



SIMO EDUCATION
INDIAN PHYSICS OLYMPIAD (SIPHO) 2013
SCREENING TEST
STANDARD IX

IX
PHYSICS

Time: 60 minutes

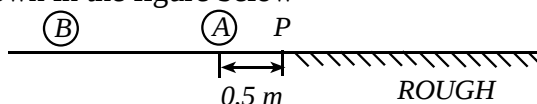
Maximum Marks : 85

Instructions:

- The question paper contains 25 questions across two Sections to be answered in 60 minutes
- Section-A contains 10 questions. Each question carries **4** marks and may have MORE THAN ONE correct answer.
- Section-B contains 15 questions. Each question carries **3** marks and has ONLY ONE correct answer.
- One mark would be deducted for every wrong answer. No marks would be deducted for unattempted questions.
- You can retain the Question paper with you after the Olympiad.
- Fill the OMR sheet completely and carefully. Please leave space after initials in your name

SECTION - A

1. Consider the track shown in the figure below



Two identical small marbles A and B can be seen. A is at rest while B moves towards A at uniform velocity. The track is smooth towards left of P while it offers a resistance of 0.1 m/s^2 towards its right. After some time, the marbles are seen at rest 25cms apart. After collision, A travels $1/6$ th second more time than B to come to rest.

Which of the following statements is/are correct?

- A) B travels with a speed of 5 m/s before collision.
- B) The total distance travelled by A after collision is 0.45 m
- C) 48% of kinetic energy is lost during collision
- D) After collision, there is a time (before they rest) at which both of their momenta are equal.

2. Consider a two particle system shown below



Particle A is accelerating towards right with 1 m/s^2 and particle B is accelerating towards left with 2 m/s^2 . Then,

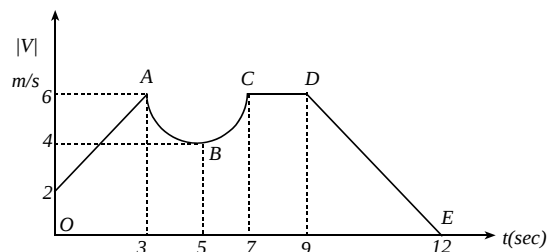
- A) Total momentum of system is conserved
- B) Total Momentum is not conserved (even before collision) as the particles are accelerating
- C) Total Momentum is constant only till they collide, but change after they collide.
- D) Total Momentum (magnitude) after collision will be less than that of before collision.

3. A person wants to check his weight by standing on a weighing scale. However, he is trying to do so in an elevator. Let his actual weight on ground be W.
- A) His weight while elevator is moving up will be less than W
 - B) His weight while elevator is moving down will be less than W
 - C) His weight while elevator is moving up will be more than W
 - D) His weight while elevator is moving down will be more than W.
4. A body of mass 0.5 kg is travelling towards right from point O at speed of 10 m/s. It is under influence of a force of 2N acting towards left. The time at which magnitude of displacement is 12m is/are
- A) 2 sec
 - B) 3 sec
 - C) 5 sec
 - D) 6 sec

5. The following plot represent velocity (magnitude) on Y axis and time (in sec) on X axis. ABC is a semicircular loop in the plot.

Which of the following statements is/are correct?

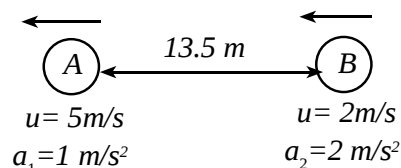
- A) The maximum acceleration of the body during the journey is $4/3 \text{ m/s}^2$.
 B) The distance travelled by body during ABC loop is $4(6-\pi)\text{m}$
 C) At B, the net force acting on body is zero
 D) The body finally decelerates at 2 m/s^2 .



6. Two bodies A and B are travelling towards left as shown below at $t=0$. Their accelerations are also directed towards left.

Which of the following statements is/are true?

- A) They collide in 9 seconds
 B) The maximum separation between them before collision is 18m

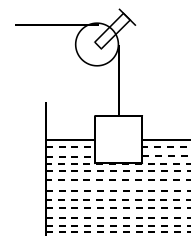


- C) If equal force is acting on both bodies, the difference of their momenta is constant before collision
 D) Sum of kinetic energies of bodies is constant

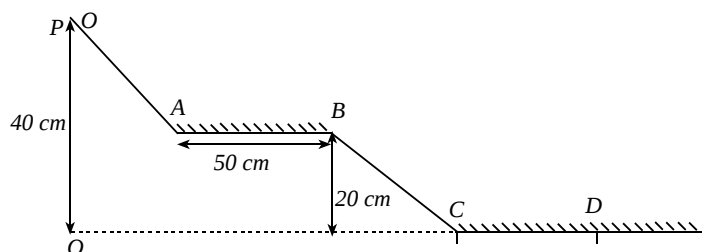
7. A cubical block is immersed in water partially as shown below. Half of the mass of the block is under water. Density of the block is 5 g/cc . Side of the cube is 10 cms. The string is cut after the block is just fully immersed in water. Take $g=10 \text{ m/s}^2$. Density of water is 1 g/cc .

Which of the following statements is/are correct?

- A) Tension in the string is 45 N initially.
 B) As the block is lowered down into the tank, the tension in the string increases
 C) After the string is cut, the speed of block in 2 seconds is 16 m/s.
 D) None of the above statements is true.



8.



A small object is released from top of the double inclined wedge. The horizontal surface (AB) of wedge offers a resistance of 1 m/s^2 to the object. The ground from foot of wedge C also offers an equal resistance. The object is released from rest from point P. Take $g=10 \text{ m/s}^2$.

Which of the following statements is/are correct?

- A) The object stops at a distance of 3.5 m from C
 B) The total energy (PE+KE) of the body is conserved
 C) The speed of the body at B is $\sqrt{3} \text{ m/s}$
 D) The maximum speed of the body is achieved at A.

9. Two mirrors A and B are kept at an angle of 130° as shown below.

A light ray $\vec{R}$ is incident on A at an acute angle θ as shown.

The ray reflects from A and incidents on B and again gets reflected from B as ray $\vec{P}$.

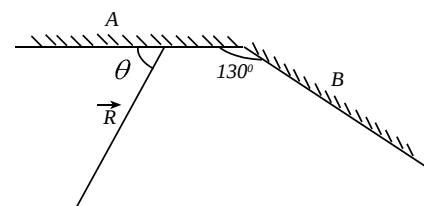
The angle of deviation suffered by ray $\vec{R}$ is

- A) depends on value of θ

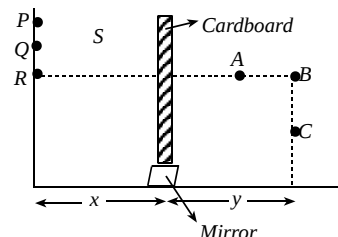
- B) independent of value of θ

- C) $180 - \frac{3\theta}{2}$

- D) 100°



10. Three small bulbs A,B,C are kept in L shape. A large cardboard is placed to prevent light from the bulbs to reach space S. However there is a small mirror below the cardboard which reflects light from bulbs into space S. As a result, three patches of light P, Q and R are cast on wall as shown below.



Then, which of the following statements is/are always true?

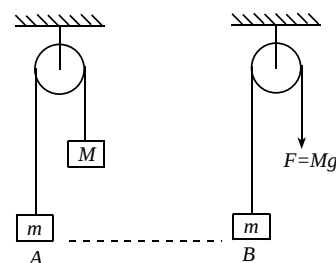
- A) The patch Q is cast by bulb B
- B) If $AB=BC$, then $RQ=QP$
- C) Bulb A casts shadow R
- D) $x>y$

SECTION - B

11. A toy cannon (mass 50 gms) is placed at rest on smooth surface. It has a shell (mass 10 gms). The cannon fires it at 0.1 m/sec to right. Distance between shell and canon after 5 seconds of firing it is
12. Consider two similar Atwood machines A and B kept side by side as shown ($M>m$). Both start from rest position.

In the second case (machine B), the string is being pulled down with force Mg .

The smaller mass m of which of the two machines will reach top first?



- A) Machine A
 - B) Machine B
 - C) Both reach top at same time
 - D) Cannot be determined.
13. Consider following statements
- I. An object with higher mass has higher inertia than that of lower mass
 - II. Inertia is defined as minimum force required to set a body at rest in motion.
- Which of the above statements is/are true?
- A) Only I
 - B) Only II
 - C) Both I & II
 - D) Neither I nor II
14. Two magnets M_1 and M_2 are tied with strings one smooth table as shown below. Now string of M_1 is cut. As M_1 moves towards M_2 under influence of magnetic force, what happens to tension in string tied to M_2 ?
- A) Decreases as M_1 approaches it
 - B) increases as M_1 approaches it
 - C) remains constant as M_1 approaches it
 - D) First decreases and then remains constant
15. If a body is travelling with uniform speed, then it always happens that
- A) It is travelling in a straight line
 - B) No force is acting on it
 - C) Both (A) and (B)
 - D) Neither (A) nor (B)



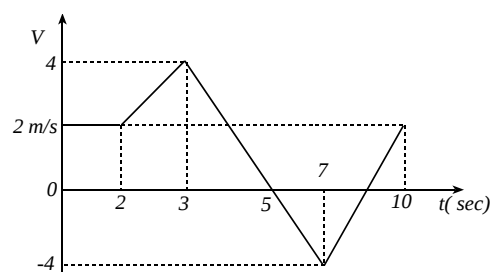
16. Observe the following velocity time plot of a body traveling in straight line for 10 seconds. The object was initially travelling towards right. Consider following statements.

I) The average velocity of the body is 0.5 m/s towards right.

II) The average speed of the body is 2m/s

Which of the above statement is correct?

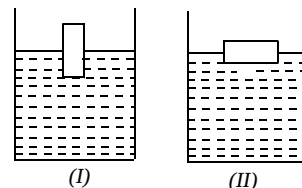
- A) Only I
- B) Only II
- C) Both I & II
- D) Neither I nor II



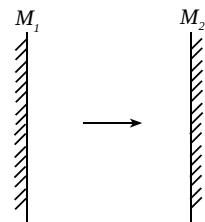
17. Magnitude of displacement of a body is equal to distance travelled by it. Then it always happens that
 A) The body is traveling in straight line
 B) Velocity and Acceleration are always in same direction
 C) Both (A) and (B)
 D) Neither (A) nor (B)
18. A wooden block is half immersed in water in two different positions as shown below.

In which of the cases, the block will experience more buoyant force?

- A) I
 B) II
 C) same in both cases
 D) cannot be determined



19. The maximum pressure exerted by a brick of dimension 5 cmx6cmx15cm and density 6 g/cc on ground is
 A) 16 kPa
 B) 12 kPa
 C) 6 kPa
 D) 9 kPa
20. If an egg of volume 40 cc is dropped in pure water (density 1 g/cc) of 200 cc, it sinks. When 40 grams of salt is added to it, it floats. Possible mass of egg is
 A) 65 gms
 B) 45 gms
 C) 35 gms
 D) 55 gms
21. A body is projected up with a speed of $2\sqrt{2}$ m/s. Air offers a resistance of 0.1 m/s^2 to the body. The speed with which it reaches ground is ($g=10 \text{ m/s}^2$)
 A) 2.56 m/s
 B) 2.72 m/s
 C) 2.80 m/s
 D) None of these
22. A foot ball is kicked from top of a building of height 20 m horizontally with a force F of 20 N. As a result, it starts moving with an acceleration of 5 m/s^2 . Consider following statements. (Take $g=10 \text{ m/s}^2$).
 I) Work done by F is zero
 II) work done by gravitational force is zero
 Which of the above statements is/are correct?
 A) Only I
 B) Only II
 C) Both I & II
 D) Neither I nor II
23. Water is being pumped out from a cubical sump of side 3 m at speed of 1 litre per second. Assuming tank is full and top of sump is at ground level, the power of the motor is
 A) 15 W
 B) 20 W
 C) 25 W
 D) None of the above
24. Two plane mirrors M_1 and M_2 are kept as shown below.
 A house fly is travelling towards M_2 at speed 10 cms/sec.
 Let images of fly in M_1 and M_2 be I_1 and I_2 respectively.
 The speed of I_2 as seen by I_1 is
 A) 10 cm/sec to left
 B) 10 cm/sec to right
 C) 20 cm/sec to left
 D) None of these
25. Two mirrors are kept at an angle of 90° . It forms n images of object kept midway between them. Consider following statements about the images.
 I. All of them are virtual
 II. All of them are laterally inverted.
 Which of the above statements is/are correct?
 A) Only I
 B) Only II
 C) Both I & II
 D) Neither I nor II



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