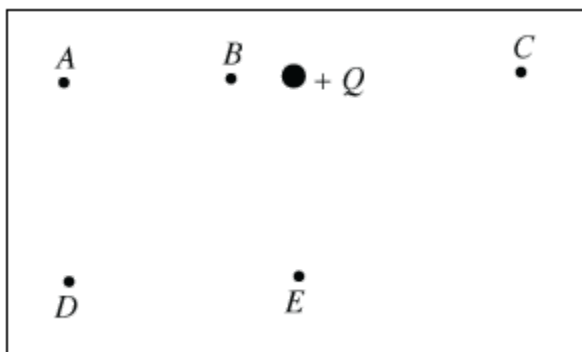


SAT Physics Practice Test 9

Question 1

The set of lettered choices below refers to multiple questions. Select the one lettered choice that best answers each question. A choice may be used once, more than once, or not at all in each set.



This question relates to a point charge $+Q$ fixed in position, as shown in the diagram. Five points near the charge and in the plane of the page are shown.

1 - At which point will the magnitude of the electric field be the least?

- Point A
- Point B
- Point C
- Point D
- Point E

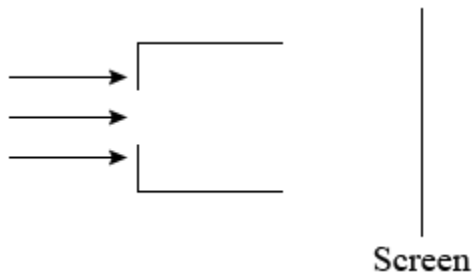
2- At which point will an electron experience a force directed toward the top of the page?

- A
- B
- C
- D

E

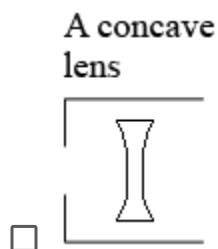
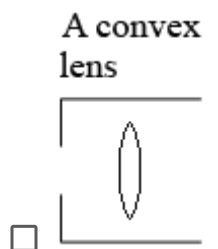
Question 2

The set of lettered choices below refers to multiple questions. Select the one lettered choice that best answers each question. A choice may be used once, more than once, or not at all in each set.



A beam of light is incident on a rectangular opening in the front of a box, as shown in the side view above. The back of the box is open. After passing through the box, the light is incident on a screen. The following devices may be in the box, positioned as shown.

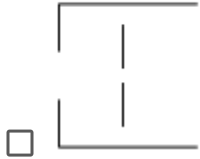
1- Which device could produce a tiny spot of light on the screen?



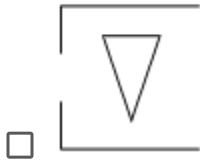
**A thick sheet
of glass**



**An opaque card with
a very narrow slit**

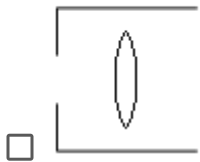


**A prism with vertex
pointing down**

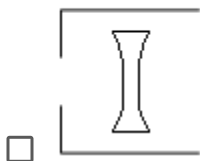


2- Which device could produce a diffraction pattern consisting of a central bright fringe with parallel secondary fringes that decrease in intensity with increasing distance from the center of the screen?

**A convex
lens**



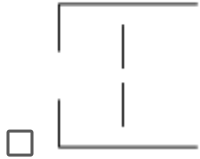
**A concave
lens**



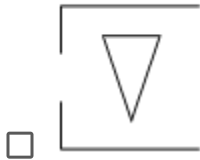
A thick sheet
of glass



An opaque card with
a very narrow slit



A prism with vertex
pointing down



Question 3

The half-life of one isotope of radium is about 1,600 years. In a given sample of this isotope, $\frac{15}{16}$ of the radium atoms will decay in a time most nearly equal to?

- 1,000 years
- 1,500 years
- 1,600 years
- 3,200 years
- 6,400 years

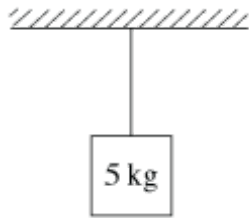
Question 4

When a vector of magnitude 6 units is added to a vector of magnitude 8 units, the magnitude of the resultant vector will be?

- exactly 2 units
- exactly 10 units

- exactly 14 units
- 0 units, 10 units, or some value between them
- 2 units, 14 units, or some value between them

Question 5



A 5-kilogram block is suspended by a cord from the ceiling, as shown above. The force exerted on the block by the cord is most nearly?

- zero
- 25 N
- 50 N
- 100 N
- 200 N

Question 6



A known positive charge is located at point P that is between two unknown charges, and Q_2 , as shown above. P is closer to Q_2 than Q_1 . If the net electric force acting on the charge at P is zero, it may correctly be concluded that:

- Both Q_1 and Q_2 are positive
- Both Q_1 and Q_2 are negative
- Q_1 and Q_2 have opposite signs
- Q_1 and Q_2 have the same sign, but the magnitude of Q_1 is greater than the magnitude of Q_2
- Q_1 and Q_2 have the same sign, but the magnitude of Q_2 is greater than the magnitude of Q_1

Question 7

Two small conducting spheres are identical except that sphere X has a charge of negative 10 micro coulombs and sphere Y has a charge of plus 6 micro coulombs. After the spheres are brought in contact and then separated, what is the charge on each sphere, in micro coulombs?

Sphere ^X	Sphere ^Y
-4	0

Sphere ^X	Sphere ^Y
-2	-2

Sphere ^X	Sphere ^Y
+2	-2

Sphere ^X	Sphere ^Y
+4	0

Sphere ^X	Sphere ^Y
+6	-10

Question 7

A satellite moving in a circular orbit with respect to the Earth's center experiences a gravitational force. If the satellite is put into a new circular orbit of a smaller radius, how will the gravitational force and the speed of the satellite change, if at all?

Gravitational Force	Speed
Decrease	Decrease

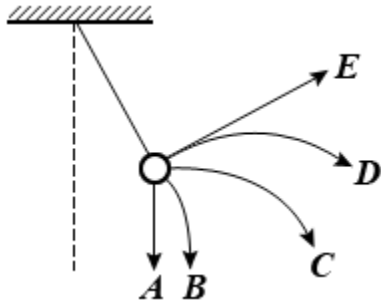
Gravitational Force	Speed
Decrease	Increase

Gravitational Force	Speed
Remain the same	Remain the same

Gravitational Force	Speed
Increase	Decrease

Gravitational Force	Speed
Increase	Increase

Question 8



A pendulum is swinging upward and is halfway toward its highest position, as shown above when the string breaks. Which of the paths shown best represents the one that the ball would take after the string breaks?

- A
- B
- C
- D
- E

Question 9

If the addition of 2,000 joules of heat to 10 kilograms of a substance raises its temperature 2°C , the specific heat of the substance is?

- 0.2J/kg- $^{\circ}\text{C}$
- 50J/kg- $^{\circ}\text{C}$
- 100J/kg- $^{\circ}\text{C}$
- 200J/kg- $^{\circ}\text{C}$
- 0.01J/kg- $^{\circ}\text{C}$

Question 10

An object with mass m and speed v_0 directed to the right strikes a wall and rebounds with speed v_0 directed to the left.

The change in the object's kinetic energy is?

- $-mv_0^2$

- $-\frac{1}{2} m v_0^2$
- Zero
- $\frac{1}{2} m v_0^2$
- $m v_0^2$

Question 11

Which one is NOT a vector?

- A. Displacement
- B. Velocity
- C. Acceleration
- D. Linear momentum
- E. Kinetic energy

Question 12

If an object's mass and the net force it feels are both known, then Newton's second law could be used to directly calculate which quantity?

- A. Displacement
- B. Velocity
- C. Acceleration
- D. Linear momentum
- E. Kinetic energy

Question 13

Which quantity can be expressed in the same units as an impulse?

- A. Displacement
- B. Velocity
- C. Acceleration
- D. Linear momentum

E. Kinetic energy

Question 14

If an object's speed is changing, which of the quantities could remain constant?

- A. Displacement
- B. Velocity
- C. Acceleration
- D. Linear momentum
- E. Kinetic energy

Question 15

Which provides the basis for the observation that the universe is expanding?

- A. Newton's law of universal gravitation
- B. Redshift of light from other galaxies
- C. The fact that every element of atomic number greater than 83 is radioactive
- D. The zeroth law of thermodynamics
- E. Mass–energy equivalence

Question 16

Which principle could be used to help calculate the amount of radiation emitted by a star?

- A. Newton's law of universal gravitation
- B. Redshift of light from other galaxies
- C. The fact that every element of atomic number greater than 83 is radioactive
- D. The zeroth law of thermodynamics
- E. Mass–energy equivalence

Question 17

Which is due to the change in wave speed when a wave strikes the boundary to another medium?

- A. Reflection
- B. Refraction

- C. Polarization
- D. Diffraction
- E. Interference

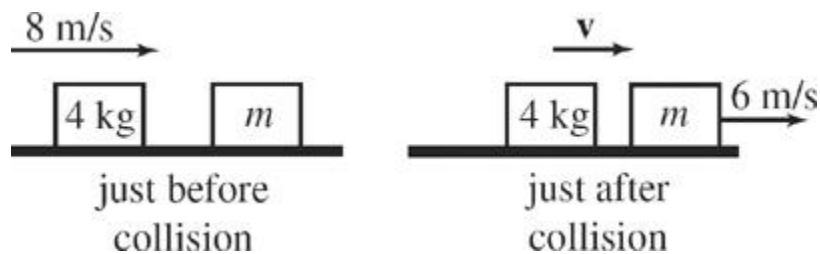
Question 18

Which phenomenon is NOT experienced by sound waves?

- A. Reflection
- B. Refraction
- C. Polarization
- D. Diffraction
- E. Interference

Question 19

It refers to the collision of two blocks on a frictionless table. Before the collision, the block of mass m is at rest.

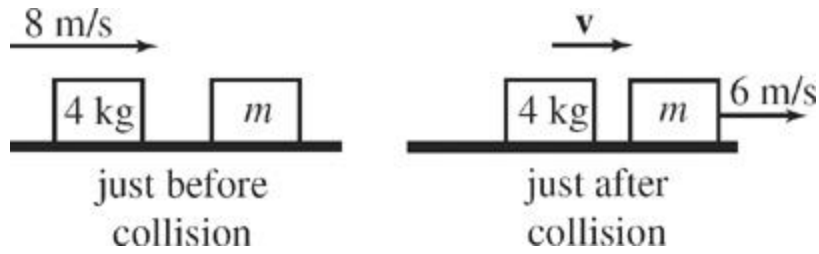


What is the total momentum of the blocks just AFTER the collision?

- A. 12 kg-m/s
- B. 16 kg-m/s
- C. 18 kg-m/s
- D. 24 kg-m/s
- E. 32 kg-m/s

Question 20

It refers to the collision of two blocks on a frictionless table. Before the collision, the block of mass m is at rest.

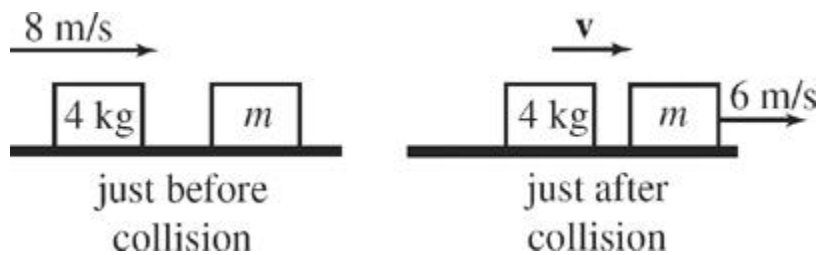


If the collision were elastic, what is the total kinetic energy of the blocks just AFTER the collision?

- A. 16 J
- B. 32 J
- C. 64 J
- D. 128 J
- E. 256 J

Question 21

It refers to the collision of two blocks on a frictionless table. Before the collision, the block of mass m is at rest.



If the blocks had instead stuck together after the collision, with what speed would they move if $m = 12\text{ kg}$?

- A. 2.0 m/s
- B. 2.7 m/s
- C. 3.2 m/s
- D. 4.0 m/s
- E. 4.6 m/s

Question 22

Two particles have unequal charges; one is $+q$ and the other is $-2q$. The strength of the electrostatic force between these two stationary particles is equal to F . What happens to F if the distance between the particles is halved?

- A. It decreases by a factor of 4.
- B. It decreases by a factor of 2.
- C. It remains the same.
- D. It increases by a factor of 2.
- E. It increases by a factor of 4.

Question 23

A simple harmonic oscillator has a frequency of 2.5 Hz and an amplitude of 0.05 m. What is the period of the oscillations?

- A. 0.4 sec
- B. 0.2 sec
- C. 8 sec
- D. 20 sec
- E. 50 sec

Question 24

A light wave, traveling at 3×10^8 m/s has a frequency of 6×10^{15} Hz. What is its wavelength?

- A. 5×10^{-8} m
- B. 2×10^{-7} m
- C. 5×10^{-7} m
- D. 5×10^{-6} m
- E. 2×10^7 m

Question 25

A beam of monochromatic light entering a glass window pane from the air will experience a change in

- A. frequency and wavelength

- B. frequency and speed
- C. speed and wavelength
- D. speed only
- E. wavelength only

Question 26

Two cannons shoot cannonballs simultaneously. The cannon embedded in the ground shoots a cannonball whose mass is half that of the cannonball shot by the elevated cannon. Also, the initial speed of the cannonball projected from ground level is half the initial speed of the cannonball shot horizontally from the elevated position. Air resistance is negligible and can be ignored. Each cannonball is in motion for more than 2 seconds before striking the level ground.

For the cannonball of mass m , which of the following quantities decreases as the cannonball falls to the ground?

- A. Kinetic energy
- B. Potential energy
- C. Momentum
- D. Speed
- E. Mass

Question 27

Which of the following statements is true concerning phase changes?

- A. When a liquid freezes, it releases thermal energy into its immediate environment.
- B. When a solid melts, it releases thermal energy into its immediate environment.
- C. For most substances, the latent heat of fusion is greater than the latent heat of vaporization.
- D. As solid melts, its temperature increases.
- E. As a liquid freezes, its temperature decreases.

Question 28

Four point charges are labeled Charge 1, Charge 2, Charge 3, and Charge 4. It is known that Charge 1 attracts Charge 2, Charge 2 repels Charge 3, and Charge 3 attracts Charge 4. Which of the following must be true?

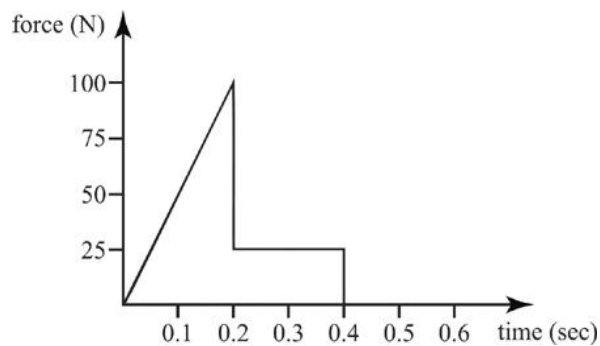
- A. Charge 1 attracts Charge 4.
- B. Charge 2 attracts Charge 3.
- C. Charge 1 repels Charge 3.
- D. Charge 2 repels Charge 4.
- E. Charge 1 repels Charge 4.

Question 29

An object of mass 5 kg is acted upon by exactly four forces, each of magnitude 10 N. Which of the following could NOT be the resulting acceleration of the object?

- A. 0 m/s^2
- B. 2 m/s^2
- C. 4 m/s^2
- D. 8 m/s^2
- E. 10 m/s^2

Question 30



The total force acting on an object as a function of time is given in the graph above. What is the magnitude of the change in momentum of the object between $t = 0$ and $t = 0.4 \text{ sec}$?

- A. 2 kg-m/sec
- B. 5 kg-m/sec
- C. 10 kg-m/sec
- D. 12 kg-m/sec

E. 15 kg-m/sec