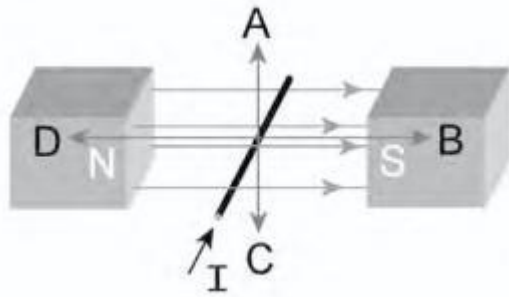


SAT Physics Practice Paper 18



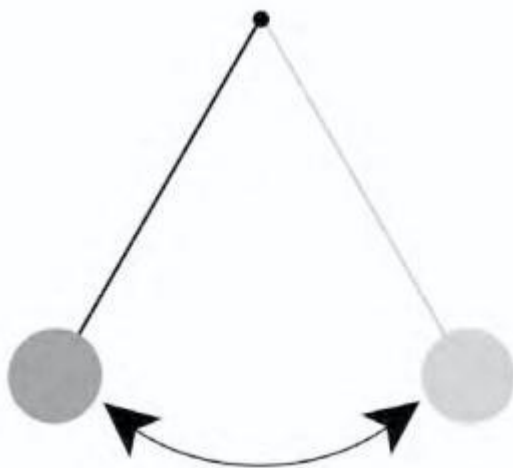
1.

A wire within a magnetic field has a current flowing in it as shown. Any force exerted on the wire is in the direction of

- A. point A.
- B. point B.
- C. point C.
- D. point D.
- E. No forces are exerted on the wire.

2. A 24 V battery is connected to a 4 ohm resistor, causing a current of 5 amperes. What is the internal resistance of the battery?

- A. 0 W
- B. .8 W
- C. .4 W
- D. 1.6 W
- E. 1.2 W



3.

A pendulum is used on Earth and then transported to the moon where it is released and allowed to swing freely. Which of the following statements about the pendulum is correct?

- A. The period of the pendulum on the moon is greater than it was on Earth.
- B. The frequency of the pendulum on the moon is greater than it was on Earth.
- C. The potential energy of the pendulum on the moon is greater than it was on Earth.
- D. The kinetic energy of the pendulum on the moon is greater than it was on Earth.
- E. The period, the frequency, the kinetic energy, and the potential energy of the pendulum on the moon are the same as they were on Earth.

4. A girl standing on a high bridge over a creek throws a rock straight down at leaves floating in the creek. Just as she throws the rock she accidentally drops another rock. Neglecting air resistance, which statement best describes the situation just as the rocks reach the water?

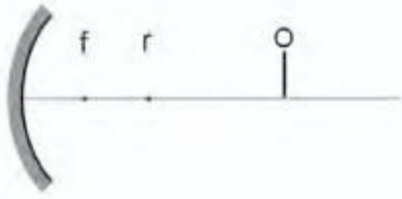
- A. The acceleration of the thrown rock is greater.
- B. The acceleration of the dropped rock is greater.
- C. The acceleration of both rocks is the same.
- D. The average velocity of both rocks is the same.
- E. The final velocity of both rocks is the same.

5. When does an artificial earth satellite that is in an elliptical orbit experience its greatest centripetal acceleration?

- A. When it first enters orbit
- B. When it is nearest the earth
- C. When it is farthest from the earth
- D. When it leaves orbit
- E. Its centripetal acceleration is always the same

6. A sample of a radioactive substance has a half-life of 20 minutes. If the sample's activity is 200 counts/second, what is the number of counts/second after one hour passes?

- A. 6.25 counts/sec
- B. 12.5 counts/sec
- C. 25 counts/sec
- D. 50 counts/sec
- E. 100 counts/sec



7.

An object (O) is placed in front of a concave mirror as shown in the diagram above. Which of the following choices best describes the image formed?

- A. Virtual and magnified
- B. Real and erect
- C. Inverted and magnified
- D. Virtual and reduced
- E. Real and inverted

8. A very rich boy has an ice hockey practice floor that is essentially frictionless installed in a long refrigerated boxcar. As the train is moving, the boy practices shooting at the goal at the other end of the car. Just as he releases his shot, the train goes around a sharp curve to the left (looking forward in the direction the boy is shooting). Which statement most accurately describes the boy's shot?

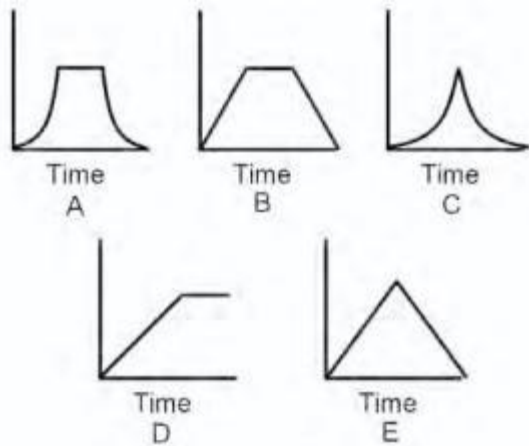
- A. It curves to the right and misses to the right side of the net.
- B. It curves to the left and misses to the left side of the net.
- C. It travels straight and misses to the right side of the net.
- D. It travels straight and misses to the left side of the net.
- E. It travels straight into the goal.



9.

The three blocks in the diagram above are identical and are pulled at a constant rate across a surface that has a frictional coefficient of .22. Which of the following statements about the tensions in the connecting strings is correct?

- A.  $T_1$  is equal to  $(T_3 - T_2)$ .
- B.  $T_1$  is equal to  $(T_2 - T_3)$ .
- C.  $T_2$  is equal to  $(T_3 - T_1)$ .
- D.  $T_3$  is equal to  $(T_1 - T_2)$ .
- E.  $T_3$  is equal to  $(T_2 - T_1)$ .



10.

A boxcar rolls down an incline and strikes a stationary boxcar at the bottom of the incline. The two boxcars stick together and roll a short distance before they come to a stop. Which of the graphs above shows the total momentum of both boxcars throughout the time they are moving?

- A. Time A
- B. Time B
- C. Time C
- D. Time D
- E. Time E

11. At the third maxima on both sides of the zeroth fringe in a Young's double slit experiment, the light

- A. travels the same distance.
- B. from the lower opening travels three times farther than light from the upper opening.
- C. from the upper opening travels three times farther than light from the lower opening.
- D. from either opening travels 2 wavelengths farther than light from the other opening.
- E. from either opening travels 3 wavelengths farther than light from the other opening.

12. A professional golfer strikes a golf ball with his driver, imparting a momentum of  $8 \text{ kg}\cdot\text{m/s}$  on the ball. The golf ball strikes a wall and maintains contact for  $.0025$  seconds before it bounces straight backward at the same velocity with which it struck the wall. The momentum of the golf ball is

- A.  $6400 \text{ kg}\cdot\text{m/s}$
- B.  $3200 \text{ kg}\cdot\text{m/s}$
- C.  $8 \text{ kg}\cdot\text{m/s}$
- D.  $.02 \text{ kg}\cdot\text{m/s}$
- E.  $.01 \text{ kg}\cdot\text{m/s}$

13. Two disks of equal mass but different diameter are connected with an axle system that allows them to roll down an incline together. Both disks start and finish at the same time. Which of the following statements best describes the disks?

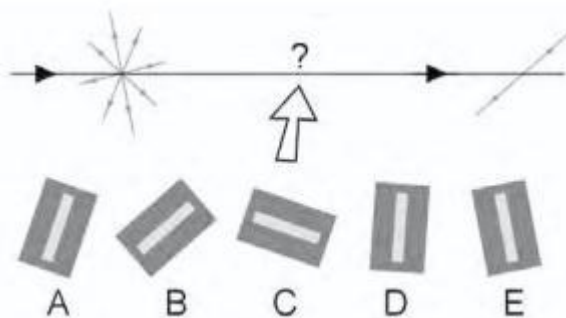
- A. Their tangential velocity is the same.
- B. Their tangential acceleration is the same.
- C. Their angular velocity is the same.
- D. Their angular displacement is the same.
- E. Their angular acceleration is the same.

14. A motorcycle racer starts from rest and accelerates on a straight track at  $5 \text{ m/s}^2$ . How far does the racer travel in 8 seconds?

- A. 40 m
- B. 60 m
- C. 80 m
- D. 120 m
- E. 160 m

15. A photon can eject an electron from the surface of a photovoltaic metal if and only if

- A. the frequency of the photon is above the activation minimum.
- B. the wavelength of the photon is above the activation minimum.
- C. the speed of the photon is above an activation minimum.
- D. the momentum of the photon is below the activation minimum.
- E. the momentum of the impacted electron is above the activation minimum.



16.

Which of the Polaroids in the diagram above will produce the polarized light shown?

- A. Polaroid A

- B. Polaroid B
- C. Polaroid C
- D. Polaroid D
- E. Polaroid E

**17.** Which of the following best describes the condition of an enclosed gas during an isothermal expansion?

- A. The gas remains at constant pressure.
- B. The gas remains at constant volume.
- C. The gas remains at constant temperature.
- D. The gas remains at constant density.
- E. The gas remains at constant molarity.

**18.** The velocity of a moving object is doubled. Which of the following statements about the object is correct?

- A. The kinetic energy of the object increases by four.
- B. The displacement of the object increases by four.
- C. The momentum of the object increases by four.
- D. The frictional force increases by four.
- E. None of these quantities increase by four.

**19.** Two concurrent forces act at right angles to one another. The resultant force is 65N and one of the component forces is 35N. What is the force of the other component?

- A. 40N
- B. 45N
- C. 50N
- D. 55N
- E. 60N

**20.** Which of the following statements is/are correct about an object that has no unbalanced forces applied to it?

- I. The object has no velocity.
- II. The object has no acceleration.
- III. The object does not move.

- A. I only
- B. II only
- C. I and III only
- D. II and III only
- E. I, II, and III

**21.** When a gas undergoes an adiabatic expansion, its

- A. energy increases.
- B. pressure increases.
- C. volume decreases.
- D. temperature increases.
- E. temperature decreases.

**22.** Two moving electrons enter a strong magnetic field at right angles to the field. The velocity of one of the electrons is four times greater than the velocity of the other electron. Which of the following best describes the ratio of the circular radii the two electrons follow?

- A. The faster electron has a radius two times larger than the slower electron.
- B. The faster electron has a radius four times larger than the slower electron.
- C. The faster electron has a radius eight times larger than the slower electron.
- D. The faster electron has a radius sixteen times larger than the slower electron.
- E. The faster electron has a radius sixty-four times larger than the slower electron.

**23.** A pair of particles (helium nuclei) approach one another head on. Compared to the force they exert on one another at a distance of .066 m, by how much will the force the two particles exert on one another at .033 m increase?

- A. 2
- B. 3
- C. 4
- D. 6
- E. 8

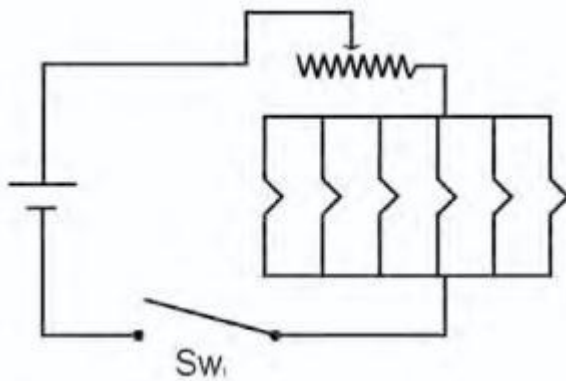
**24.** According to Einstein's theory of relativity, which of the following would be a correct assumption to make for a traveler in a spaceship traveling at .95c?

- A. Clocks on the spaceship run more slowly.

- B. The spaceship will appear shortened.
- C. The mass of the spaceship increases while it is in motion.
- D. Light travels at the same velocity for the traveler whether he is moving or not moving.
- E. All of these assumptions would be correct.

**25.** The engineer of a train blows the train whistle as he approaches a crossing. A few moments later he hears an echo from the whistle. The engineer hears the echo of the whistle because of

- A. reflection.
- B. refraction.
- C. constructive interference.
- D. destructive interference.
- E. Doppler effect.



**26.**

The diagram above shows a battery and a variable resistor set at its midpoint resistance in series with a parallel light circuit. Switch 1 ( $Sw_1$ ) is closed and the light bulbs illuminate. When the variable resistor is moved slightly to the left ( $L$ ) the bulbs dim a little. When the variable resistor is moved slightly to the right ( $R$ ) the bulbs brighten slightly. What happens in the circuit when the variable resistor is set all the way to the right?

- A. The lights brighten considerably.
- B. The total circuit resistance increases.
- C. The total circuit current decreases.
- D. The total applied voltage increases.
- E. The total power used in the circuit increases.

**27.** The density of any substance from the most dense phase to the least dense phase is

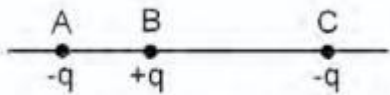
- A. gas, liquid, solid



- B. liquid, solid, gas
- C. liquid, gas, solid
- D. solid, gas, liquid
- E. solid, liquid, gas

**28.** An object that is placed on the edge of a constant speed turntable has

- A. constant linear velocity.
- B. tangential acceleration.
- C. centripetal acceleration.
- D. centrifugal acceleration.
- E. no acceleration.



**29.**

The diagram above shows a proton at point B between two electrons at points A and C. The distance from point B to point C is twice the distance from point B to point A. The force the proton experiences at point B is

- A. two times stronger from the electron at A.
- B. three times stronger from the electron at A.
- C. four times stronger from the electron at A.
- D. the same from both electrons.
- E. It is not possible to determine the force the proton experiences from the information provided.

**30.** A laser beam passes from the air into a piece of plexiglass. All of the following are false EXCEPT

- A. the velocity decreases.
- B. the wavelength increases.
- C. the frequency decreases.
- D. the period decreases.
- E. None of the above is true.

**31.** A 30 kg child is standing in the back of a stationary 10 kg wagon that is free to move. The child jumps from the wagon into his mother's arms. Which of the following statements is correct at the moment he jumps from the wagon?

- A. The child's velocity is greater than the wagon's velocity.
- B. The wagon's velocity is greater than the child's velocity
- C. The impulse exerted by the child on the wagon is the same as the momentum gained by the wagon.
- D. The impulse exerted by the wagon on the child is larger than the momentum gained by the child.
- E. None of these statements is correct.

**32.** Ice, which has a temperature of  $0^{\circ}\text{C}$ , is added to 500 g of water that has a temperature of  $100^{\circ}\text{C}$ . Ice is continually added to the system until it has all melted and no more ice will melt. What is the temperature of the water in the system?

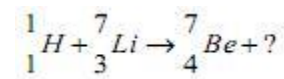
- A.  $50^{\circ}\text{C}$
- B.  $25^{\circ}\text{C}$
- C.  $4.184^{\circ}\text{C}$
- D.  $1^{\circ}\text{C}$
- E.  $0^{\circ}\text{C}$

**33.** Two similar pith balls are very near to one another, and each is charged with 2 excess electrons. The angle  $\theta$  between  $q_1$  and  $q_2$  is  $5.5^{\circ}$ . One electron is removed from  $q_1$  and placed on  $q_2$  so that  $q_1$  has 1 electron and  $q_2$  has 3 electrons. The angle between the pith balls changes to  $4^{\circ}$ . Which of the following statements is correct?

- I. The amount of electrostatic charge has decreased.
- II. The electrostatic force between the pith balls has decreased.
- III. Both the electrostatic charge and force have decreased.

- A. I only
- B. II only
- C. I and III only
- D. II and III only
- E. I, II, and III

**34.** Complete the nuclear reaction below by selecting the answer choice that correctly completes the reaction.



- A.  ${}^1_1\text{H}$

B.  $\frac{1}{n}$

C.  $-1^{\epsilon}$

D.  $\alpha$

E.  $\gamma$

**35.** A stuntman drives a brand new 800kg sports car off a high cliff at 200 km/hour. At the exact moment that the car is driven off the cliff, an 800kg rock is dislodged and falls straight down toward the ground. Which of the following is a correct statement about the event?

A. The car hits the ground first.

B. The rock hits the ground first.

C. The car and the rock hit the ground at the same time.

D. The x velocities of the car and the rock equalize over a period of time.

E. The x accelerations of the car and the rock are different

**36.** A person standing 1.5 m in front of a plane flat mirror would see their image at a distance of

A. .75 m

B. 1.5 m

C. 2.25 m

D. 3 m

E. 6 m

**37.** A paperboy rides his bicycle down the street and throws the papers to houses as he rides by them. When a thrown paper leaves his hand, which of the following statements is NOT true about the paper?

A. Its velocity changes.

B. Its acceleration changes.

C. Its displacement changes.

D. Its position relative to the earth changes.

E. Its position relative to the paperboy changes.

**38.** A tugboat pulls on an 84,000N barge with a cable having a breaking strength of 15,000N. The maximum acceleration the tugboat can apply to the barge without the cable breaking is

A.  $.75 \text{ m/s}^2$

B.  $1.0 \text{ m/s}^2$

- C.  $1.25 \text{ m/s}^2$
- D.  $1.5 \text{ m/s}^2$
- E.  $1.75 \text{ m/s}^2$

**39.** Two equal vectors  $V$  and  $V'$  are added together. All of the following are possible values for the magnitude of the resultant vector EXCEPT

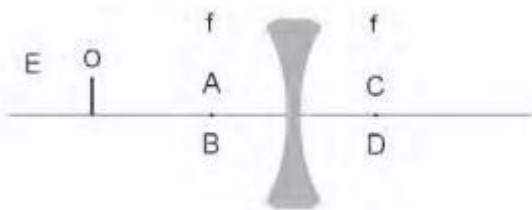
- A. 0
- B.  $1/4 V$
- C.  $1/2 V$
- D.  $2 V$
- E.  $4 V$

**40.** A 30N child can push open a 1000N door because

- A. the torque the child exerts on the door is greater than the torque the door exerts on the child.
- B. the lever arm through which the child's force is exerted is less than the lever arm through which the door's weight is exerted.
- C. the door's center of gravity is located at the bottom hinge.
- D. the door's center of gravity is located at the top hinge.
- E. the door's center of gravity is located at the doorknob.

**41.** The kinetic energy a pendulum contains when it passes through its zero displacement may be decreased by

- A. increasing the mass of the bob.
- B. increasing the thickness of the string.
- C. decreasing the length of the string.
- D. increasing the length of the string.
- E. decreasing the displacement of the



**42.**

An object (O) is placed in front of a convex lens as shown. Which of the positions best describes the location of the image?

- A. Position A
- B. Position B
- C. Position C
- D. Position D
- E. Position E

**43.** During a lacrosse game, an attacking player shoots a low hard shot into the goal. The ball leaves the lacrosse stick and travels into the net very quickly. What happens as the ball flies toward the goal?

- A. The horizontal acceleration of the ball increases.
- B. The vertical acceleration of the ball increases.
- C. The horizontal velocity of the ball is constant.
- D. The vertical velocity of the ball is constant.
- E. All the listed quantities are constant.

**44.** Einstein's theory of relativity is based on which of the following statements?

- A. Mass and energy are equivalent.
- B. The velocity of light is a constant.
- C. Space and time are anomalies.
- D. All particles have antiparticles.
- E. Energy is infinite.

**45.** While a child flies a kite on a breezy day, a burst of wind causes the kite to fly in 1.6 m diameter circles in the sky every second. If the circular motion were converted to a straight down speed, how fast would the kite dive toward the ground?

- A. 3.14 m/s
- B. 5 m/s
- C. 6.28 m/s
- D. 9.8 m/s
- E. 15.7 m/s