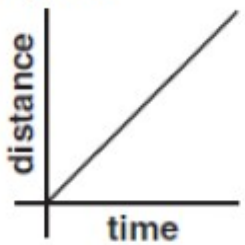
5.

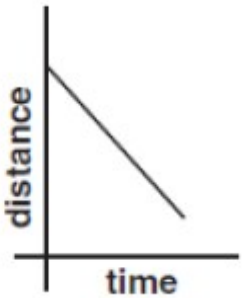
An object moves away from a motion detector with a constant speed. Which graph best represents the motion of the object?

A.

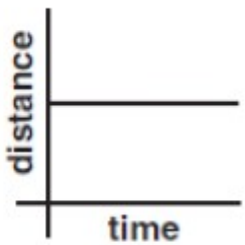
B.



C.



D.



17.

A student in a lab experiment jumps upward off a common bathroom scale as the lab partner records the scale reading. What does the lab partner observe during the instant the student pushes off?

A. the scale reading will remain unchanged during the entire time the student is in contact with the scale
B. the scale reading will increase momentarily then will decrease as the student is moving upward from the scale
C. the scale reading will increase during the entire time the studnet is in contact with the scale
D. the scale reading will decrease momentarily then will increase as the student is moving upward from the scale.

22.

Objects on the surface of Earth experience a large downward force although the universal gravitational constant is very small. Which of the following best explains this phenomenon?

A. Objects on Earth's surface exert a gravitational pull as strong as Earth's regardless of the gravitational constant
B. The universal gravitational constant only describes relationships between small objects in outer space
C. Earth's mass is large enough that it gravity remains strong even when multiplied by a small constant
D. The universal gravitational constant increases in proportion with the mass of an object

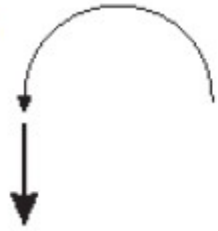
25

A satellite that is moving in a circular orbit around Earth and maintaining a constant speed will experience a

A. changing gravitational force toward Earth
B. net gravitational force toward Earth
C. changing acceleration away from Earth
D. net acceleration away from Earth

27

The picture shows the circular path of a toy plane being swung around on a string. What path would the toy take if the string broke?

A. 

B. 

C. 

D. 

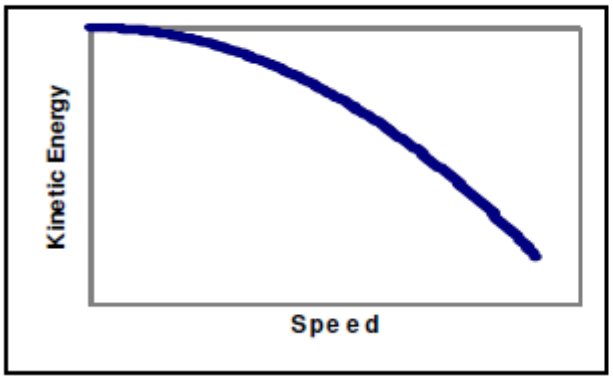
29

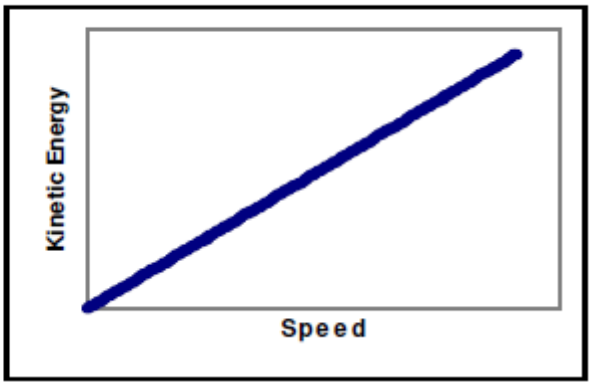
A small car is being driven in a circular path at constant speed on a horizontal surface. What is the direction of the frictional force that keeps the car from skidding as it travels along this path?

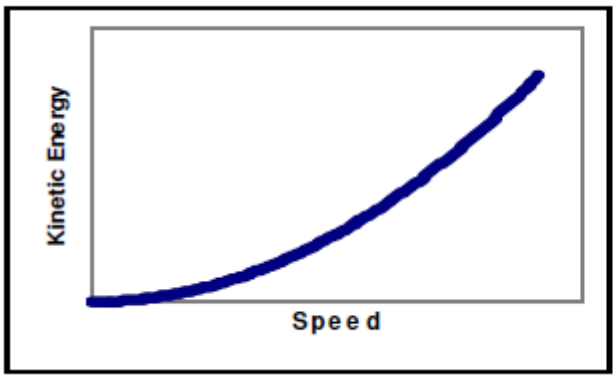
A. opposite the direction of the velocity of the car
B. in the same direction as the velocity of the car
C. toward the center of the circle
D. outward from the center of the circle

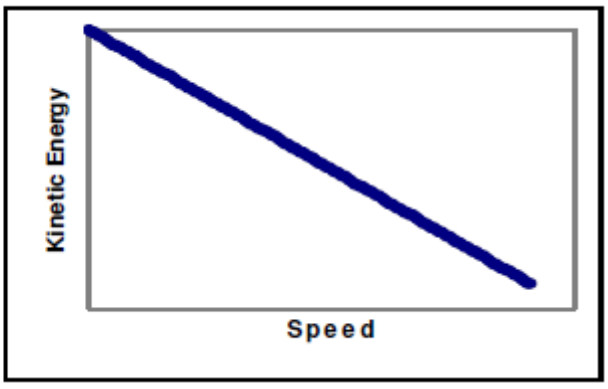
32

Which shows a graph of an object's kinetic energy as a function of the object's speed?

A. 

B. 

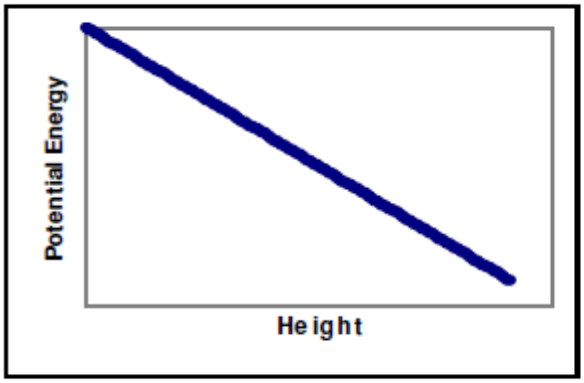
C. 

D. 

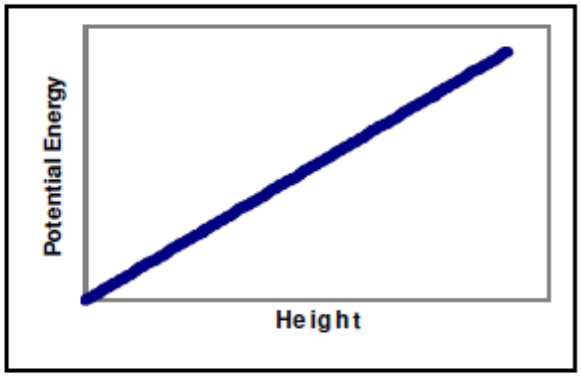
36

Which graph shows an object's potential energy as a function of its height off the ground?

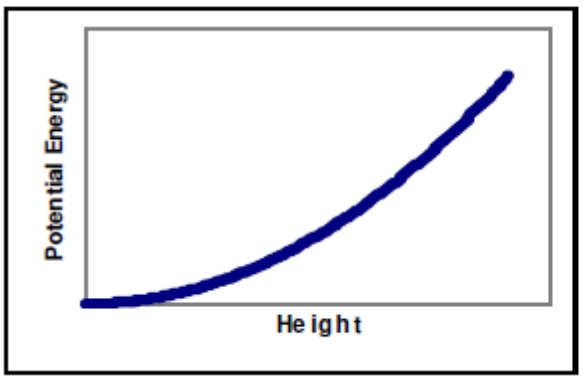
A.



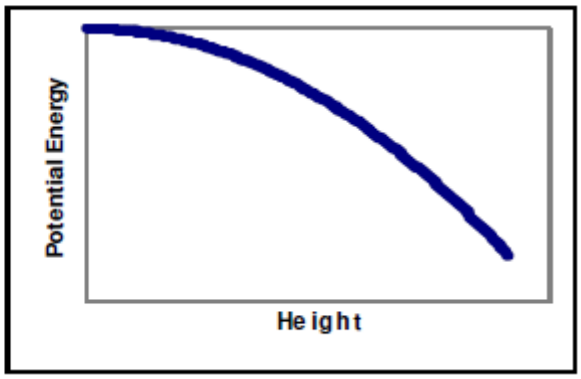
B.



C.



D.



41

A high diver steps off a diving platform that is 10 meters above the water. If no air resistance is present, during the fall there will be a decrease in the diver's

A. gravitational potential energy
B. total mechanical energy
C. kinetic energy
D. momentum

45

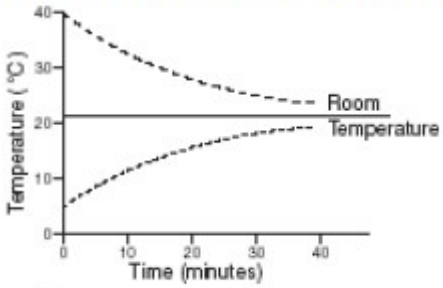
A pendulum bob swings back and forth. The kinetic energy of the bob is a maximum at

A. the bottom of the swing
B. its first release point
C. all positions
D. the top of the swing

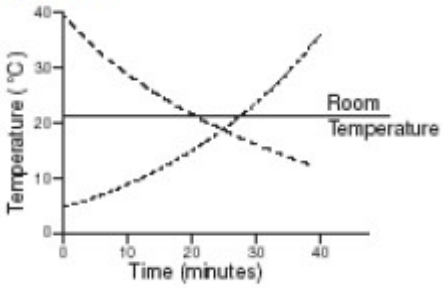
66

A cup of water at 40ºC and cup cup of water at 5ºC are left on a table. Which graph correctly shows the temperature of the two cups of water as time passes?

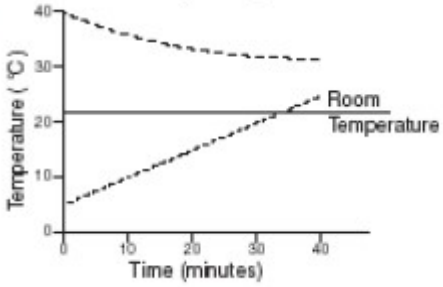
A.



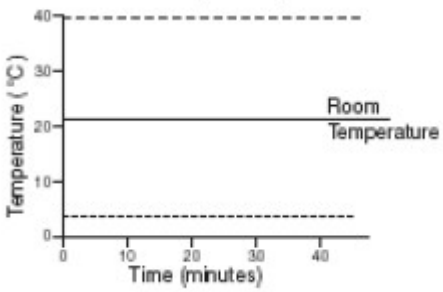
B.



C.



D.



67

A heated gas expands, raising a piston. Which of the following describes the energy exchanges of this process?

A. Energy is transferred to the gas by the piston, and to the piston from the heat source.
B. Energy is transferred to the gas from the heat source, and to the raised piston from the gas
C. Energy is transferred to the gas in the form of heat and work done by the piston
D. Energy is transferred directly to the piston from the heat source

68

When a steel block at 100 degrees C is placed on top of a copper block at 20 degrees C, the thermal energy of the copper begins to increase. Which of the following is the source of this increase in energy?

A. the work done by the molecules within the copper
B. the work done by the interation of the two metals
C. heat flowing by means of conduction
D. heat flowing by means of radiation

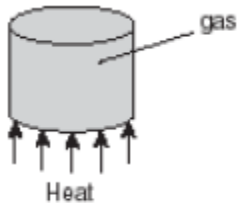
73

The pressure of a gas inside a closed, rigid container will increase when the gas temperature increases. The pressure of the gas increases because the

A. density of the gas decreases
B. rate of collisions of gas molecules with the surface increases.
C. container expands in size when heated.
D. gas molecules bond together to form more massive molecules

74

A gas in a sealed cylinder is heated.



Which of the following does not increase as the gas is heated?

A. the average number of gas molecules hitting the cylinder walls per second
B. the average kinetic energy of the gas molecules
C. the average speed of the gas molecules
D. the average distance between the gas molecules

75

When a gas is heated in a closed container, the internal pressure increases. Which *best* describes the reason for the increase in pressure

A. the average kintic energy of the gas molecules decreases
B. the potential energy of the gas increases
C. the average kinetic energy of the gas molecules increases
D. the potential energy of the gas decreases

76

Molecules move about in random motion whithin a liquid. The total internal energy of the liquid depends on all of the following except its

A. temperature B. mass C. specific heat D. melting point

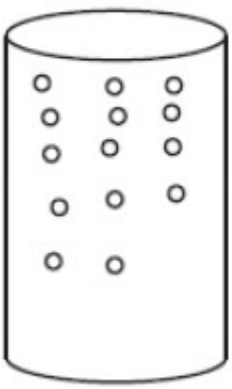
81

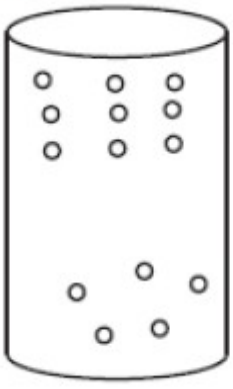
A container of cold water is dumped into a larger container of hot water. It is mixed and then left alone for a long time interval. The water temperature is found to

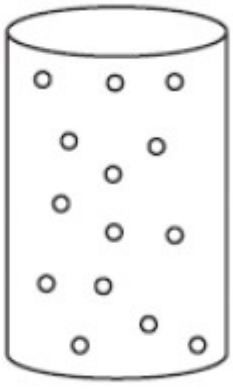
A. randomly vary from region to region in the container
B. be uniform throughout the container
C. fluctuate at all positions in the container
D. be greater at the bottom of the container

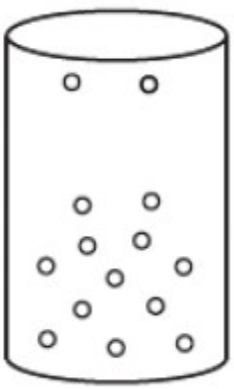
83

Nitrogen molecules within a glass tube are allowed to move randomly. Which figure shows the molecules in a state of greatest entropy?

A. 

B. 

C. 

D. 

86

A sound wave is produced in a metal cylinder by striking one end. Which of the following occurs as the wave travels along the cylinder?

A. its amplitude increases
B. its frequency increases
C. it transfers matter
D. it transfers energy

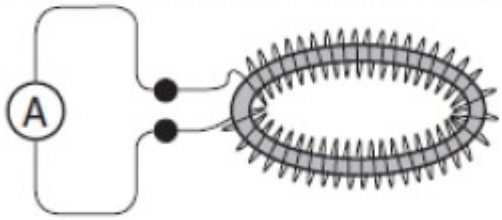
120

Superconductors are materials that appear to exhibit no resistance. Therefore, electrons passing through a superconductor will

A. generate no current
B. generate no heat
C. increase the current's power
D. decrease the electrons' charges

126

Students in a lab measure a current flowing through a long loop of wire.



If there is no current source connected to the wire, which of the following explains the source of the current?

A. the ammeter is acting as a current source
B. there is an oscillating magnetic field inside the loop
C. there is a fixed current running in a separate wire along the axis of the loop
D. there is a static configuration of positive charge external to the loop

127

In order to turn neon gas into neon plasma

A. energy must be removed from the neon gas
B. energy must be supplied to the neon gas
C. the neon gas must be ignited with a flame
D. the neon gas must become a superconductor

129

Angle between the spring gun and the horizon (degrees)	Range (meters)
20	6.4
30	8.6
40	9.8
50	9.6
60	8.7
70	6.3
80	3.4

The table shows the results of an experiment with a projectile fired from a spring gun. The results could be most easily interpreted if the data were

A. entered into a spreadsheet
B. put into a database
C. plotted in a histogram
D. plotted as range vs. angle

130

To create real-time graphs of an object's displacement versus time and velocity versus time, a student would need to use a

A. motion sensor
B. low-g accelerometer
C. potential difference probe
D. force probe

131

A student does an experiment to measure the acceleration of a falling object, which is $9.8\frac{m}{s^2}$

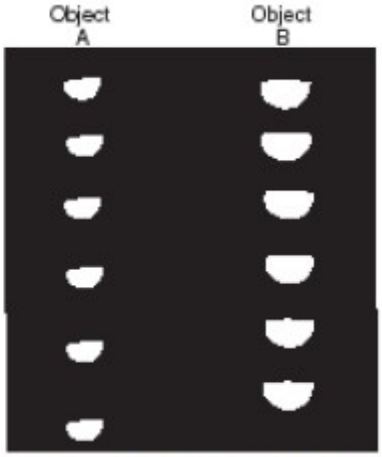
The student obtains experimental value of $14.6\ \frac{m}{s^2}$

Which of the following is the most likely cause of this discrepancy?

A. human error
B. air resistance
C. local fluctuations in gravity
D. the mass of the object

132

The picture shows two objects that were dropped and recorded with a stroboscopic cameral. The best explanation for the results is that object A



A. has less air resistance

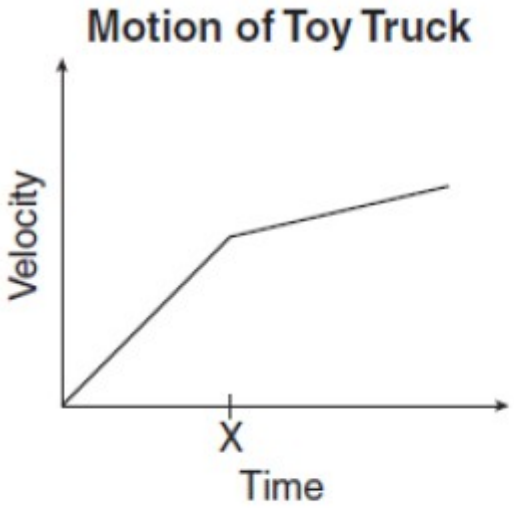
B. was dropped from a greater height

C. has greater mass

D. accelerated more slowly

133

A student applied a constant force to a toy truck. A graph of the truck's movement is shown below.



Which of the following could best explain the change in velocity at time X?

A. the truck's momentum became greater than its intertia

B. the truck went from moving in a curved path to moving in a straight path

C. the truck began traveling up a slightly sloped surface

D. the truck went from rolling on a rough surface to rolling on a polished surface

134

A student wires a series circuit that includes a block of rubber and a light bulb. She states that she does not expect the light bulb to light up when current is applied to the circuit. Which of the following best describes her statement

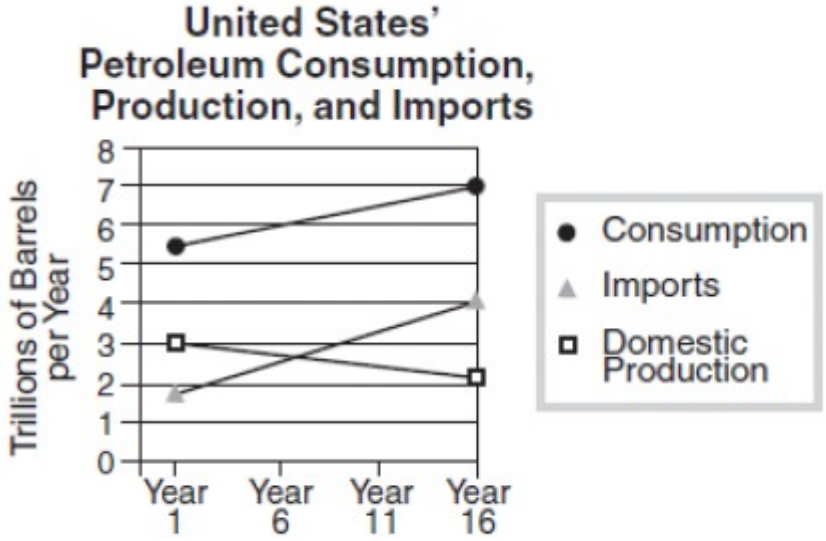
A. It is a conclusion based on observed data about electical phenomena.
B. It is a hypothesis based on knowledge of the theory of electrical phenomena.
C. It is a procedure based on her hypothesis about electrical phenomena
D. It is a theory based on her obeservations of electrical phenomena

135

A student attempts to measure the mass of a brick by measuing the force required to accelerate it at $1\frac{m}{s^2}$ on a level surface. The force required is 2N, and the student concludes that the brick has a mass of 2kg. A balance shows that the mass of the brick is really 1.5kg. The experimental error is most likely due to_____

A. gravity B. work C. friction D. inertia

136



An accurate analysis of the data in the graph could be used to support a hypothesis that the United States has

A. become increasingly dependent on imported petroleum
B. become more efficient in the conservation of petroleum
C. regulated production by prohibiting companies from producing petroleum
D. increased its reserves while consuming imported petroleum