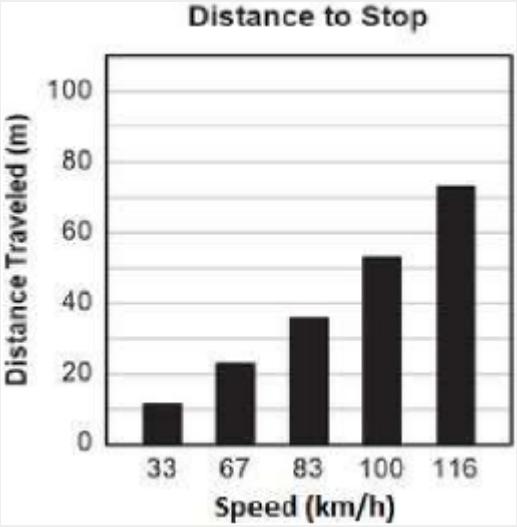
A. Add mass to the wagon.

B. Decrease the mass of the wagon.

C. Increase the speed of the wagon.

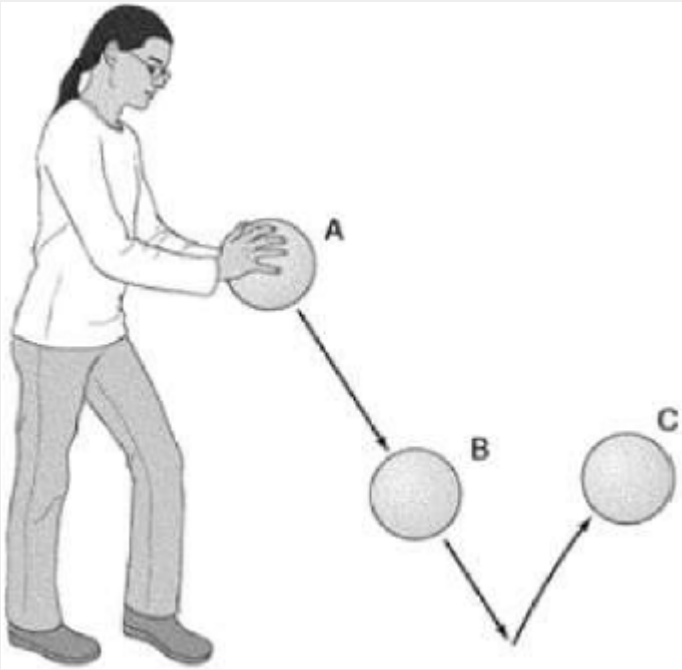
D. Decrease the speed of the wagon.

Braking distance is the distance a car travels from the time a person applies the brakes to when the car comes to a complete stop. The graph shows the relationship between the speed of a car and the distance the car travels before it stops.



Question 4.

Based on the graph, describe the relationship between the car's braking distance and kinetic energy. Be sure to use evidence from the graph to support your response



Question 5.

A rubber ball is dropped and bounces back up. The ball's potential energy _____.

A. is greater at C than at A

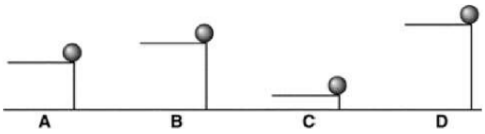
B. is the same as its kinetic energy at A

C. is at its maximum at A

D. is zero at B

Question 6.

In which diagram does the ball have the greatest potential energy?



A. A

B. B

C. C

D. D

Question 7.

A change in motion is produced by _____.

A. all forces

B. balanced forces

C. unbalanced forces

D. the absence of force

Question 8.

Whenever an object exerts a force on another object, the second object exerts a force of the same magnitude, but in the _____ direction to that of the first object.

A. opposite

B. same

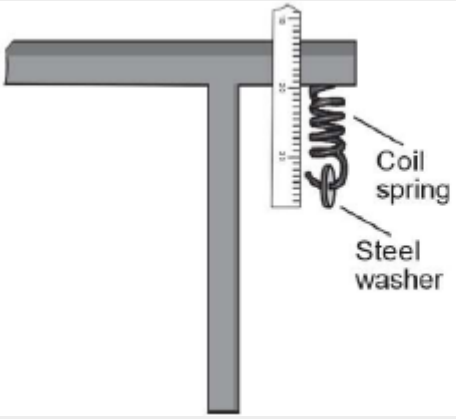
C. right angle

D. vertical

Andy makes a claim that the force due to gravity depends on the masses of interacting objects. He does an investigation to test his claim, following this procedure:

1. Hang a coil spring from the edge of a desk so that the spring hangs freely.
2. Measure the length of the spring using a meterstick.
3. Attach a steel washer to the coil spring.
4. Measure the length of the spring using the meterstick.
5. Repeat steps 3–4, using additional steel washers.

A diagram of the setup for the investigation is shown. The collected data is given in the table.



Length of Coil Spring

Number of Washers	Spring length (cm)
0	10
1	22
2	33
3	43
4	52

Question 9.

Which statement best explains why Andy's claim is supported by the data?

A. The length of the spring increased each time a steel washer was added to the spring.

B. The length of the spring decreased each time a steel washer was added to the spring.

C. The force due to gravity depended on the distance between the steel washers and Earth.

D. The force due to gravity by Earth on the steel washer was greater than the force due to gravity by the steel washer on Earth.

Question 10.

Pick the best example of Newton's third law of motion in action.

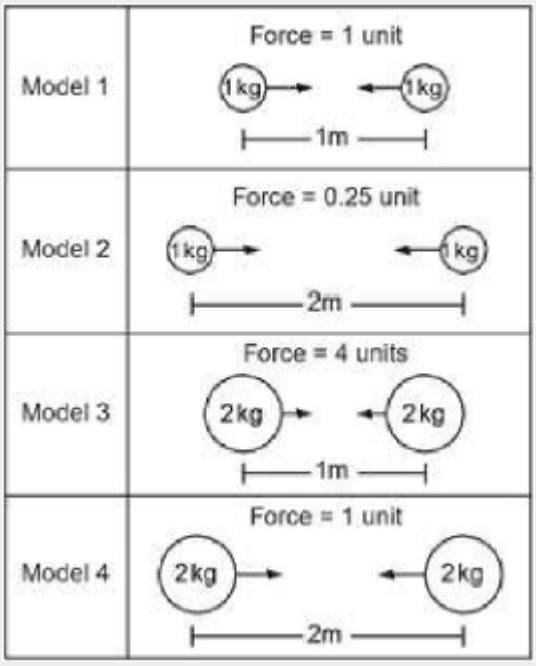
A. A rocket accelerating in space as a result of gases and the rocket pushing each other in opposite directions.

B. A rocket being towed to the launch pad while friction acts in the opposite direction.

C. An asteroid moving around the Sun while being pulled toward the Sun.

D. An asteroid continuing to spin because nothing has exerted a force to stop it.

Each of these four models represents the force of gravity between two objects. The masses of the objects and the distances between the objects vary. The arrows in each model indicate the direction of the force of gravity between the two objects.



Question 11.

Which statements provide evidence from these models to support an argument that both distance and mass affect the gravitational force between two objects?

A. Models 1 and 2 provide evidence that distance affects gravitational force.

B. Models 1 and 2 provide evidence that mass affects gravitational force.

C. Models 1 and 3 provide evidence that mass affects gravitational force.

D. Models 2 and 4 provide evidence that distance affects gravitational force.

E. Models 3 and 4 provide evidence that distance affects gravitational force.

F. Models 2 and 4 provide evidence that mass affects gravitational force.

G. Models 2 and 3 provide evidence that mass affects gravitational force.

Question 12.

Alice is investigating whether she can show magnetic field lines, using iron filings and two bar magnets. She arranges the magnets so that the north pole of one magnet is close to the south pole of the other magnet. Alice lays a transparent sheet of plastic on top of the magnets and sprinkles iron filings on it. She taps the plastic sheet gently to see whether the Iron filings will form a pattern showing magnetic field lines.

Which statement describes a conclusion that would be supported by this investigation?

A. A magnetic field forms only when two magnets are touching.

B. A magnetic field forms only when the north pole of a magnet is close to the south pole of another magnet.

C. Forces from a magnetic field can act on an object without touching the object.

D. Forces from a magnetic field are stronger when the magnets are closer together.

Question 13.

A student holds a magnet 1 m from a paper clip and sees no evidence of a force acting between the two. When the student brings the magnet 1 cm away from the paper clip, the paper clip begins to slide toward the magnet. Which statement best explains these results?

A. The material in the paper clip was not a magnetic material until the magnet was moved closer.

B. The magnet did not have a magnetic field until it was close to the paper clip.

C. The paper clip repelled the magnet at the farther distance.

D. The magnetic field of the magnet was too weak to move the paper clip at the farther distance.

Question 14.

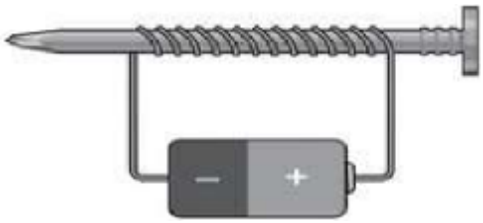
The strength of an electromagnet can be increased by reducing the number of turns on the wire coil so that more current can flow.

A. True

B. False

Question 15.

A student created an electromagnet out of a piece of copper wire, a nail, and a battery, as shown.



The student observed that the electromagnet could not lift paper clips off a desktop as expected. Which hypothesis will most likely help the student build an electromagnet capable of lifting paper clips?

A. Using a wooden stick instead of a nail will increase the number of paper clips that the electromagnet can pick up.

B. Adding more coils of copper wire to the nail will increase the number of paper clips that the electromagnet can pick up.

C. Pushing the coils of copper wire closer together will increase the number of paper clips that the electromagnet can pick up.

D. Using a battery that produces less electric current will increase the number of paper clips that the electromagnet

can pick up.

Question 16.

Which best describes the changes in energy as a child goes down a slide?

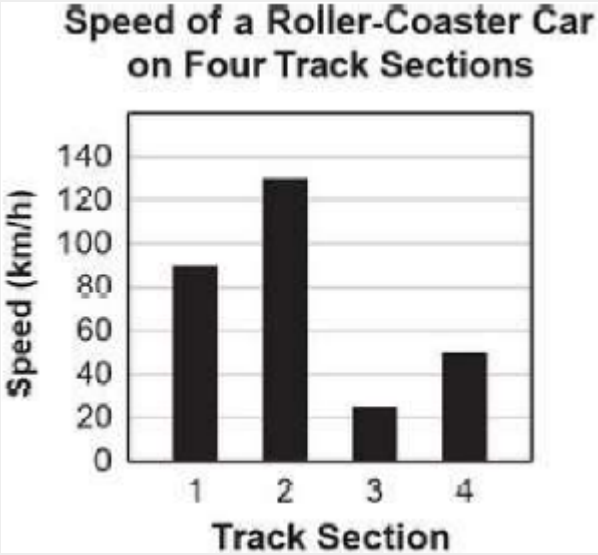
A. potential energy decreases and kinetic energy increases

B. potential energy is constant and kinetic energy increases

C. potential and kinetic energy are constant

D. mechanical energy decreases

The graph shows the average speed of a car on four different track sections of a roller coaster.



Question 17.

Which statement is false?

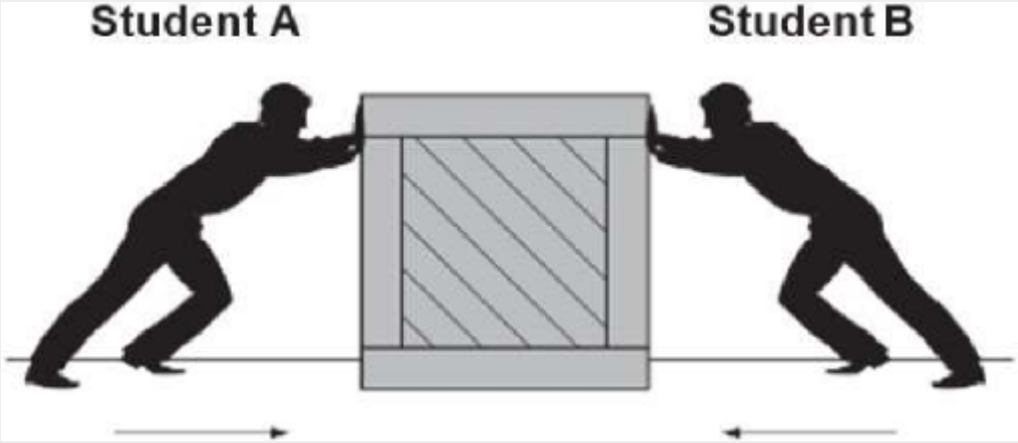
A. The car's kinetic energy is greatest in track section 2.

B. Track section 2 is likely at the top of a hill.

C. Track section 2 is likely at the bottom of a hill.

D. The car's kinetic energy varies even though its mechanical energy remains almost constant.

Two students are investigating the effect of forces on the motion of an object. The two students each push on a box, as shown in the picture.



Even though the students are pushing the box very hard, the box does not move.

Question 18.

Describe one way the students could make the box move. Explain why this would move the box.

Question 19.

While wrapping a gift, a student sticks a few pieces of tape to the edge of a table. The student makes the following observations:

- When pieces of tape are pulled off the table, those pieces of tape push away from each other.
- The ends of the tape keep curling over to touch the student's fingers.
- A scrap of paper gets stuck to the smooth side of the tape, even though that side of the tape does not have adhesive material on it.

Investigating which question would best help the student explain the observations about the tape?

A. What is the maximum number of objects that can be attracted to the tape?

B. Have electric fields been generated around each piece of tape?

C. Does placing the tape near a compass change the direction of its needle?

D. How does distance affect the attraction between the two pieces of tape?

Question 20.

To show the relationship between kinetic energy and potential energy, students create a model of a baseball being thrown (Figure 1).

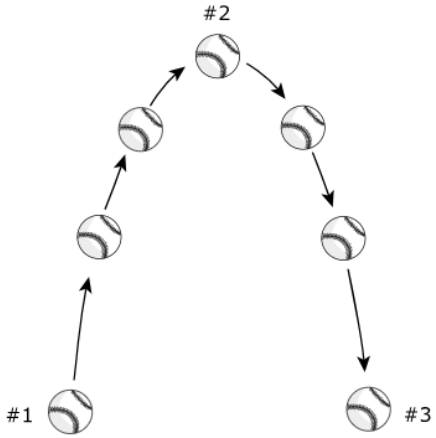


Figure 1. Baseball in Motion

Correctly describe the relationship between kinetic and potential energy in Figure 1.

Complete the sentences by choosing the correct answer from each box.

Position 2 is the position that contains the most [Box W] because the ball has reached its maximum height. Positions 1 and 3 contain the most [Box X]. Energy is conserved in the system because [Box Y] is increasing as the baseball is climbing, and [Box Z] is increasing as the ball is falling.

Box W

A. kinetic energy

B.

potential energy

Box X

A. kinetic energy

B. potential energy

Box Y

A. kinetic energy

B. potential energy

Box Z

A. kinetic energy

B. potential energy

Question 21.

What happens to the parts of food molecules as matter moves through an organism?

A. The parts of the food molecules are rearranged to make new molecules or release energy.

B. The parts of the food molecules do not change.

C. The parts of the food molecules disappear.

D. The food molecules are broken apart and expelled by the body.

Question 22.

Which of the following best describes how food is used for energy in the human body?

A. Our body absorbs food directly into our bloodstream, which then goes to our muscles to be used as energy.

B. Our bodies store food in our fat cells until we need it for energy.

C. Food is broken down into small pieces by our teeth and stomach acid, and then transported to our cells to be used as energy.

D. Food is transformed into new molecules through chemical reactions in our body, which are then used to support growth and release energy.