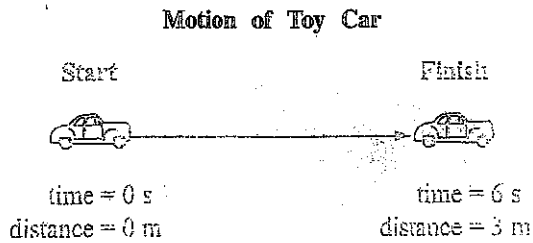


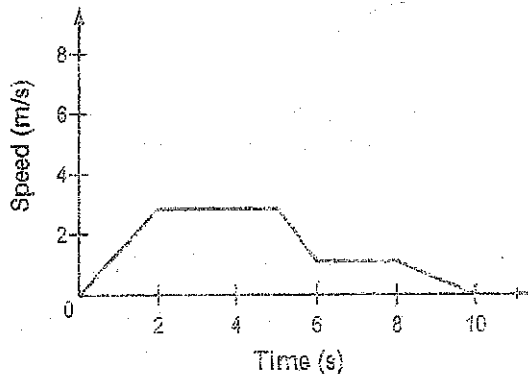
Forces and Motion Test

1. The diagram below shows information about the motion of a toy car between two points on a track.



Which of the following can be determined using the information shown in the diagram?

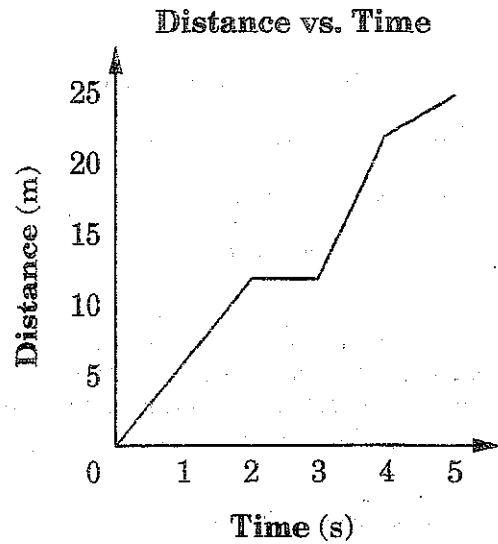
- A. the car's position after the first two seconds
 - B. the car's mass as it moves away from the start
 - C. the car's average speed between the two points
 - D. the car's total acceleration within the first meter
2. The graph below shows the speed of an object during a 10 s time interval.



In which of the following time intervals is the speed of the object decreasing?

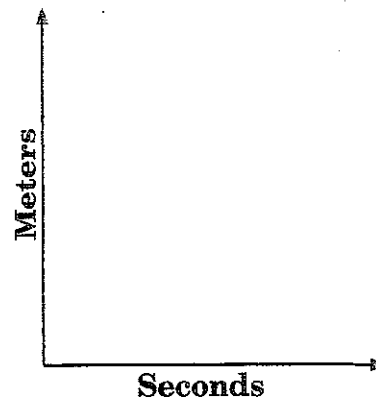
- A. between 0 s and 2 s
- B. between 2 s and 4 s
- C. between 6 s and 8 s
- D. between 8 s and 10 s

3. This graph shows the motion of an animal.



When does the animal remain still?

- A. between second 1 and second 2
 - B. between second 2 and second 3
 - C. between second 3 and second 4
 - D. between second 4 and second 5
4. This type of graph is used to describe something about an object.



What could this graph describe?

- A. friction
- B. volume
- C. mass
- D. speed

5. A car moves along a road that has markers every kilometer. Over time, it passes the markers in shorter periods of time. Which *best* describes the motion of the car?

A. The car is keeping the same direction.
B. The car is maintaining the same speed.
C. The car is increasing speed.
D. The car is changing direction.

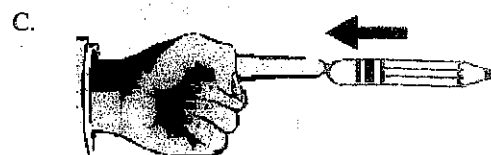
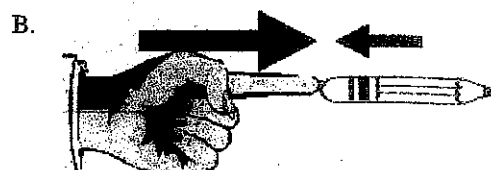
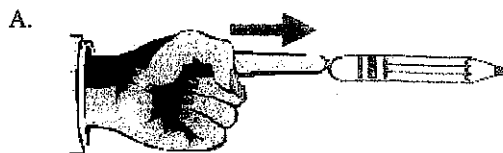
6. A student is a passenger in the front seat of a moving car. Which object is the *best* frame of reference for the student to determine how fast the car is moving relative to the ground?

A. a person sitting in the backseat of the car
B. a truck traveling in the lane next to the car
C. the driver sitting next to the student
D. a signpost on the side of the road

7. A person is sitting on a train that is moving 100 km/h. From which frame of reference is the person moving 0 km/h?

A. the ground
B. the train
C. a train passing in the opposite direction
D. a car stopped at a crossing

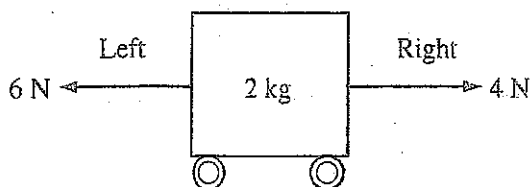
8. Susan gently pushes the tip of her finger against the eraser on her pencil and the pencil does not move. Which of the following figures *best* illustrates the interaction of forces between Susan's finger and her pencil?



9. This test paper is sitting at rest on your desk. Which of the following statements *best* describes this situation?

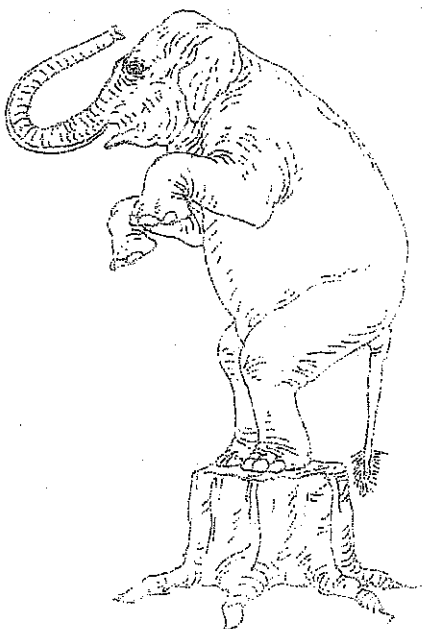
A. There are no forces acting on your paper.
B. Your paper is at rest in any coordinate system.
C. Your paper exerts no force on the desk.
D. There are several forces acting on your paper, but they balance each other.

10. Two forces act on the 2 kg box shown below.



A 4 N force acts to the right and a 6 N force acts to the left. What is the net force acting on the box?

- A. 10 N to the right B. 10 N to the left
C. 2 N to the right D. 2 N to the left
11. The illustration below shows a 2-ton elephant balancing on a tree stump.



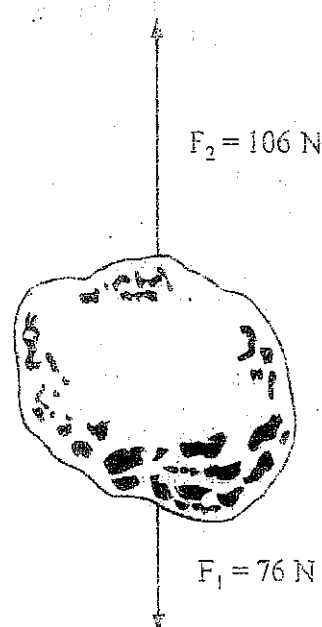
Which of the following statements must be accurate?

- A. The weight of the tree stump is greater than 2 tons.
B. A 4-ton force on the ground spreads out in all directions.
C. The tree stump is exerting a 2-ton force upward on the elephant.
D. The downward force on the ground under the tree stump is 4 tons.

12. Which of the following will definitely cause a change in the velocity of a parked car?

- A. The car experiences an unbalanced force.
B. All forces acting on the car increase by 1 N.
C. All forces acting on the car decrease by 1 N.
D. The forces acting on the car are equal and balanced.

13. The diagram below shows the forces acting on a rock.

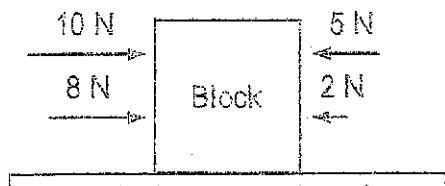


The weight of the rock is 76 N. An upward force of 106 N is exerted on the rock. What is the net force acting on the rock?

- A. 30 N upward B. 76 N downward
C. 106 N upward D. 182 N downward

14. Four students push on a block of wood with the forces shown in the diagram below. Assume friction is negligible.

Four students push on a block of wood with the forces shown in the diagram below. Assume friction is negligible.



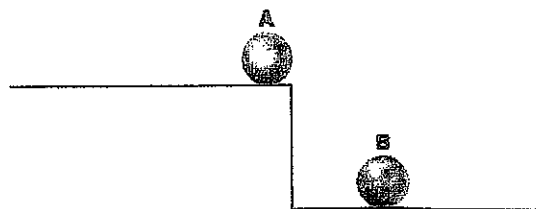
The block slides horizontally. What is the net force acting on the block of wood?

- A. 3 N to the left B. 8 N to the left
C. 11 N to the right D. 25 N to the right
15. A chair exerts a force of 20 N on a floor. What is the force that the floor exerts on the chair?
- A. 10 N B. 20 N C. 21 N D. 40 N
16. The moon has a smaller mass than the Earth. If you were able to travel to the moon your weight would
- A. increase.
B. decrease.
C. remain the same.
D. vary from day to night.
17. What effect does gravity have on a person living on Earth?
- A. It causes a person to have mass.
B. It causes a person to have weight.
C. It causes a heavy person to fall faster than a light person.
D. It causes a heavy person to fall slower than a light person.

18. Windmills are used to convert wind energy into a more useful form. In most cases, there are three steps in this process. The energy is in a different form at each step. Which of the following flowcharts shows the most likely order of the energy changes?

- A. wind energy → mechanical energy → solar energy
B. wind energy → thermal energy → mechanical energy
C. wind energy → solar energy → electrical energy
D. wind energy → mechanical energy → electrical energy

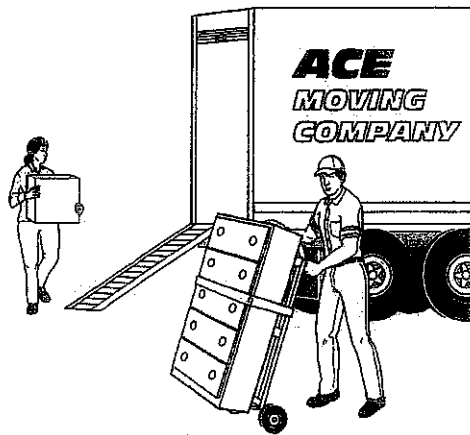
19. The diagram shows two bowling balls of equal mass. Ball A is resting near the edge of a shelf. Ball B is resting on the ground below.



Which of these statements *best* describes the diagram above?

- A. Ball A has more kinetic energy than Ball B.
B. Ball B has more kinetic energy than Ball A.
C. Ball A has more potential energy than Ball B.
D. Ball B has more potential energy than Ball A.

20.

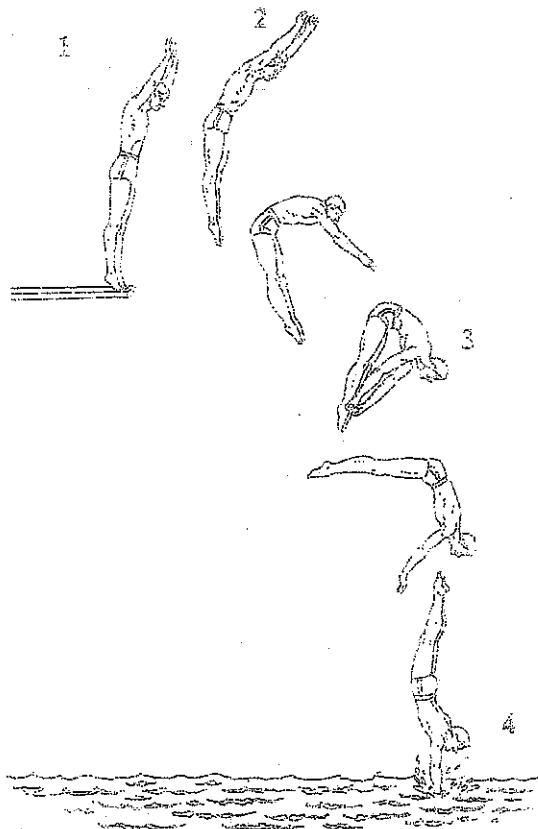


A family is moving from Pennsylvania to Connecticut during the summer.

As the moving van burns gasoline in its engine, it converts _____.

- A. chemical energy into mechanical energy
- B. kinetic energy into potential energy
- C. thermal energy into electrical energy
- D. mechanical energy into kinetic energy

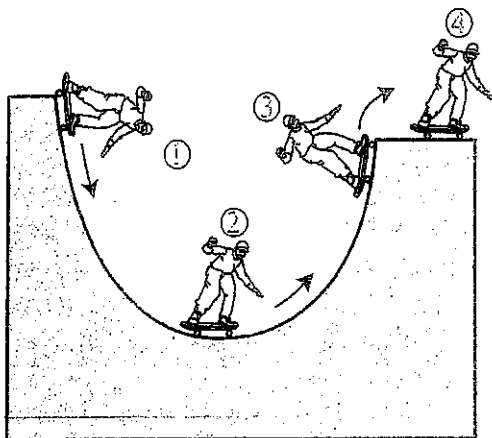
21. The diagram below represents a diver's motion from the top of a high diving board into a pool of water.



At which labeled point does the diver have the least potential energy?

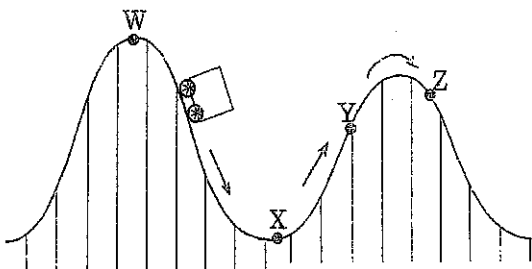
- A. 1
- B. 2
- C. 3
- D. 4

22. A skateboarder travels from location 1 to location 4 as shown below.



At which location does the skateboarder have the *most* kinetic energy and the *least* potential energy?

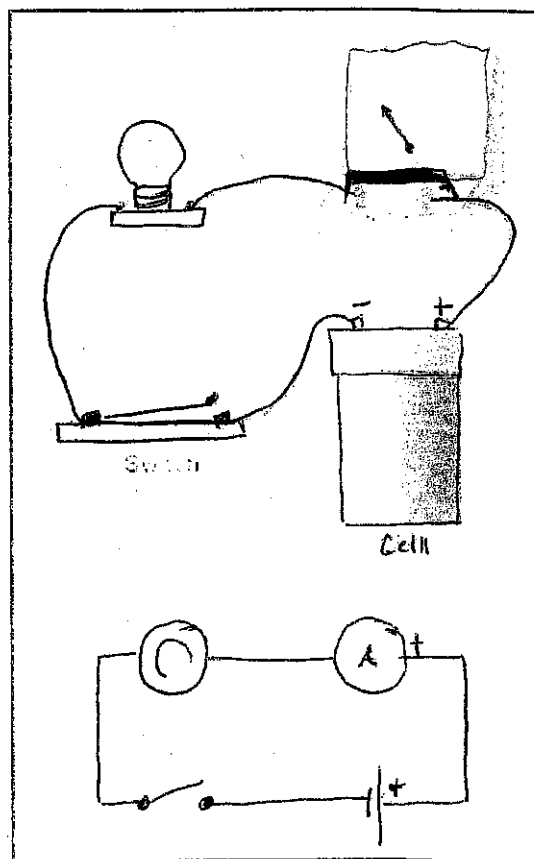
- A. 1 B. 2 C. 3 D. 4
23. Which of the following describes the mechanical energy of a cart at rest at the top of a steep hill?
- A. The cart has no mechanical energy.
- B. The cart's mechanical energy is all kinetic.
- C. The cart's mechanical energy is all potential.
- D. The cart's mechanical energy is half potential and half kinetic.
24. A roller coaster car moves on a roller coaster track through positions W, X, Y, and Z.



At what position will the roller coaster car most likely have the greatest kinetic energy?

- A. W B. X C. Y D. Z

25. The circuit below shows a light bulb, an ammeter (which measures the flow of electricity), a battery (cell), and a switch.

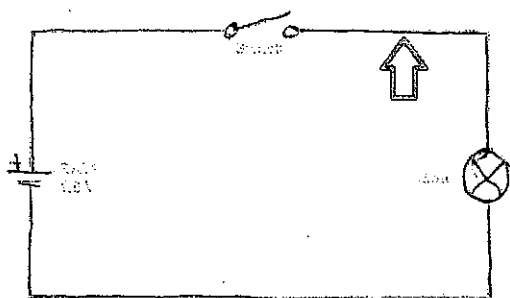


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What needs to be done for the light bulb to light up?

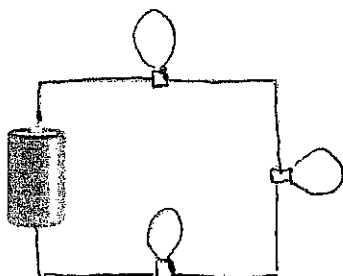
- A. Nothing, the bulb is already lit.
- B. The ammeter needs to be removed.
- C. The switch needs to be closed.
- D. The battery (coil) needs to be moved to the other side of the switch.

26. The circuit below shows an arrow pointing to a black line.



What does the black line represent?

- A. An energy source.
 - B. A load.
 - C. A box that contains the circuit.
 - D. A conductor.
27. The circuit below shows a battery and three identical light bulbs.

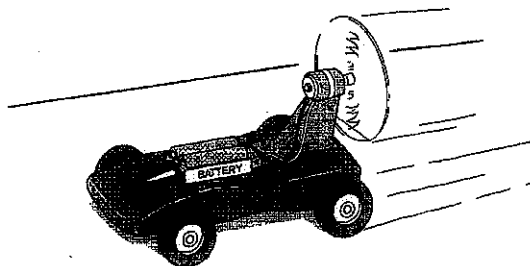


How will the bulbs burn?


- A. The three bulbs will be equally bright.
- B. Only the bulb at the bottom will burn since electricity flows from negative to positive.
- C. Only the bulb at the top will burn since electricity flows from positive to negative.
- D. The bulbs will not light because it is an open circuit.

28.

Toy Car



Written Response

In paragraph form, describe  energy transformations that occur in this battery-powered toy car. An energy transformation is where one type of energy is changed into another type of energy. Explain your answer fully. Circle each energy transformation. You may not use nuclear energy or electromagnetic energy in your answer.

