CLASS TEST

PHYSICS CLASS TEST # 35

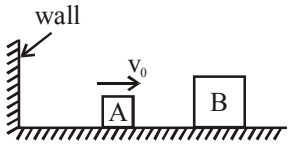
SECTION-I

Single Correct Answer Type **10 Q. [3 M (–1)]**

1. A 40 g ball dropped from a certain height bounces back from the horizontal ground without losing mechanical energy. If its speed is 10 m/s just before making contact with the ground, and the average value of the force of the ground on the ball is equal to 16 N while ball and wall are in contact, how long were they in contact?

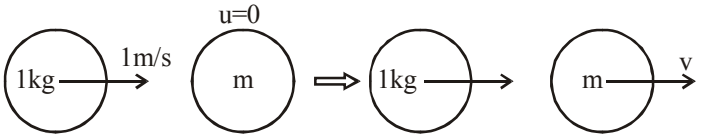
(A) 25 ms (B) 50 ms (C) 75 ms (D) 100 ms

2. Block A of mass m is moving with a speed v_0 on a frictionless horizontal surface as shown in figure. It collides with a massive block B of mass $M = \alpha m$ ($\alpha > 1$) initially at rest. All collisions are elastic. Condition on α for which the two blocks will undergo only one collision is :



(A) $\alpha < 3$ (B) $\alpha < 4$ (C) $\alpha < 5$ (D) $\alpha < 6$

3. A particle of mass 1 kg moving with velocity 1 m/s, collides elastically with another particle of mass m. In the collision particle of mass 1 kg loses $\frac{3}{4}$ of its K.E. The value of m is :



(A) $\frac{1}{2}$ kg (B) $\frac{1}{3}$ kg (C) $\frac{1}{4}$ kg (D) $\frac{1}{5}$ kg

4. A body of mass m_1 strikes a stationary body of mass m_2. If the collision is elastic and head-on, the fraction of kinetic energy transmitted by the first body to the second body is :

(A) $\frac{m_1 m_2}{m_1 + m_2}$ (B) $\frac{2m_1 m_2}{m_1 + m_2}$ (C) $\frac{4m_1 m_2}{(m_1 + m_2)^2}$ (D) $\frac{2m_1 m_2}{(m_1 + m_2)^2}$

5. The body having mass m_1 moving with a speed of v, collides elastically with a motionless body and after impact jumps aside from it at an angle 90° to the initial direction of motion with speed of v/2. find the mass of motionless body.

(A) $\frac{m_1}{6}$ (B) $\frac{5}{3}m_1$ (C) $\frac{4}{3}m_1$ (D) $\frac{3}{5}m_1$

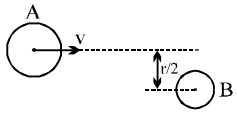
6. A ball, moving with a speed of 9 m/s, strikes an identical stationary ball such that after the collision, the direction of each ball makes an angle of 30° with the original line of motion. The speeds of the two balls after the collision are, respectively,

(A) $3\sqrt{3}\ m/s,\ 3\ m/s$ (B) $3\ m/s,\ 3\sqrt{3}\ m/s$ (C) $3\ m/s,\ 3m/s$ (D) $3\sqrt{3}\ m/s,\ 3\sqrt{3}\ m/s$

7. A particle is thrown vertically upward with a speed u from the top of a tower of height h from ground level. If after first impact with ground it just reaches to height h from ground the coefficient of restitution for the collision is :-

(A) 1 (B) u^2 (C) $\sqrt{\frac{2gh}{u^2 + 2gh}}$ (D) $\frac{\sqrt{2gh}}{u}$

8. A disk A of radius r moving on perfectly smooth surface at a speed v undergoes an elastic collision with an identical stationary disk B. Find the velocity of the disk B after collision if the impact parameter is r/2 as shown in the figure



(A) $\frac{v\sqrt{15}}{4}$ (B) $\frac{v}{4}$ (C) $\frac{v}{2}$ (D) $\frac{\sqrt{3}v}{2}$

9. A ball is suspended from the top of a cart by a string of length 1.0 m. The cart and the ball are initially moving to the right at constant speed V, as shown in figure (i). The cart comes to rest after colliding and sticking to a fixed bumper, as in figure (ii). The suspended ball swings through a maximum angle 60°. The initial speed v is

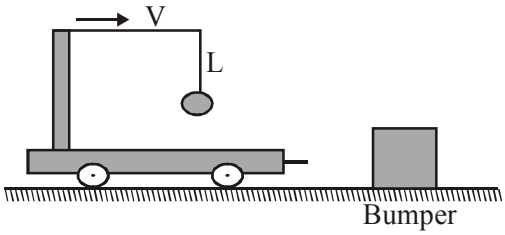


Fig. (i)

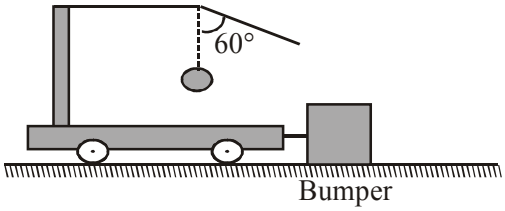
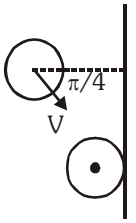


Fig. (ii)

(A) $\sqrt{10}$ m/s (B) $2\sqrt{5}$ m/s (C) $5\sqrt{2}$ m/s (D) 4 m/s

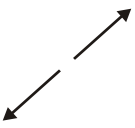
10. In a carom-board game the striker and the coins are identical and of mass m. In a particular hit the coin is hit when it is placed close to the edge of the board as shown in figure such that the coin travels parallel to the edge. If the striker is moving with speed V before the strike, then the net impulse on the striker during collision if it moves perpendicular to the edge is (assume all collisions to be perfectly elastic)



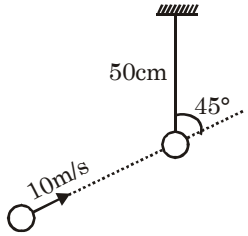
(A) $mV\sqrt{\frac{5}{2}}$ (B) 2mV (C) $\frac{mV\sqrt{3}}{2}$ (D) mV

Multiple Correct Answer Type 2 Q. [4 M (–1)]

11. A mass m moves with a given speed and collides (not necessarily head-on) elastically with another mass m that is initially at rest, as shown in Fig. Which of the figures shows an impossible outcome for the two velocities? (The velocities are drawn to scale)

(A)  (B)  (C)  (D) 

12. On a smooth horizontal surface, a ball of mass 1kg is placed, tied to a nail O on the same horizontal surface with a string of length 50 cm. Another ball of same mass travelling on the horizontal surface with a speed of 10 m/s, its velocity making an angle of 45° with string as shown, collides with the first ball. The balls stick to each other after collision :-



(A) Momentum will not be conserved during collision.
(B) Tension in the string just after collision is zero.
(C) Time for which the string remains slack after collision is 0.141 sec.
(D) Velocity of the balls just after the string is taut again is $\frac{5}{\sqrt{2}}$ m/s

Linked Comprehension Type (1 Para × 2Q. & 1 Para × 3Q.) [3 M (-1)] (Single Correct Answer Type)

Paragraph for question no. 13 and 14

Two identical particles each of mass 4 kg are placed together at the edge of a tall cliff. They are joined by an inextensible string of negligible mass. One of the particles is projected with a speed of $10\sqrt{3}$ m/s at 60° above the horizontal. The string becomes taut after 2 sec. ($g = 10$ m/s^2)

13. The length of the string is :

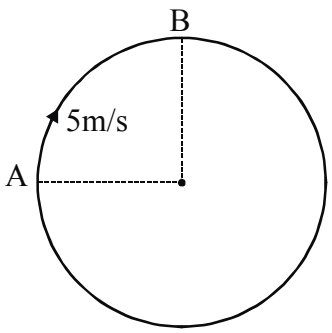
(A) $5\sqrt{3}$ m (B) 10 m (C) 20 m (D) $10\sqrt{3}$ m

14. Tension in the string when the second particle starts moving is :

(A) $10\sqrt{3}$ N (B) 7.5 N (C) 15 N (D) 10 N

Paragraph for Question no. 15 to 17

Two friends A and B (each weighing 40 kg) are sitting in a frictionless well having vertical circular smooth wall. They subtend angle 90° at the centre of well. 'A' rolls a ball of mass 40 kg in clockwise direction on the platform base towards B along the wall of the well which B catches. Then similarly B rolls the ball towards 'A' anticlockwise and A catches it. The ball has a fixed speed of 5 m/s.
(Neglect catching and throwing time).



15. Find the total impulse by the wall of well on whole system by the time ball travels from A to B

(A) 200 kg-m/s (B) 400 kg-m/s (C) zero (D) None of these

16. Find the angular displacement of A till he meets B

(A) 150° (B) 60° (C) 90° (D) 180°

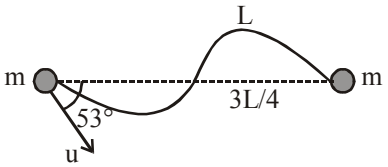
17. When A meets B they catch each other and now they move together i.e. perfectly inelastic collision. What will be the velocity when they (A+B) throw the ball after catching it

(A) 2.5 m/s (B) $\frac{5}{3}$ m/s (C) $\frac{50}{11}$ m/s (D) None of these

SECTION-III

Numerical Grid Type (Ranging from 0 to 9) 1 Q. [4 M (0)]

1. In the figure shown, each tiny ball has mass m, and the string has length L. One of the balls is imparted a velocity u, in the position shown, in which the intial distance between the balls is $\frac{3L}{4}$. If the impulse of the tension in the string when it becomes taut is $m\alpha$ kg-ms^{-1}, then find the value of α.
(Given : m = 2kg, u = 15 m/s)



SECTION-IV

Matrix Match Type (4 × 5) 1 Q. [8 M (for each entry +2(0)]

1. A body of mass m_1 collides one dimensionally with another stationary body of mass m_2. The coefficient of restitution is e. Find the correct combination of options of column II to satisfy the condition of column I.

	Column I		**Column II**
(A)	After the collision, velocity of the second body is maximum when	(P)	e =1
(B)	After the collision, momentum of the second body is maximum when	(Q)	$m_1 >> m_2$
(C)	After the collision, kinetic energy of the second body is maximum when	(R)	e = 0
(D)	After the collision, kinetic energy of system is minimum when	(S)	$m_1 << m_2$
		(T)	$m_2 = m_1$

CLASS TEST

CLASS TEST # 35			ANSWER KEY
SECTION-I			
Single Correct Answer Type			**10 Q. [3 M (–1)]**
1. Ans. (B)	**2. Ans. (A)**	**3. Ans. (B)**	**4. Ans. (C)**
5. Ans. (B)	**6. Ans. (D)**	**7. Ans. (C)**	**8. Ans. (A)**
9. Ans. (A)	**10. Ans. (A)**		
Multiple Correct Answer Type			**2 Q. [4 M (–1)]**
11. Ans. (A,B,C,D)	**12. Ans. (B, C, D)**		
Linked Comprehension Type (Single Correct Answer Type)			**(1 Para × 2Q. & 1 Para × 3Q.) [3 M (-1)]**
13. Ans. (C)	**14. Ans. (B)**	**15. Ans. (B)**	**16. Ans. (A)**
17. Ans. (A)			
SECTION-III			
Numerical Grid Type (Ranging from 0 to 9)			**1 Q. [4 M (0)]**
1. Ans. 6			
SECTION-IV			
Matrix Match Type (4 × 5)			**1 Q. [8 M (for each entry +2(0)]**
1. Ans. (A)-PQ; (B)-PS; (C)-PT; (D)-RS			