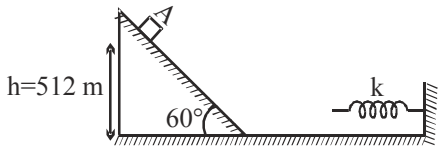
CLASS TEST

PHYSICS CLASS TEST # 36

SECTION-I

Single Correct Answer Type **7 Q. [3 M (–1)]**

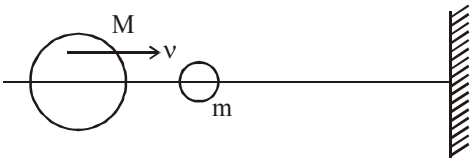
1. A small Block A is released from the top of an incline plane at height of h = 512 m. All surfaces are frictionless. The block collides with the ground inelastically but does not stick to it. After collision with the spring, it returns back and collides with the incline inelastically but again does not stick to it. Find the maximum height (in m) from the ground attained by block A when it climbs up the incline.



(A) 16 (B) 32 (C) 6 (D) 8

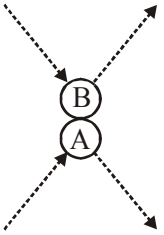
2. Two beads of masses M and m can move without friction on a horizontal wire as shown in the diagram. Initially M is moving with a speed v and m is stationary. During subsquent collisions speed of m will increase. If all collisions are perfectly elastic then maximum speed attained by m is.(Here : M>>m)

(A) v (B) $\sqrt{\frac{m}{M}}v$



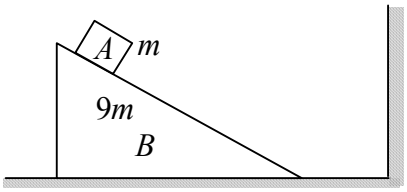
(C) $\sqrt{\frac{M}{m}}v$ (D) ∞

3. The figure below depicts the paths of two colliding steel balls, A and B. Which of the arrows best represents the impulse applied to ball A during the collision ?



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

4. As shown in the figure, block *A* of mass *m* starts from rest from the top of the wedge of the mass 9m. Wedge can slide on smooth ground. Block A slides down onto the ground, moves along it with a speed u, has an elastic collision with the wall, and climbs back onto the wedge. All surfaces are frictionless. Choose the wrong alternative.



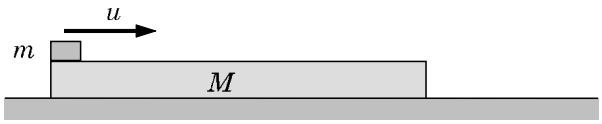
(A) Just before collision between block *A* and wall, the center of mass of block *A* and wedge *B* remains at rest.

(B) Just after collision the center of mass of block *A* and wedge *B* moves with a velocity *u*/5.

(C) Finally when block *A* reaches the maximum height on wedge *B*, its velocity will be *u*/5.

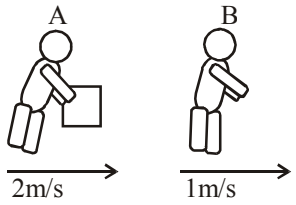
(D) Finally block A reaches to the same height, from where it was released.

5. A small block of mass m is placed on a long plank of mass M that is placed on a frictionless horizontal floor. The block is abruptly given a velocity u on the plank. If during sliding of the block a distance L relative to the plank, total heat loss is Q, find acceleration of the plank during the sliding of the block?



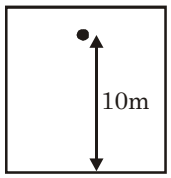
(A) $\frac{Q}{mL}$ (B) $\frac{Q}{ML}$ (C) $\frac{Q}{(m+M)L}$ (D) None of these

6. Two astronauts, A and B, both with mass of 60kg, are moving along a straight line in the same direction in a "weightless" spaceship. Relative to the spaceship the speed of A is 2 m/s and that of B is 1 m/s. A is carrying a bag of mass 5 kg with him. To avoid collision with B, A throws the bag with a speed v relative to the spaceship towards B and B catches it. Find the minimum value of v.



(A) 7.8 m/s (B) 26.0 m/s (C) 14.0 m/s (D) 9.2 m/s

7. A particle of mass 2kg is projected vertically upward in a lift with a velocity 10m/s relative to the lift from a height 10m above the floor of lift. When particle strikes the floor of lift what will be the velocity of the particle just before the strike and the impulse imparted on it by lift respectively.



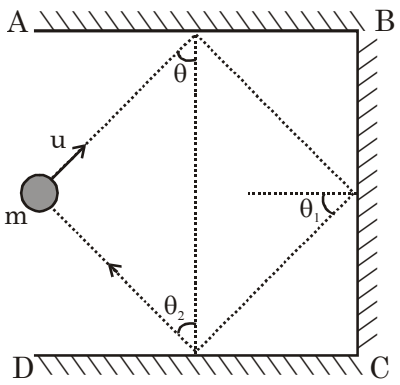
[At t = 0, V = 10 m/s & a = 5m/s^2 (Both upwards) for the lift]. Particle does not rebound after it strikes the floor of lift :-

(A) 0 m/s, 40 N-s (B) 10 m/s upward, No impulse

(C) 10 m/s downward, 60 N-s (D) 30 m/s downward, 20 N-s

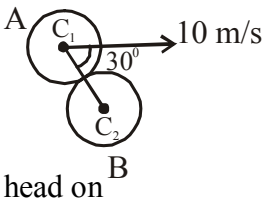
Multiple Correct Answer Type 5 Q. [4 M (–1)]

8. Particle of mass 'm' placed on a horizontal surface surrounded by walls as shown in figure. Coefficients of restitution for collision with walls AB, BC, CD are e = 1, e = 1/2, e = 1/4 respectively. Particle Ist collide with wall AB as shown. After collision from wall BC & CD respectively if again return to same position. Relation between θ_1, θ_2 & θ will be :-



(A) $\tan\theta_1 = 2\tan\theta$ (B) $\tan\theta_2 = 2\tan\theta$ (C) $\tan\theta_1 = 2\cot\theta$ (D) $4\cot\theta_1 = \tan\theta_2$

9. A ball A collides elastically with an another identical ball B with velocity 10 m/s at an angle of 30° from the line joining their centres C_1 and C_2. Select the correct alternative(s).



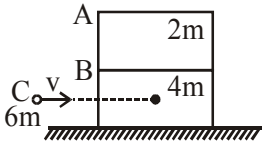
(A) velocity of ball A after collision is 5 m/s

(B) velocity of ball B after collision is $5\sqrt{3}$ m/s

(C) both the balls move at right angles after collision

(D) kinetic energy will not be conserved here, because collsion is not head on

10. A block A of mass 2m is placed on other block B of mass 4m which is placed on a fixed table as shown in figure. A small object C of mass 6m moving horizontally along a line passing through the center of block B and perpendicular to its face with a speed v collides elastically with block B. Friction is absent between ground and block B and surface between blocks is rough. Then :-



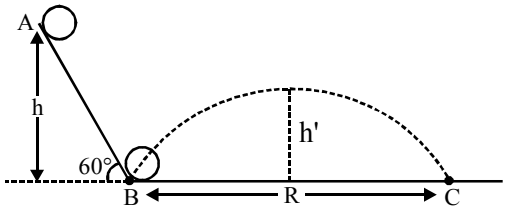
(A) Velocity of A just after collision is v

(B) Velocity of B just after collision is $\frac{6}{5}v$

(C) Velocity of centre of mass of system (A + B) is $\frac{4}{5}v$ after collision

(D) Momentum of (C + B) can be conserved during collision.

11. In the figure shown, a ball is released from the smooth track. If the ball strikes the horizontal surface of the track and bounces off, it again strikes the horizontal surface at some distance R from B and rises to a height maximum of h' above the surface (If the coefficient of restitution for the collision is e) :-



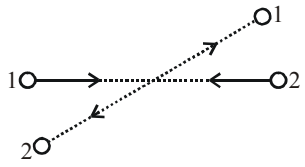
(A) R is maximum for e = $\frac{1}{\sqrt{3}}$

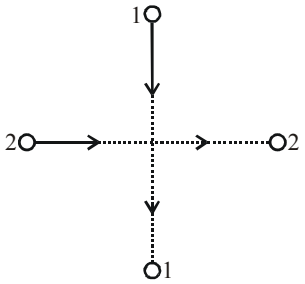
(B) R is maximum for e = 1

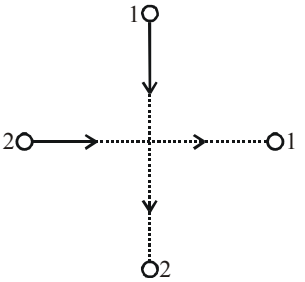
(C) $h' \le \frac{3h}{4}$ for all values of e

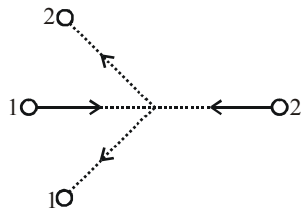
(D) h' = h for e = 1

12. Two identical balls (1 and 2) moving with equal speed collide on a frictionless surface. Collision may or may not be elastic. Which of the following diagrams is/are a physically possible situation ?

(A)


(B)


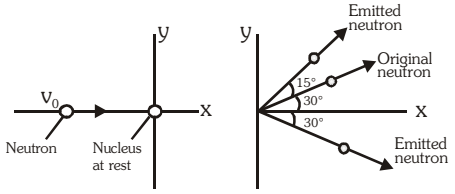
(C)


(D)


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

Paragraph for Question 13 to 15

Fission, the process that supplies energy in nuclear power plants, occurs when a heavy nucleus is split into two medium–sized nuclei. One such reaction occurs when a neutron colliding with a ^{235}U(Uranium) nucleus splits that nucleus into a ^{141}Ba(Barium) nucleus and a ^{92}Kr (Krypton) nucleus. In this reaction, two neutrons also are split off from the original ^{235}U. Before the collision, we have the arrangement in figure. After the collision, we have the ^{141}Ba nucleus moving in the +z direction and ^{92}Kr is moving in –z direction. The three neutrons are moving in the xy–plane as shown in Fig. The incoming neutron has an initial velocity of magnitude 3.0×10^3m/s and a final velocity of magnitude $\frac{\sqrt{3}}{2} \times 10^3$ m/s in the directions shown.



13. What is the speed of emitted neutron with angle 45° ?

(A) 750 ms^{-1} (B) $\frac{\sqrt{3}}{2} \times 10^3$ ms^{-1} (C) 3×10^3 ms^{-1} (D) 1500 m/s

14. What is the speed of emitted neutron with angle 30° ?

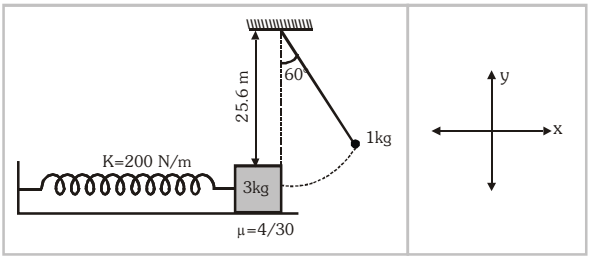
(A) 3×10^3 ms^{-1} (B) 1960 ms^{-1} (C) 1010 m/s (D) $\frac{\sqrt{3}}{2} \times 10^3$ ms^{-1}

15. Which relation is obeyed for velocity of Barium (Ba) and Krypton (Kr).

(A) $v_{Kr} = \frac{v_{Ba}}{2}$ (B) $v_{Kr} = 4\ v_{Ba}$ (C) $v_{Kr} = 1.5\ v_{Ba}$ (D) $v_{Kr} = 6\ v_{Ba}$

Paragraph for Question 16 to 18

As shown in figure there is a small bob having mass 1 kg is attached to the string having negligible mass. Bob is released as shown in figure. Initially when spring is in natural length. ($g = 10m/s^2$)



16. If there is no loss in mechanical energy due to collision then find the maximum compression in the spring?

(A) 106 cm (B) 86 cm (C) 46 cm (D) 96 cm

17. Just after achieving maximum compression in the spring as per previous problem, a bullet of mass 100g strikes to the block in such a manner that there is maximum loss in mechanical energy due to collision. The velocity of bullet is $v\hat{i}$ .Find the value of v so that elongation of spring is equal to compression of spring? (Assuming there is no further collision with bob)

(A) 140 m/s (B) 70 m/s (C) 160 m/s (D) 320 m/s

18. Find the total work done by the friction in above two problems?

(A) – 11 J (B) – 11.7 J (C) – 7.8 J (D) – 4 J

CLASS TEST

CLASS TEST # 36			ANSWER KEY
SECTION-I			
Single Correct Answer Type			**7 Q. [3 M (–1)]**
1. Ans. (B)	**2. Ans. (C)**	**3. Ans. (B)**	**4. Ans. (D)**
5. Ans. (B)	**6. Ans. (A)**	**7. Ans. (A)**	
Multiple Correct Answer Type			**5 Q. [4 M (–1)]**
8. Ans. (B, C, D)	**9. Ans. (A,B,C)**	**10. Ans. (B, C, D)**	**11. Ans. (B, C)**
12. Ans. (A,C)			
Linked Comprehension Type (Single Correct Answer Type)			**(2 Para × 3Q.) [3 M (-1)]**
13. Ans. (A)	**14. Ans. (B)**	**15. Ans. (C)**	**16. Ans. (D)**
17. Ans. (B)	**18. Ans. (B)**		