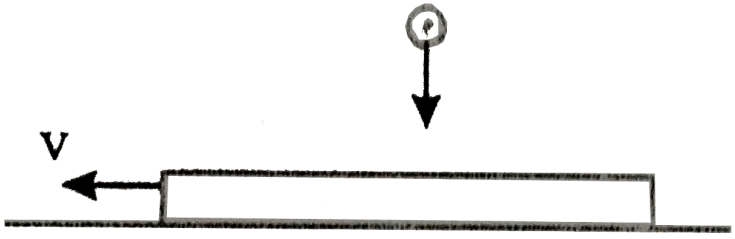
PHYSICS

AIMED AT STUDENTS PREPARING FOR IIT JEE EXAMS

COLLISION

Single Answer Type

1. 

A board is moving with velocity v on a smoother horizontal plane. The upper surface of the board is rough on which a ball falls with velocity v and rebounds with velocity $\frac{v}{2}$. The mass of the board is same as that of ball. After the collision, the board comes to state of rest. The co-efficient of friction between the board and the ball is

A. $\frac{1}{2}$

B. $\frac{2}{3}$

C. $\frac{1}{4}$

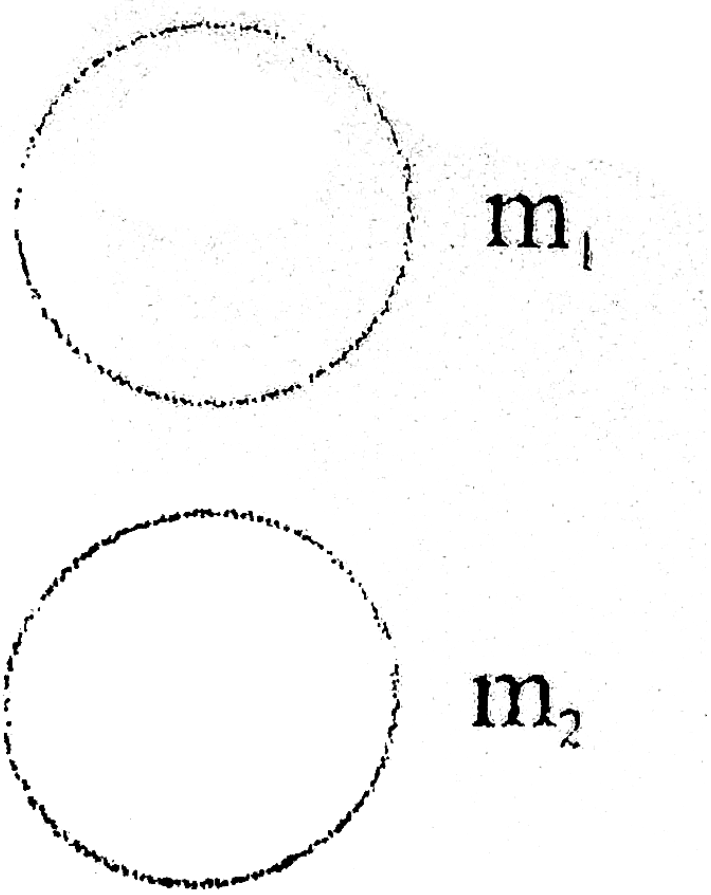
D. $\frac{3}{5}$

Answer: B

Watch Video Solution

2. Two balls of masses m_1 and m_2 are placed on top of one over the other (with a small gap between them) and then dropped on to the ground. What is the ration m_1 / m_2 for which

the upper ball ultimately receives the largest possible fraction of the total energy? Take all collisions as elastic. Neglect air resistance



A. 1 : 1

B. $1:2$

C. $1:3$

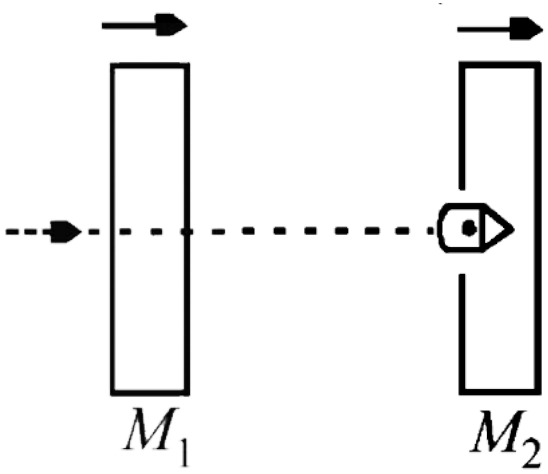
D. $1:4$

Answer: C

Watch Video Solution

3. A 20 gm bullet pierces through a plate of mass $m_1 = 1$ kg and then comes to rest inside a second plate of mass $M_2 = 2.98$ kg as shown , it is found that the two plates initily

atrest , now move with equal velocity . Find the percentage loss in the initial velocity of the bullet when it is between M and M_2 neglet any loss of material of the pletes due to the action of the bullet



A. $50\ \%$

B. $25\ \%$

C. $100\ \%$

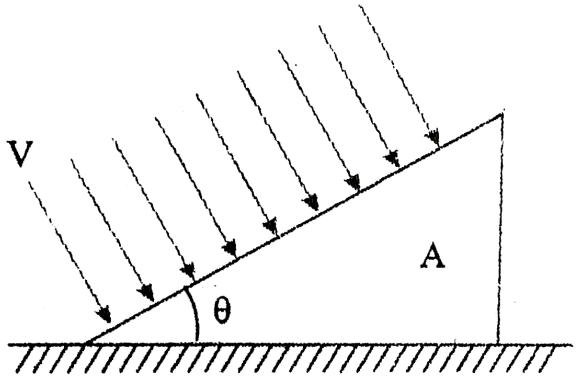
D. $75\ \%$

Answer: B

Watch Video Solution

4. The air of density ρ and moving with a velocity v strikes perpendicular the inclined surface of area A and of a wedge kept on a horizontal surface. The mass of the wedge is m. Assuming the collisions to be perfectly

inelastic, the minimum value of the coefficient of friction between the wedge and the ground so that the wedge does not move is (Assume mass of particles of air is negligible)



A. $\dfrac{\rho A v^2 \sin\theta}{mg + \rho A v^2 \cos\theta}$

B. $\tan\theta$

C. $\dfrac{\rho A v^2}{mg}\tan\theta$

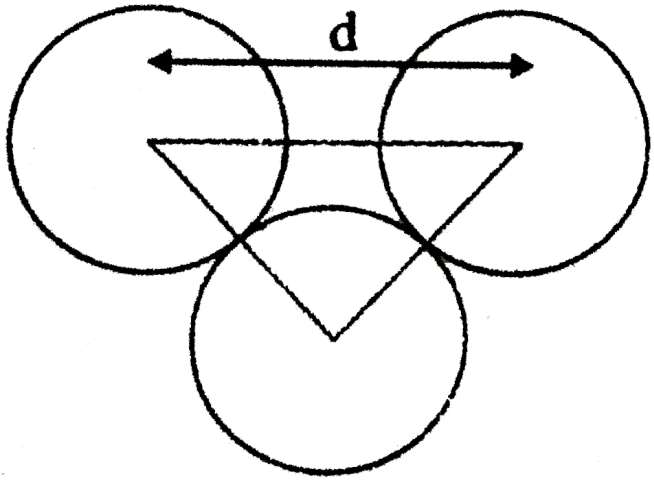
D. $\frac{\rho A v^2}{mg + \rho A v^2 \cos\theta}$

Answer: A

Watch Video Solution

5. Two identical ball of radii r are kept on a horizontal plane with their centres d distance apart. A third ball, identical to previous one, collide elastically with both the balls symmetrically as shown in the figure. If the third ball comes to rest after the collision, d

should be



A. $3r$

B. $2\sqrt{2r}$

C. $\left(\sqrt{2}+1\right)r$

D. $\left(\sqrt{2}+2\right)r$

Answer: B

Watch Video Solution

6. A partical of mass m moving with velocity $1m/s$ collides perfectly elastically with another particle of mass $2m$. If the incident particle is deflected by 90°. The heavy mass will make and angle θ with the initial direction of m equal to:

A. 60°

B. 45°

C. 15°

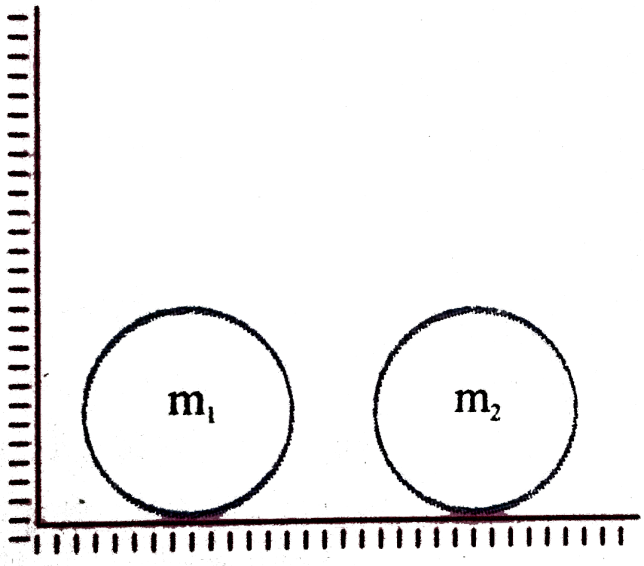
D. 30°

Answer: D

Watch Video Solution

7. Mass m_1 strikes m_2 which is at rest. The ratio of masses for which they will collide again. (Collisions between ball and wall are elastic. Coefficient of resttution between m_1

and m_2 is e and all the surface are smooth)



A. $\frac{e}{2+e}$

B. $\frac{2e}{2+e}$

C. $\frac{e}{2(2+e)}$

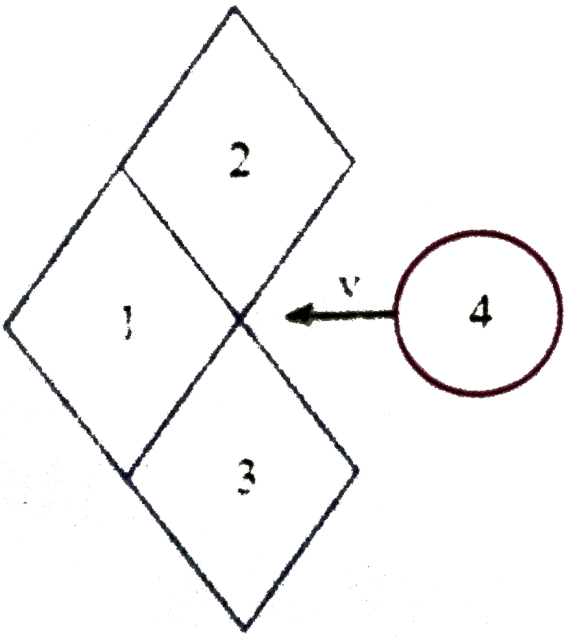
D. 1

Answer: C

Watch Video Solution

8. A smooth washer impinges at a velocity $'v'$ on a group of three smooth identical blocksresting on a smooth horizontal surface as shown in fig. Mass of each block is equal to mass of the washer. The diameter of the washer and its height are equal to edge of the block. The velocity of blocks (2) and (3) after

collision is



A. v

B. $\frac{v}{\sqrt{2}}$

C. $\frac{v}{2}$

D. $2v$

Answer: B

Watch Video Solution

9. A partical of mass $'m'$ moving with a velocity $\left(3\hat{i}+2\hat{j}\right)m/s$ collides with statinary mass $'M'$ and finally $'m'$ moves with a velocity $\left(-2\hat{i}+\hat{j}\right)m/s$ if $\frac{m}{M}=\frac{1}{13}$ the velocity of the M after collision is?

A. $\left(5\hat{i}+\hat{j}\right)m/s$

B. $\left(5\hat{i}-\hat{j}\right)m/s$

C. $\left(\frac{5\hat{i}}{13} - \frac{\hat{j}}{13}\right) m/s$

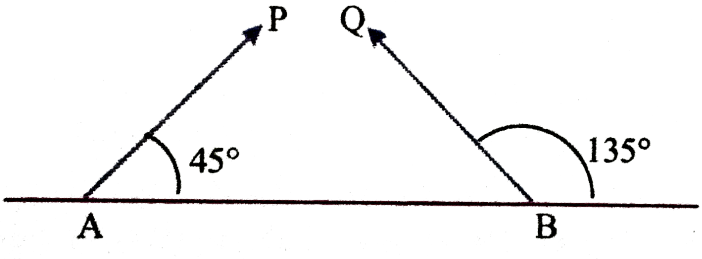
D. $\left(\frac{5\hat{i}}{13} + \frac{\hat{j}}{13}\right) m/s$

Answer: D

Watch Video Solution

10. Particles P and Q of masses $20g$ and $40g$, respectively, are projected from positions A and B on the ground. The initial velocities of P and Q make angles of 45° and 135°, respectively with the horizontal as shown in

the fig. Each particle has an initial speed of $49m/s$. The separation AB is $245m$. Both particles travel in the same vertical plane and undergo a collision. After the collision P retraces its path. The separation of Q from its initial position when it hits the ground is



A. $245m$

B. $\frac{245}{3}m$

C. $\frac{245}{2}m$

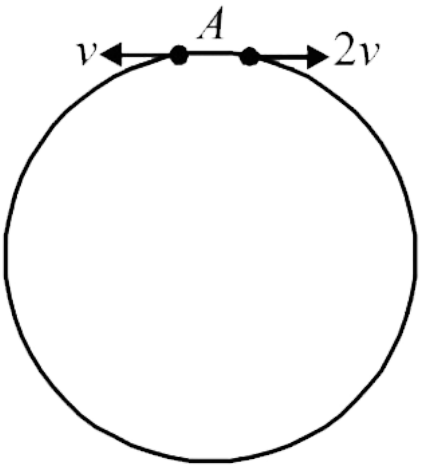
D. $\frac{245}{\sqrt{2}}m$

Answer: C

Watch Video Solution

11. Two small particles of equal masses stant moving in opposite direction from a point A in a burtizonetal circule orbic their tangention velocity are V and $2V$, respectively as shown in the figure between collsions , the particals move with constant speed After making how

many elastic collition , other the then that at A these two partical will again reach the point A ?



A. 4

B. 3

C. 2

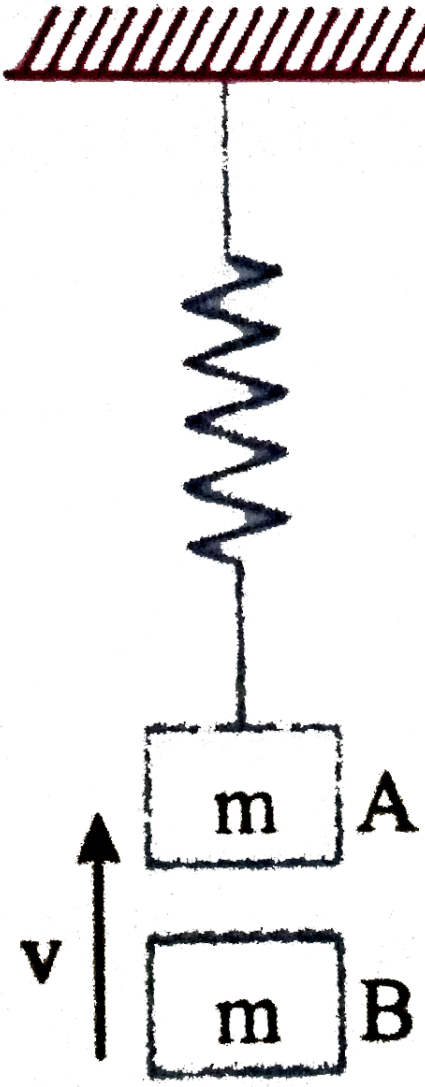
D. 1

Answer: C

Watch Video Solution

12. Block A is hanging from vertical spring of spring constant K and is rest. Block B strikes block A with velocity v and sticks to it. Then the value of v for which the spring just attains

natural length is



A. $\sqrt{\frac{60mg^2}{k}}$

B. $\sqrt{\frac{6mg^2}{k}}$

C. $\sqrt{\frac{10mg^2}{k}}$

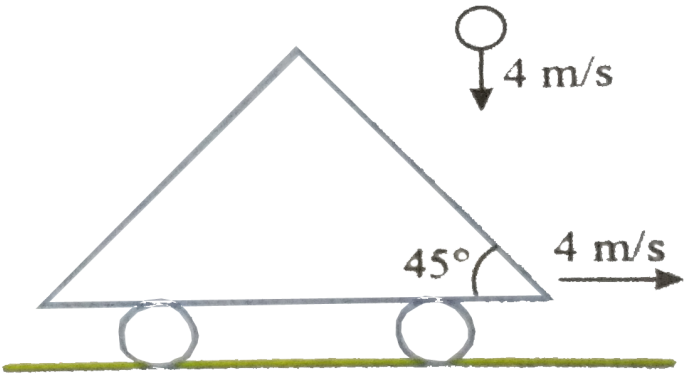
D. $\sqrt{\frac{mg^2}{k}}$

Answer: B

Watch Video Solution

13. A small ball falling vertically downward with constant velocity $4m/s$ strikes elastically a massive inclined cart moving with velocity

$4m/s$ horizontally as shown. The velocity of the rebound of the ball is



A. $402m/s$

B. $403m/s$

C. $4m/s$

D. $405m/s$

Answer: C

Watch Video Solution

14. A spaceship travelling along $+y$ axis with speed v_0 suddenly shoots out one fourth of its parts with speed $2v_0$ along $+x$-axis. xy axes are fixed with respect to ground. The velocity of the remaining part is

A. $\frac{2}{3}v_0$

B. $\frac{\sqrt{20}}{3}V_0$

C. $\frac{\sqrt{5}}{3}V_0$

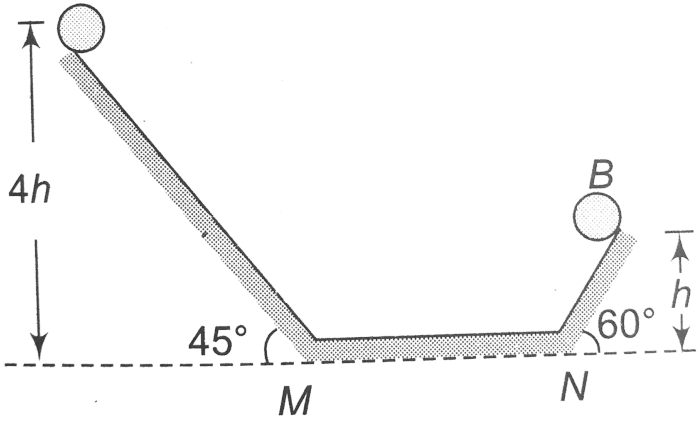
D. $\frac{\sqrt{13}}{3}V_0$

Answer: B

Watch Video Solution

15. Two identical balls A and B arereleased from the positions shown in figure. They collide elasticallly on horizontal position MN. The ratio of the heightsattaned by A and B

after collisuion will be (neglect friction):



A. $1:4$

B. $2:1$

C. $4:13$

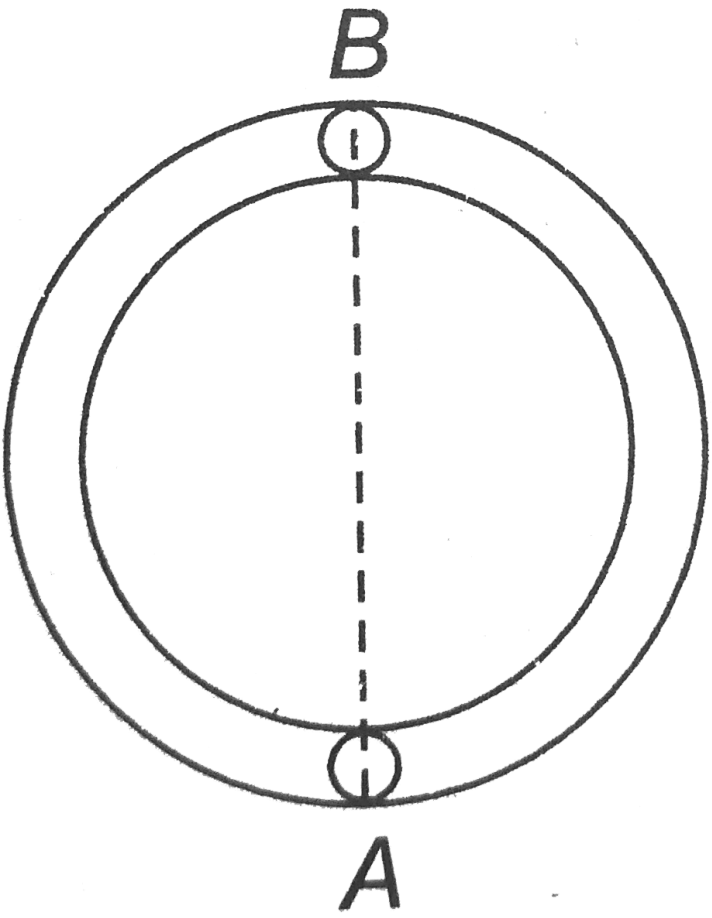
D. $2:5$

Answer: C

Watch Video Solution

16. Two equal sphere A and b lie on a smooth horizontal circle groove at opposite ends of a diameter. At time $t = 0$, A is projected along the groove and tis first implings on$B$ at time $t = T_1$ and $aga \in attime$t = T_(2). Ife $isthecoefficientofrestitution, theratio$

T_(2)//T_(1)` is



A. $\frac{2}{e}$

B. $\frac{(2+e)}{2}$

C. $\frac{2(e+1)}{e}$

D. $\frac{(2+e)}{e}$

Answer: D

Watch Video Solution

17. A ball of mass $10kg$ strikes another ball of mass $25kg$ at rest. If they separated in mutually perpendicular directions then the coefficient of restitution is:

A. $\frac{10}{25}$

B. $\frac{25}{10}$

C. 1

D. 0.8

Answer: A

Watch Video Solution

18. The coefficient of restitution for a body is $e = \frac{1}{3}$. At what angle the body must be incident on a perfectly hard plane so that the

angle between the direction before and after the impact be at right angles:

A. 37°

B. 60°

C. 45°

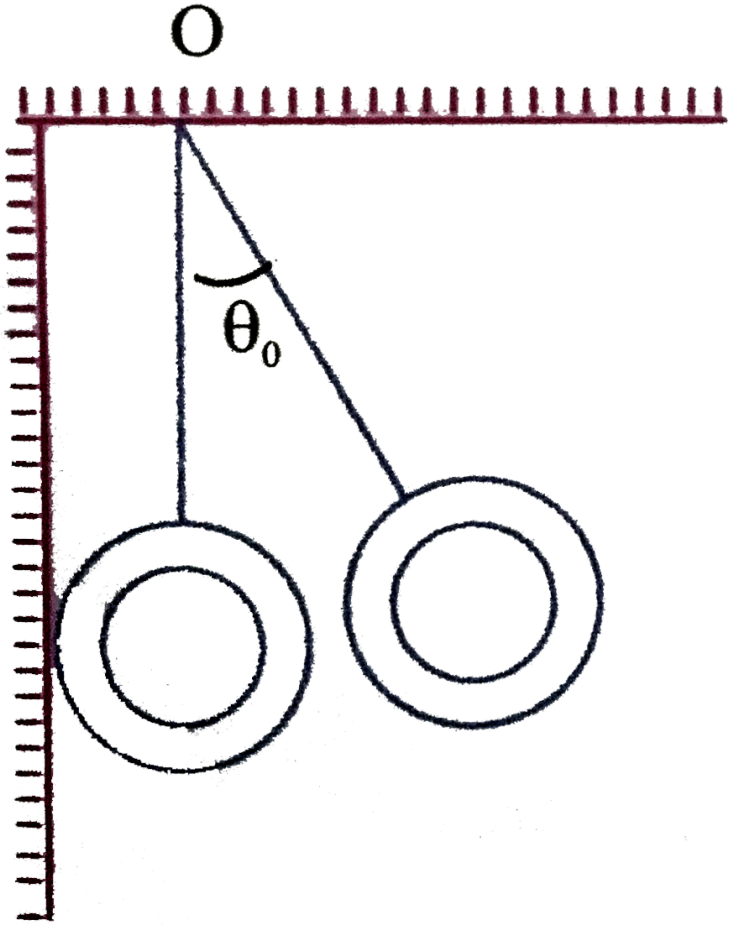
D. 30°

Answer: D

 Watch Video Solution

19. An iron ball of mass m, suspeneded by a light inextensible string of length l from a fixed point O, is shifted by an angle $._0$ as shown so as to strike the vertical wall perpendicularly. The maximum angle made by the string with vertical after the first collision (

e is the coefficient of restitution). is_____



A. $\sin^{-1}\{1-e^2(1-\cos\theta_0)\}$

B. $\cos^{-1}\{1-e^2(1-\cos\theta_0)\}$

C. $\tan^{-1}\{1 - e^2(1 - \cos\theta_0)\}$

D. Zero

Answer: B

Watch Video Solution

20. Three small bodies with the mass ratio 3 : 4: 5 (the mass of the lightest body is m) are kept at three different points on the inner surface of a smooth hemispherical cup of radius r. The cup is fixed at its lowest point on

a horizontal surface. At a certain instant, the bodies are released. Determine the maximum amount of heat Q that can be liberated in such a system.At what initial arrangement of the bodies will the amount of liberated heat be maximum ? Assume that collisions are perfectly inelastic.

A. $2mgr$

B. $3mgr$

C. $6mgr$

D. $4mgr$

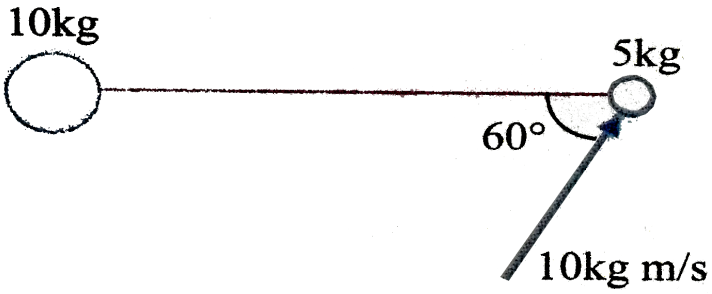
Answer: D

Watch Video Solution

Multiple Answer

1. Two point masses are connected by a light intextensible string are lying on a frictionless surface as shown in figure. An impulse of

magnitude $10kg - m/s$ is given to $5kg$ block.



A. Velocity of $10kg$ block immediately after impulse is given $\frac{1}{3}m/s$

B. Velocity of $10kg$ block immediately after impulse is given $2m/s$

C. Speed of $5kg$ block immediately after impulse is given $\sqrt{\frac{28}{9}}m/s$

D. Speed of $5kg$ block immediately after impulse is given $\frac{\sqrt{28}}{9} m/s$

Answer: A::C

Watch Video Solution

2. A body moving towards a finite body at rest collides with it. It is possible that

A. Both the bodies come to rest

B. The stationary body remains at rest while the moving body changes the direction of its velocity

C. Both bodies may move after the collision

D. The moving body may come to rest while the body at rest may move.

Answer: C::D

Watch Video Solution

3. A ball of mass m_1, collides elastically and head on with ball of mass m_2 at rest. Then

A. The transfer of kinetic energy to the second ball is maximum when $m_1 = m_2$

B. The change of momentum of first ball is maximum, when $m_1 < \ < m_2$.

C. The velocity of the second ball is maximum, when $m_1 > \ > m_2$.

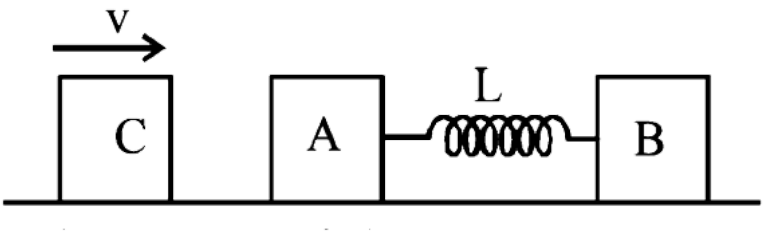
D. None of these

Answer: A::B::C

Watch Video Solution

4. Two blocks A and B, each of mass m, are connected by a masslesss spring of natural length L and spring constant K. The blocks are initially resting on a smooth horizontal floor with the spring at its natural length, as shown in fig. A third identical block C, also of mass m, moves on the floor with a speed v along the line joining A and B, and collides elastically

with A. Then



A. the kinetic energy of the $A - B$ system, at maximum compression of the spring, is zero

B. the kinetic energy of the $A - B$ system, at maximum compression of the spring,

is $\frac{mv^2}{4}$

C. the maximum compression of the spring is $v\sqrt{\left(\frac{m}{K}\right)}$

D. the maximum compression of the spring is $v\sqrt{\frac{m}{2K}}$

Answer: B::D

Watch Video Solution

5. The balls, having linear momenta $\overrightarrow{p}_1 = \overrightarrow{\pi}$ and $\overrightarrow{p}_2\_2 = -\overrightarrow{\pi}$, undergo a collision in free space. There is no external force acting on the balls. Let $\overrightarrow{p}'_1$ and $\overrightarrow{p}'_2$ be their final momenta.The following option (s) is (are) NOT ALLOWED for any non-zero value of p, a_1, a_2, b_1, b_2, c_1 and c_2.

A. $\overrightarrow{p_1}' = a_1\hat{i} + b_1\hat{j} + c_1\hat{k}$

$\overrightarrow{p_2}' = a_2\hat{i} + b_2\hat{j}$

B. $\vec{p_1}' = c_1\hat{k}$

$\vec{p_2}' = c_2\hat{k}$

C. $\vec{p_1}' = a_1\hat{i} + b_1\hat{j} + c_1\hat{k}$

$\vec{p_2}' = a_2\hat{i} + b_2\hat{j} - c_1\hat{k}$

D. $\vec{p_1}' = a_1\hat{i} + b_1\hat{j}$

$\vec{p_2}' = a_2\hat{i} + b_1\hat{j}$

Answer: A::D

 Watch Video Solution

6. If the resultant of all the external forces acting on a system of particles is zero. Then from an inertial frame, one can surely say that

A. linear momentum of the system does not change in time

B. kinetic energy of the system does not change in time

C. angular momentum of the system may change in time

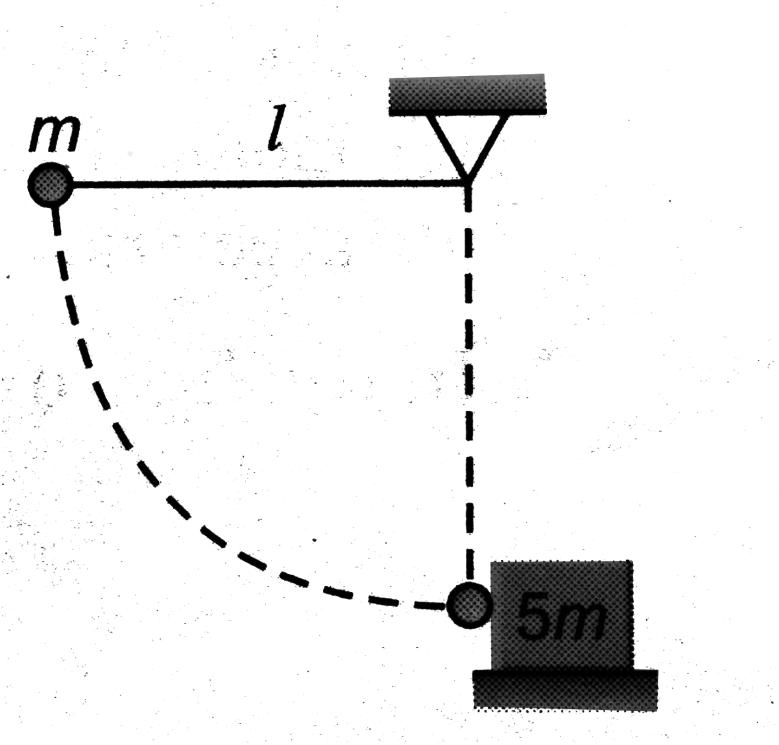
D. potential energy of the system does not change in time.

Answer: A::C

Watch Video Solution

7. A pendulum bob of mass m connected to the end of material string of length l is released from rest from horizontal position as shown in the figure. At the lowest point the bob makes an elastic collision with a

stationary block of mass $5m$, which is kept on a frictionless surface. Choose out the correct statement(s) for the instant just after the impact.



A. Tension in the string at lowest point just after collision is $(17/9)mg$

B. Tension in the string at lowest point just before collision is $3mg$

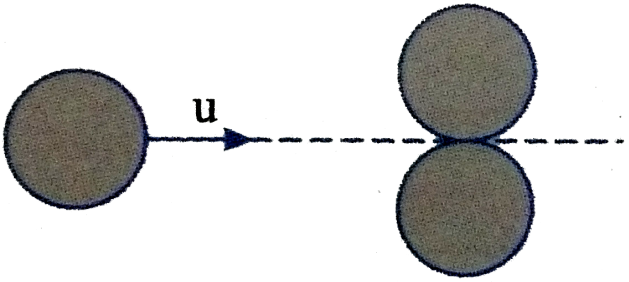
C. The velocity of the block is $\sqrt{2gl}/3$

D. The maximum height attained by the pendulum bob after impact is (measured from the lowest position) $\frac{4l}{9}$

Answer: A::B::C::D

Watch Video Solution

8. Two equal spheres of mass m are in contact on a smooth horizontal table. A third identical sphere impinges symmetrically on them and reduces to rest. Then:



A. Coefficient of restitution is $e = \frac{2}{3}$

B. Loss of kinetic energy $\frac{1}{6}mu^2$ where u is velocity before impact

C. After the collision, velocity of equal mass sphere is $\frac{u}{\sqrt{3}}$

D. Loss of kinetic energy $\frac{1}{3}mu^2$

Answer: A::B::C

Watch Video Solution

9. A particle (A) of mass m_1 elastically collides with another stationary particle (B) of mass m_2. Then :

A. $\frac{m_1}{m_2} = \frac{1}{2}$ and the particles fly a part in the opposite direction with equal velocities.

B. $\frac{m_1}{m_2} = \frac{1}{3}$ and the particles fly apart in the opposite direction with equal velocities.

C. $\frac{m_1}{m_2} = \frac{2}{1}$ and the collision angle between the particles is 60° symmetrically.

D. $\frac{m_1}{m_2} = \frac{2}{1}$ and the particles fly apart symmetrically at an angle 90°

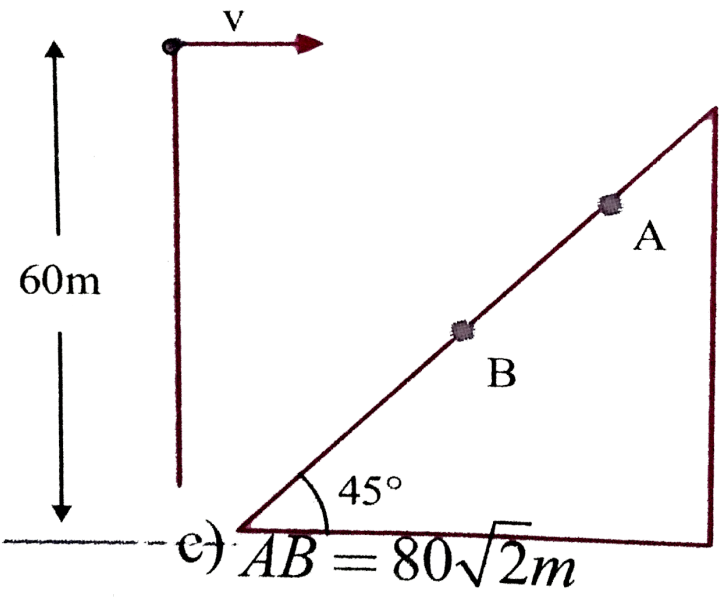
Answer: B::C

View Text Solution

10. A particle is to be projected horizontally with velocity v from a point P, which is $60m$ above the foot of a plane inclined at angle 45° with horizontal as shown in figure. The particle hits the plane perpendicularly at A. After

rebound from inlined plane it again hits at B.

If coefficient of restitution between particles and plane is $\frac{1}{\sqrt{2}}$ then,



A. $v = 20m/s$

B. $v = 10m/s$

C. $AB = 80\sqrt{2}$m

D. $AB = 80m$

Answer: A::C

Watch Video Solution

11. A body of mass m moving with a velocity v in the x direction collides with another body of mass M moving in y direction with a velocity V. They coalesce into one body during collision.

A. The magnitude of momentum of the composition body $\left[(mv)^2+(MV)^2\right]^{1/2}$

B. The fraction of initial $K.E.$ transformed into heat is $=\left(\frac{mM}{m+M}\right)\left(\frac{v^2+V^2}{mv^2+MV^2}\right)$

C. Decrease in kinetic energy is $\frac{mM}{2(m+M)}(v^2+V^2)$

D. None of these

Answer: A::B::C

Watch Video Solution

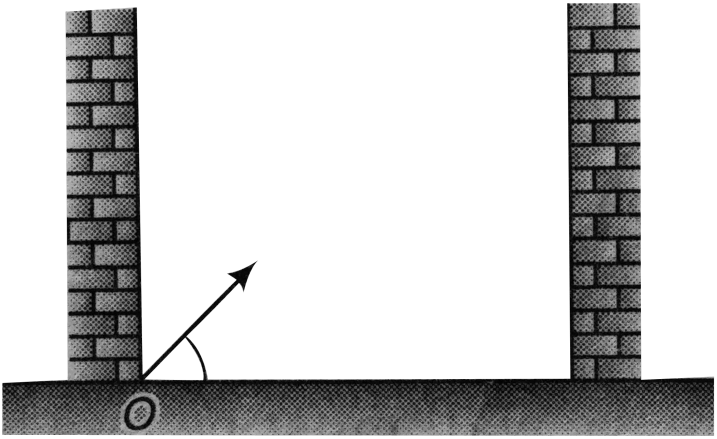
Comprehension Type

1. A small ball is projected at an angle α between two vertical walls such that in the absence of the wall its range would have been $5d$. Given that all the collisions are perfectly elastic, find.

(a) maximum height atained by the ball.

(b) total number of collisions with the walls before the ball comes back to the ground, and

(c) point at which the ball finally falls. The walls are supposed to be very tall.



A. $\frac{2u^2 \sin^2 \alpha}{g}$

B. $\frac{2u^2 \cos^2 \alpha}{g}$

C. $\frac{u^2 \sin^2 \alpha}{2g}$

D. $\frac{u^2}{2g}$

Answer: C

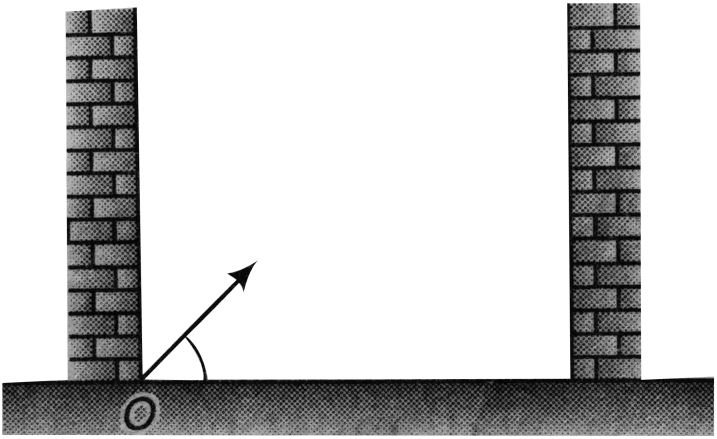
Watch Video Solution

2. A small ball is projected at an angle α between two vertical walls such that in the absence of the wall its range would have been $5d$. Given that all the collisions are perfectly elastic, find.

(a) maximum height atained by the ball.

(b) total number of collisions with the walls before the ball comes back to the ground, and

(c) point at which the ball finally falls. The walls are supposed to be very tall.



A. 5

B. 7

C. 9

D. 11

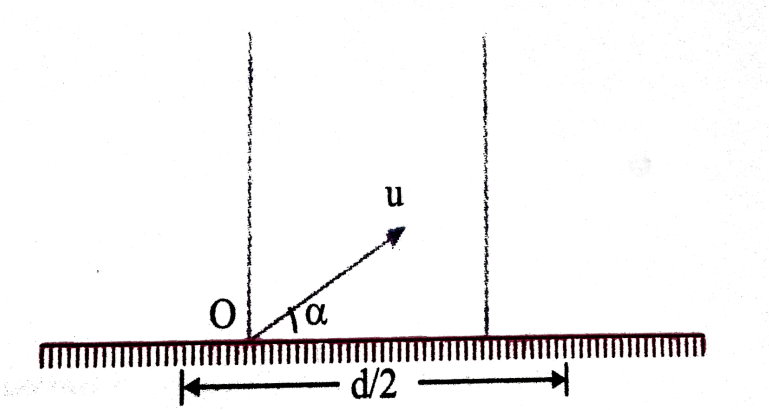
Answer: C

Watch Video Solution

3. Suppose a ball is projected with speed u at an angle α with horizontal. It collides at some distance with a wall parallel to y-axis.

Let v_x and v_y be the components of its velocity along x and y-directions at the time of impact with wall. Coefficient of restitution between the ball and the wall is e. Component of its velocity along y-diection (common

tangent) v_y will remain unchanged while component of its velocity along x -direction (common normal) v_x will become ev_x is opposite direction.



The situation shown in the figure a small ball is projected at an angle α between two vertical walls such that in the absence of the wall its range would have been $5d$. Given that all the collisions are perfectly elastic (for first

and second problems), the walls are supposed to be very tall.

The total time taken by the ball to come back to the ground (if collision is inelastic) is

A. $> \frac{2u \sin \alpha}{g}$

B. $< \frac{2u \sin \alpha}{g}$

C. $= \frac{2u \sin \alpha}{g}$

D. $= \frac{2u \cos \alpha}{g}$

Answer: C

Watch Video Solution

4. Two pendulum bobs of mass m and $2m$ collide elastically at the lowest point in their motion. If both the balls are releasd from height H above the lowest point,

Velocity of the bob of mass m just after collision is

A. $\sqrt{\frac{2gH}{3}}$

B. $\frac{5}{3}\sqrt{2gH}$

C. $\sqrt{2gH}$

D. None of these

Answer: B

Watch Video Solution

5. Two pendulum bobs of masses m and 2m collide head on elastically at the lowest point in their motion. If both the balls are released from a height H above the lowest point, to what heights do they rise for the first time after collision?

A. $\frac{25H}{9}$

B. $\frac{H}{9}$

C. $\frac{16H}{9}$

D. $\frac{H}{4}$

Answer: A

Watch Video Solution

6. Two pendulum bobs of masses m and 2m collide head on elastically at the lowest point in their motion. If both the balls are released from a height H above the lowest point, to

what heights do they rise for the first time after collision?

A. $\frac{25}{9}H$

B. $\frac{H}{9}$

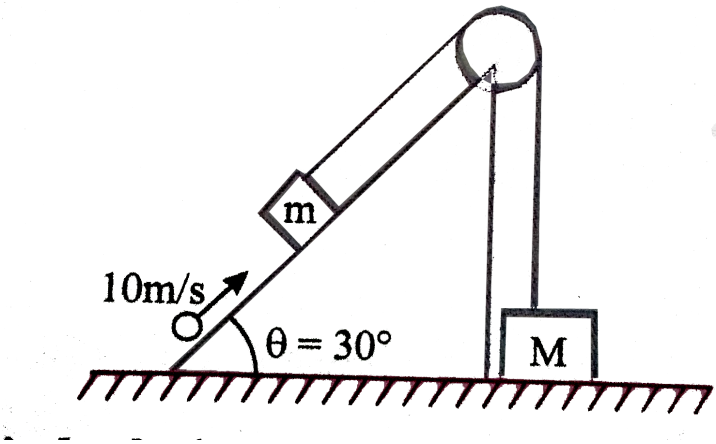
C. $\frac{16H}{9}$

D. None of these

Answer: B

Watch Video Solution

7. A light in extensible thread passes over a small frictionless pully. Two blocks of masses $m = kg$ and $M = 3kg$ respectively are attached with the thread as shown in the fig. The heavier block rests on a horizontal surface. A shell of mass $1kg$ moving upward with a velocity $10m/s$ collides and sticks with the block of mass $'m'$ as shown in the fig at $t = 0$. If the long inclined plane is smooth.



Find velocity of $(m + \text{shell})$ just after collision.

A. $5m/s$

B. $10m/s$

C. $2.5m/s$

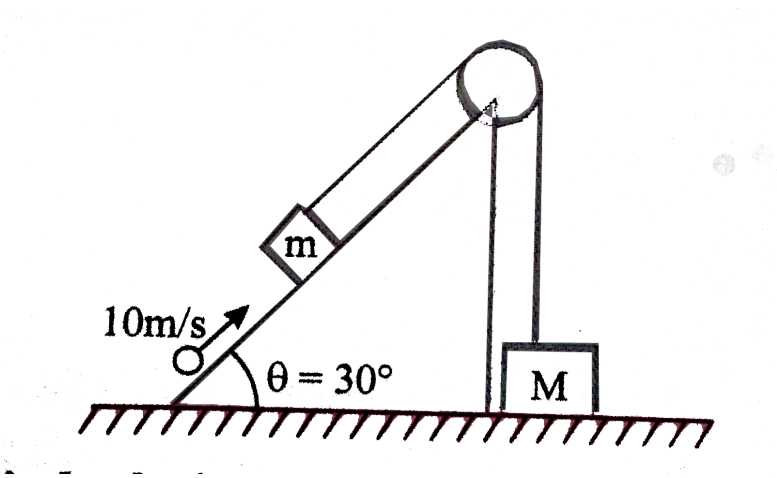
D. $7.5m/s$

Answer: A

Watch Video Solution

8. A light in extensible thread passes over a small frictionless pully. Two blocks of masses $m = kg$ and $M = 3kg$ respectively are attached with the thread as shown in the fig. The heavier block rests on a horizontal surface. A shell of mass $1kg$ moving upward with a velocity $10m/s$ collides and sticks with the block of mass $'m'$ as shown in the fig at

$t = 0$. If the long inclined plane is smooth.



Find the maximum height ascended by $'M'$

A. $\frac{1}{4}m$

B. $\frac{1}{2}m$

C. $1m$

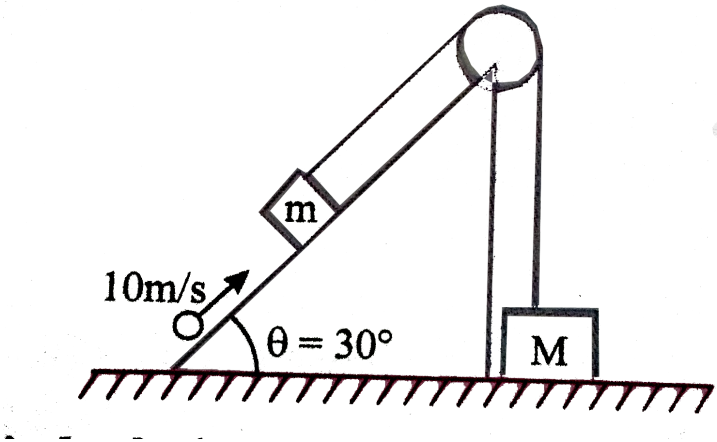
D. $\frac{1}{6}m$

Answer: B

Watch Video Solution

9. A light in extensible thread passes over a small frictionless pully. Two blocks of masses $m = kg$ and $M = 3kg$ respectively are attached with the thread as shown in the fig. The heavier block rests on a horizontal surface. A shell of mass $1kg$ moving upward with a velocity $10m/s$ collides and sticks with the block of mass $'m'$ as shown in the fig at

$t = 0$. If the long inclined plane is smooth.



Find the total time T at that instant of maximum height ascended by M

A. $\frac{7}{2}s$

B. $\frac{5}{2}s$

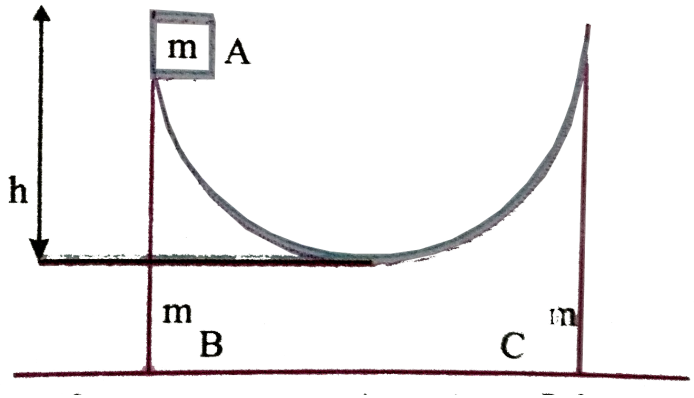
C. $\frac{3}{2}s$

D. $\frac{1}{2}s$

Answer: B

Watch Video Solution

10. Wedges B and C are smooth and they are placed in contact as shown. Block A is placed on wedge B at a height h above ground. Block and the two wedges are all of same mass m. Neglect friction every where.



The maximum height upto which block A rises on wedge C is

A. h

B. $h/2$

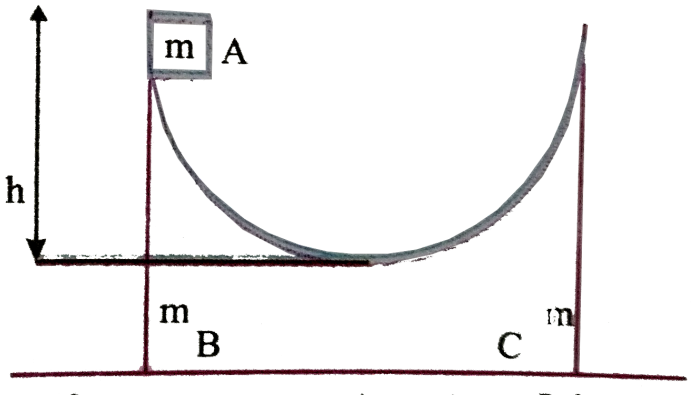
C. $h/4$

D. $h/3$

Answer: C

Watch Video Solution

11. Wedges B and C are smooth and they are placed in contact as shown. Block A is placed on wedge B at a height h above ground. Block and the two wedges are all of same mass m. Neglect friction every where.



The velocity of A when it has slide down to ground from wedge C is

A. 0

B. $\sqrt{\frac{gh}{2}}$

C. $\sqrt{\frac{gh}{4}}$

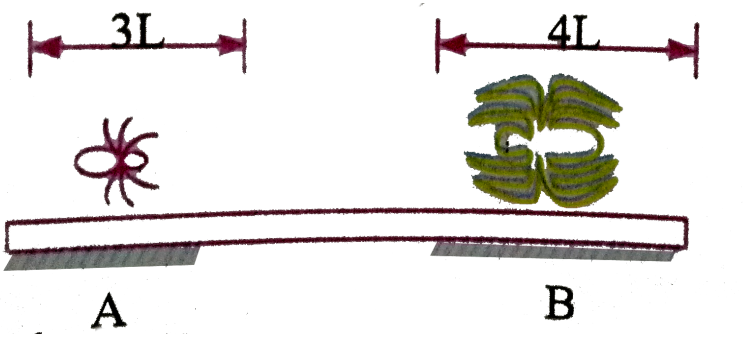
D. $\frac{\sqrt{gh}}{3}$

Answer: A

Watch Video Solution

12. A uniform bar of length $12L$ and mass $48m$ is supported horizontally on two smooth tables as shown in the figure. A small moth (an insect) of mass $8m$ is sitting on end A of the rod and a spider (an insect) of mass $16m$ is sitting on the other end B. Both the insects start moving towards each other along the rod with moth moving at speed $2v$ and the spider at half of this speed. They meet at a point P on the rod and the spider eats the moth. After this the spider moves with a velocity $v/2$ relative to the rod towards the

end A. The spider takes negligible time in eating the insect. Also, let $v = L/T$, where T is a constant having value $4\,\text{sec}$.



Displacement of the rod by the time when the insects meet is

A. $L/2$

B. L

C. $3L/4$

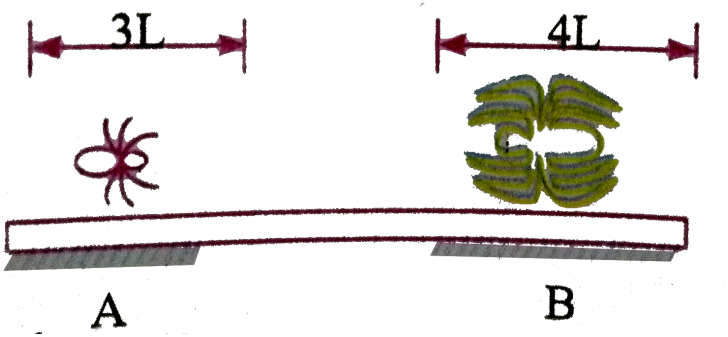
D. zero

Answer: C

Watch Video Solution

13. A uniform bar of length $12L$ and mass $48m$ is supported horizontally on two smooth tables as shown in the figure. A small moth (an insect) of mass $8m$ is sitting on end A of the rod and a spider (an insect) of mass $16m$ is sitting on the other end B. Both the insects

start moving towards each other along the rod with moth moving at speed $2v$ and the spider at half of this speed. They meet at a point P on the rod and the spider eats the moth. After this the spider moves with a velocity $v/2$ relative to the rod towards the end A. The spider takes negligible time in eating the insect. Also, let $v = L/T$, where T is a constant having value $4\,\text{sec}$.



The point P is at

A. the centre of the rod

B. the edge of the table supporting the end B

C. close to the edge of the table supporting the end A

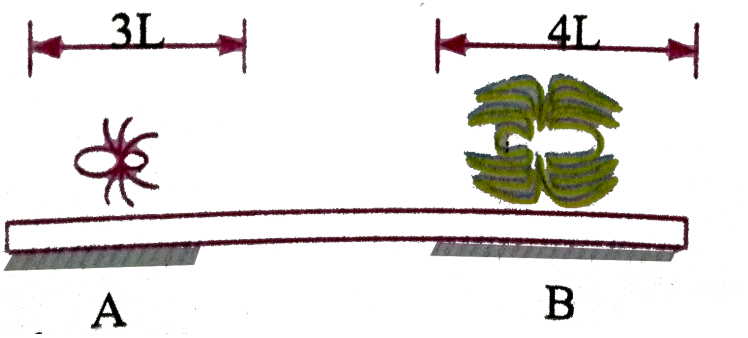
D. none of the above

Answer: B

Watch Video Solution

14. A uniform bar of length $12L$ and mass $48m$ is supported horizontally on two smooth tables as shown in the figure. A small moth (an insect) of mass $8m$ is sitting on end A of the rod and a spider (an insect) of mass $16m$ is sitting on the other end B. Both the insects start moving towards each other along the rod with moth moving at speed $2v$ and the spider at half of this speed. They meet at a point P on the rod and the spider eats the moth. After this the spider moves with a velocity $v/2$ relative to the rod towards the

end A. The spider takes negligible time in eating the insect. Also, let $v = L/T$, where T is a constant having value $4\,\text{sec}$.



The speed of the bar after the spider eats up the moth and moves towards A is

A. $v/2$

B. v

C. $v/6$

D. $2v$

Answer: C

Watch Video Solution

15. A projectile of mass $50kg$ is shot vertically upwards with n initial velocity of $100m/s$. After $5s$, it explodes into two fragments, one of (1st fragment) which having a mass of $20kg$ travels vertically up with a velovity of $150m/s\left(g = 10m/s^2\right)$. Bases on the above

paragraph answer the following questions.

What is the magnitude and direction of velocity of the 2nd fragments just after explosion is

A. $\frac{50}{3} m/s$ (up)

B. $50 m/s$ (down)

C. $50 m/s$

D. $\frac{50}{3} m/s$ (down)

Answer: D

Watch Video Solution

16. A projectile of mass $50kg$ is shot vertically upwards with n initial velocity of $100m/s$. After $5s$, it explodes into two fragments, one of (1st fragment) which having a mass of $20kg$ travels vertically up with a velovity of $150m/s\left(g = 10m/s^2\right)$. Bases on the above paragraph answer the following questions.

What is the linear momentum of $2nd$ fragement $3s$ after the explosion is

A. $140/3kg - m/s$

B. $40/3kg - m/s$

C. $80/3kg - \frac{m}{s}$

D. $100/3kg - m/s$

Answer: A

Watch Video Solution

17. A projectile of mass $50kg$ is shot vertically upwards with n initial velocity of $100m/s$. After $5s$, it explodes into two fragments, one of (1st fragment) which having a mass of $20kg$

travels vertically up with a velovity of $150m/s\left(g = 10m/s^2\right)$. Bases on the above paragraph answer the following questions.

The sum of linear momenta of fragments $3s$ after the explosion is

A. $2400kg - m/s$

B. $1400kg - m/s$

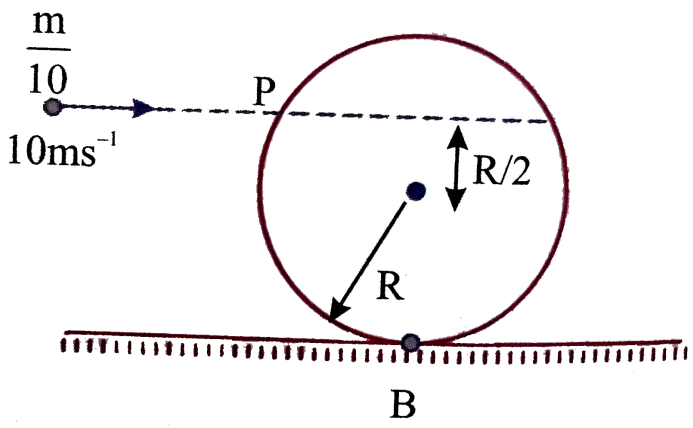
C. $1000kg - m/s$

D. $3800kg - m/s$

Answer: C

Watch Video Solution

18. A small particle of mass $m/10$ is moving horizontally at a height of $3R/2$ from ground with velocity $10m/s$. A perfectly inelastic collision occurs at point P of surface. The mass m of sphere is R. ($m = 10Kg$ and $R = 0.1m$) (Assume all surfaces to be smooth). Answer the following questions.



speed of particle just after collisons is approximately.....

A. $5.0m/s$

B. $10m/s$

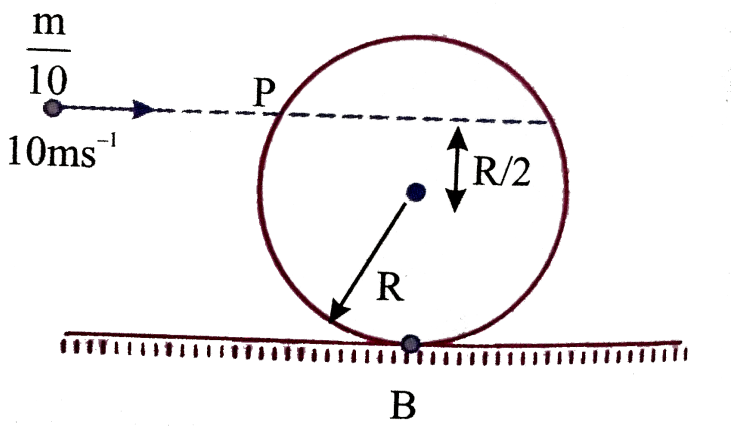
C. $15.0m/s$

D. $20.0m/s$

Answer: A

Watch Video Solution

19. A small particle of mass $m/10$ is moving horizontally at a height of $3R/2$ from ground with velocity $10m/s$. A perfectly inelastic collision occurs at point P of surface. The mass m of sphere is R. ($m = 10Kg$ and $R = 0.1m$) (Assume all surfaces to be smooth). Answer the following questions.



Speed of shpere just after collision is

A. $27/43 m/s$

B. $\frac{30}{43} m/s$

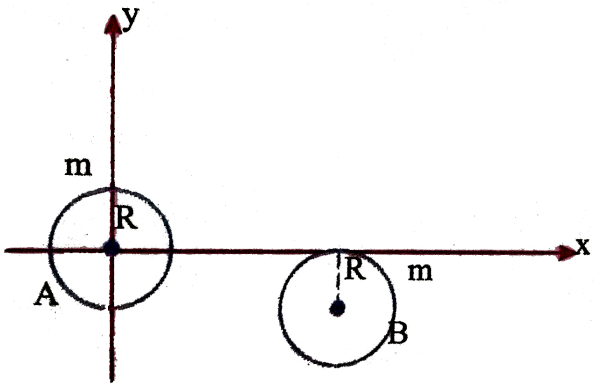
C. $\frac{35}{43} m/s$

D. $\frac{40}{43} m/s$

Answer: B

View Text Solution

20. Two smooth balls A and B, each of mass m and radius R, have their centres as shown in fig. Ball A, moving along positive x-axis, collides with ball B. Just before the collision, speed of ball $'A'$ is $4m/s$ and ball $'B'$ is stantionary. The collision



Velocity of the ball $'A'$ just after the collision is

A. $\left(i+\sqrt{3}\hat{j}\right)m/s$

B. $\left(i-\sqrt{3}\hat{j}\right)m/s$

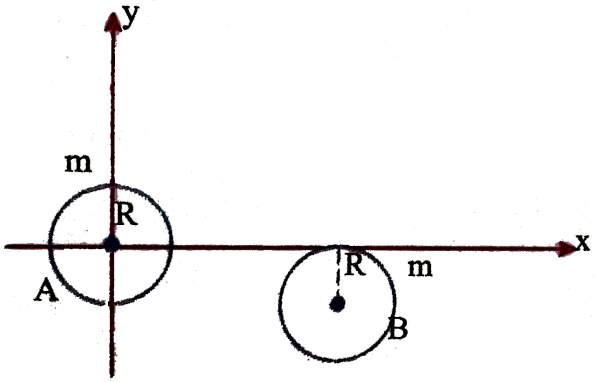
C. $\left(2i+\sqrt{3}\hat{j}\right)m/s$

D. $\left(2i+2\hat{j}\right)m/s$

Answer: A

Watch Video Solution

21. Two smooth balls A and B, each of mass m and radius R, have their centres as shown in fig. Ball A, moving along positive x-axis, collides with ball B. Just before the collision, speed of ball $'A'$ is $4m/s$ and ball $'B'$ is stantionary. The collision



What is velocity of ball $'B'$ after collision is

A. $\left(3\hat{i}-\sqrt{3}\hat{j}\right)m/s$

B. $\left(2\sqrt{3}\hat{i}-2\sqrt{3}\hat{j}\right)m/s$

C. $\left(2\hat{i}-2\sqrt{3}\hat{j}\right)m/s$

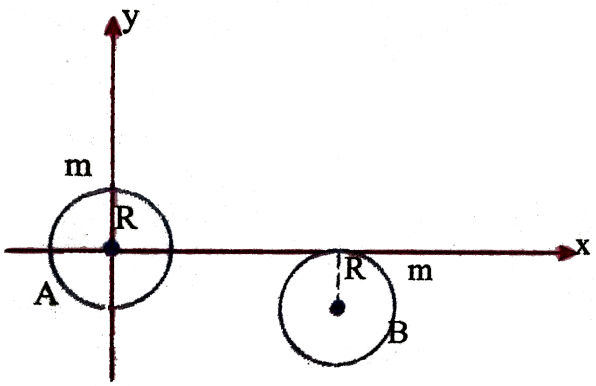
D. $\left(\sqrt{3}\hat{i}-\sqrt{3}\hat{j}\right)m/s$

Answer: B

Watch Video Solution

22. Two smooth balls A and B, each of mass m and radius R, have their centres as shown in fig. Ball A, moving along positive x-axis,

collides with ball B. Just before the collision, speed of ball $'A'$ is $4m/s$ and ball $'B'$ is stantionary. The collision



Impluse of the force exerted by $'A'$ on $'B'$ during the collision is equal to

A. $\left(\sqrt{3}m\hat{i} + 3m\hat{j}\right)kg - \frac{m}{s}$

B. $\left(\frac{\sqrt{3}}{2}m\hat{i} - 3m\hat{j}\right)kg - \frac{m}{s}$

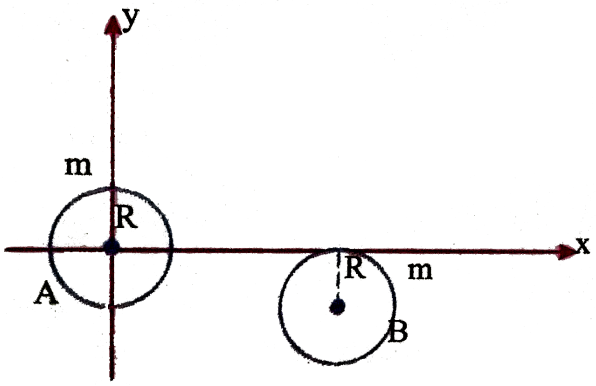
C. $\left(3m\hat{i} - \sqrt{3}m\hat{j}\right)kg - \frac{m}{s}$

D. $\left(2\sqrt{3}m\hat{i} - 3m\hat{j}\right)kg - \frac{m}{s}$

Answer: C

Watch Video Solution

23. Two smooth balls A and B, each of mass m and radius R, have their centres as shown in fig. Ball A, moving along positive x-axis, collides with ball B. Just before the collision, speed of ball $'A'$ is $4m/s$ and ball $'B'$ is stantionary. The collision



Coefficient of restitution during the collision is changed to $\frac{1}{2}$, keeping all other parameters unchanged. What is the velocity of the ball $'B'$ after the collision.

A. $\frac{1}{2}\left(3\sqrt{3}\hat{i}+9\hat{j}\right)m/s$

B. $\frac{1}{4}\left(9\hat{i}-3\sqrt{3}\hat{j}\right)m/s$

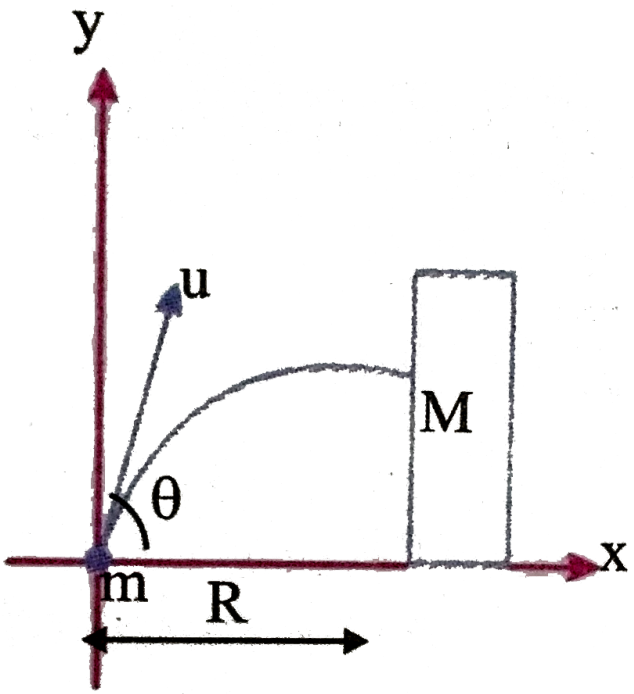
C. $\left(6\hat{i}+3\sqrt{3}\hat{j}\right)m/s$

D. $\left(6\hat{i}-3\sqrt{3}\hat{j}\right)m/s$

Answer: B

Watch Video Solution

24. A ball of mass m is projected with a velocity $'u'$ at angle θ with the horizontal. It collides with a smooth box of mass $'M'$ at its highest position. If the co-efficient of restitution is $'e'$.



FInd the velocity of the ball after collision

A. $\left(\frac{m-eM}{M+m}\right)u\cos\theta$

B. $\left(\frac{M-em}{M+m}\right)u\cos\theta$

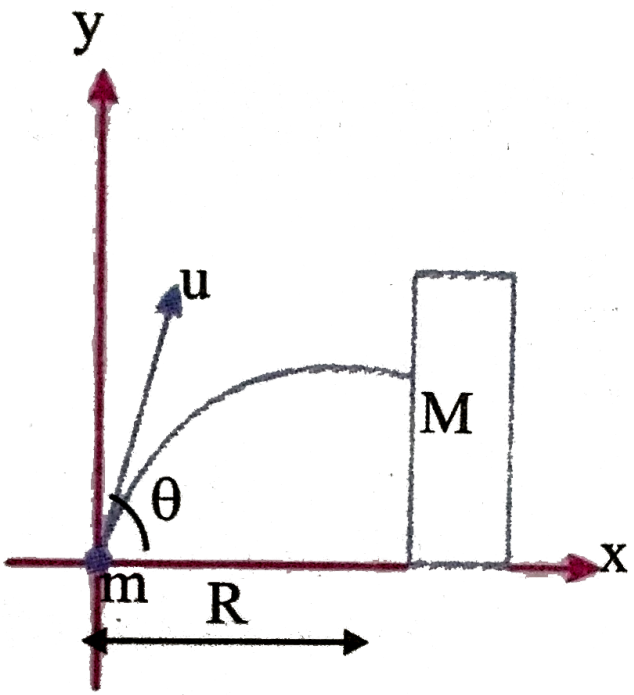
C. $\left(\frac{m+eM}{M+m}\right)u\sin\theta$

D. $\left(\frac{m-eM}{M+m}\right)u\sin\theta$

Answer: A

Watch Video Solution

25. A ball of mass m is projected with a velocity $'u'$ at angle θ with the horizontal. It collides with a smooth box of mass $'M'$ at its highest position. If the co-efficient of restitution is $'e'$.



Find the horizontal distance travelled by the ball before collision.

A. $\frac{u^2 2\sin\theta\cos\theta}{g}$

B. $\frac{u^2\sin\theta\cos\theta}{g}$

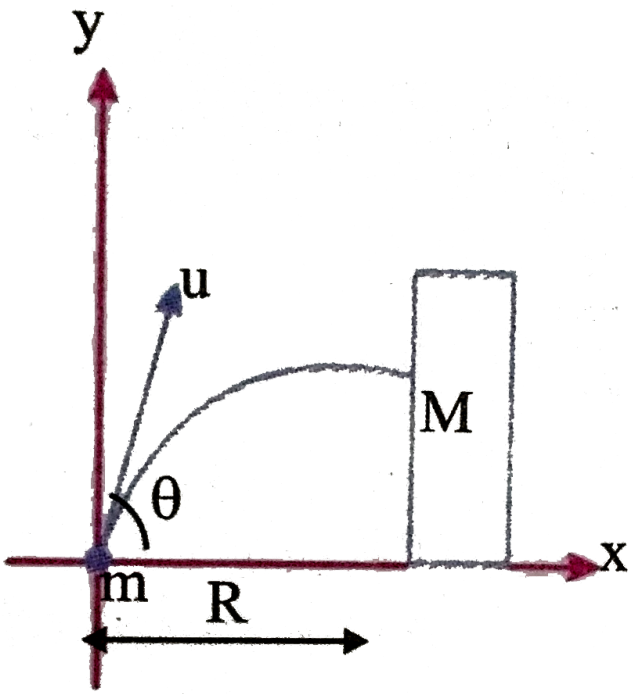
C. $\frac{u^2\sin\theta\cos\theta}{2g}$

D. $\frac{u^2 \sin\theta \cos\theta}{4g}$

Answer: B

Watch Video Solution

26. A ball of mass m is projected with a velocity $'u'$ at angle θ with the horizontal. It collides with a smooth box of mass $'M'$ at its highest position. If the co-efficient of restitution is $'e'$.



Find the position at which the ball meets the x-axis from the origin

A. $\left(\frac{M(1-e)+2m}{M+m}\right)R$

B. $\left(\frac{m(1-e)+2M}{M+m}\right)R$

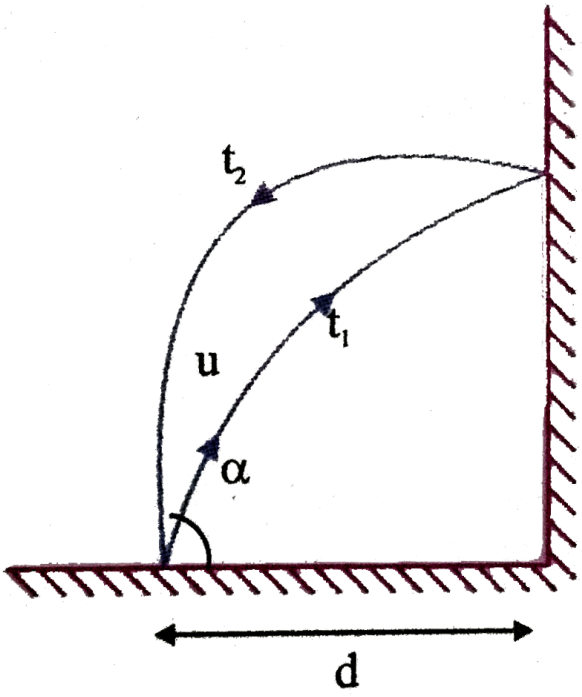
C. $\left(\frac{M+m(1-e)}{M+m}\right)R$

D. $\left(\frac{M(1-e)+2m}{2(M+m)}\right)R$

Answer: A

Watch Video Solution

27. An inelastic ball is projetced with a velocity $'u'$ at an angle $'\alpha'$ to the horizontal, towards a wall distant $'d'$ from the point of projection. After collision the ball returns to the point of projection (Co-efficient of restitution between sphere and wall is $'e'$)



The total time of journey of the ball is

A. $\frac{u \sin \alpha}{g}$

B. $\frac{2u \sin \alpha}{g}$

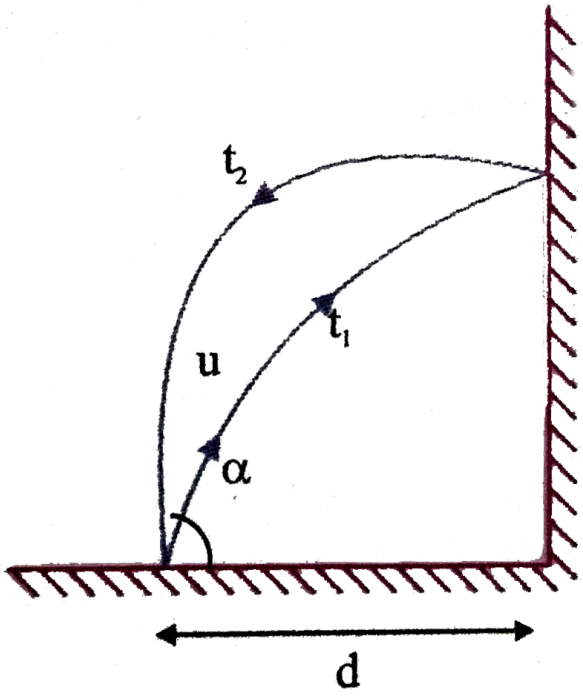
C. $\frac{2u \cos \alpha}{g}$

D. $\frac{u \tan \alpha}{2g}$

Answer: B

Watch Video Solution

28. An inelastic ball is projetced with a velocity $'u'$ at an angle $'\alpha'$ to the horizontal, towards a wall distant $'d'$ from the point of projection. After collision the ball returns to the point of projection (Co-efficient of restitution between sphere and wall is $'e'$)



The horizontal distance $'d'$ from the wall is

A. $\frac{u^2 \sin 2\alpha}{g}\left(\frac{e}{1+e}\right)$

B. $\frac{u^2 \sin \alpha}{g}\left(\frac{e}{1+e}\right)$

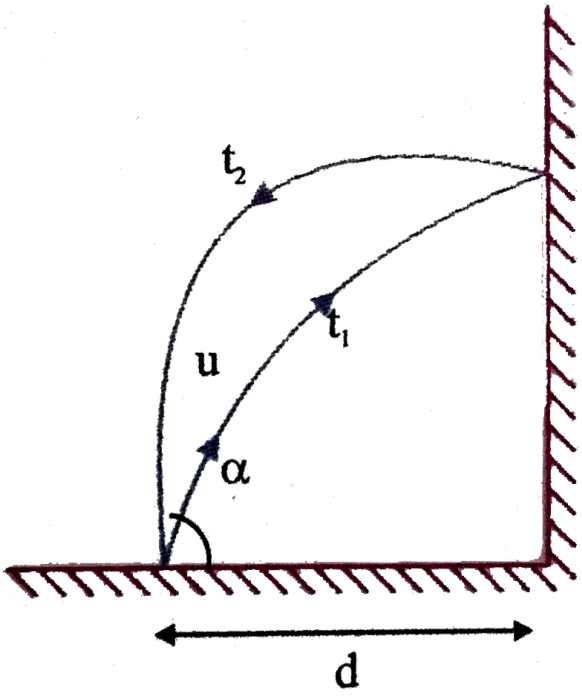
C. $\frac{u^2 \cos 2\alpha}{g}\left(\frac{e}{1+e}\right)$

D. $\frac{u^2 \sin 2\alpha}{2g}\left(\frac{e}{1+e}\right)$

Answer: A

Watch Video Solution

29. An inelastic ball is projetced with a velocity $'u'$ at an angle $'\alpha'$ to the horizontal, towards a wall distant $'d'$ from the point of projection. After collision the ball returns to the point of projection (Co-efficient of restitution between sphere and wall is $'e'$)



If the line joining the point of projection and the point of impact makes an angle $'\theta'$ with the horizontal, then $\tan\theta$ is

A. $e\tan\alpha$

B. $(1+e)\tan\alpha$

C. $\frac{(1+e)}{\tan\alpha}$

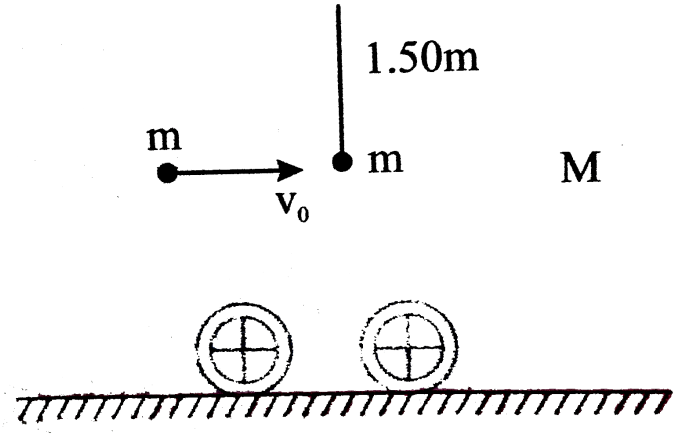
D. $\frac{\tan\alpha}{(1+e)}$

Answer: D

Watch Video Solution

30. A ball of mass $m = 1kg$ is hung vertically by a thread of length $1 = 1.50m$. Upper end of the thread is attached to the ceiling of a trolley of mass $M = 4kg$. Initially, the trolley is stationary and it is free to move along

horizontal rails with out friction. A shell of mass $m = 1kg$, moving horizontally with velocity $v_0 = 6m/s$ collides with thread starts to deflect towards right



The velocity of the combined body just after collision is

A. $2m/s$

B. $3m/s$

C. $1m/s$

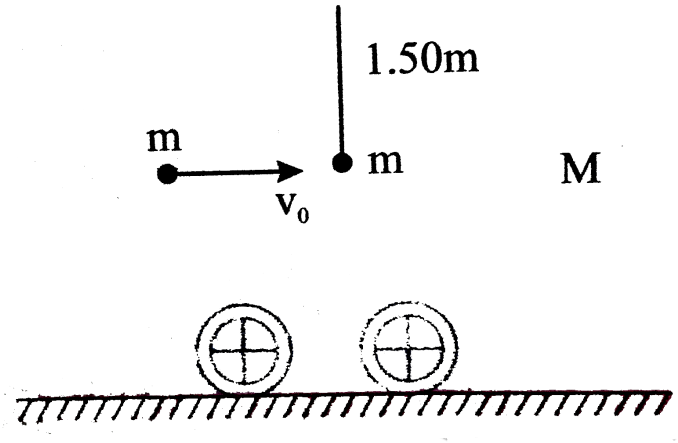
D. $4m/s$

Answer: B

Watch Video Solution

31. A ball of mass $m = 1kg$ is hung vertically by a thread of length $1 = 1.50m$. Upper end of the thread is attached to the ceiling of a trolley of mass $M = 4kg$. Initially, the trolley is

stationary and it is free to move along horizontal rails with out friction. A shell of mass $m = 1kg$, moving horizontally with velocity $v_0 = 6m/s$ collides with thread starts to deflect towards right



At the time a maximum deflection of the thread with vertical, the trolley will move with velocity

A. $2m/s$

B. $3m/s$

C. $1m/s$

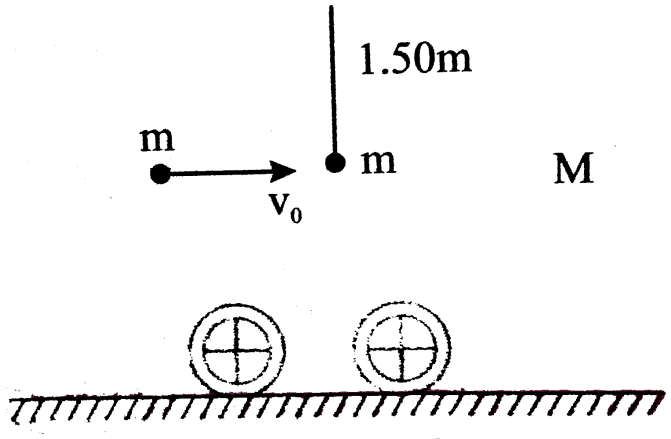
D. $4m/s$

Answer: C

Watch Video Solution

32. A ball of mass $m = 1kg$ is hung vertically by a thread of length $1 = 1.50m$. Upper end of the thread is attached to the ceiling of a

trolley of mass $M = 4kg$. Initially, the trolley is stationary and it is free to move along horizontal rails with out friction. A shell of mass $m = 1kg$, moving horizontally with velocity $v_0 = 6m/s$ collides with thread starts to deflect towards right



The maximum deflection of the thread with the vertical is

A. $\cos^{-1}\left(\frac{4}{5}\right)$

B. $\cos^{-1}\left(\frac{3}{5}\right)$

C. $\cos^{-1}\left(\frac{2}{3}\right)$

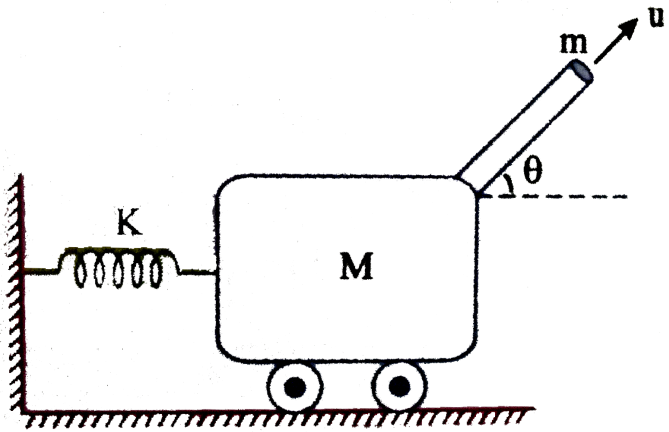
D. $\cos^{-1}\left(\frac{3}{4}\right)$

Answer: A

Watch Video Solution

33. A bullet of mass $'m'$ is fired from a gum of mass M with a (muzzle) velocity u. If the cart on which gun is fixed can move on the smooth

horizontal floor as shown



Find recoil velocity of the cart

A. $\frac{Mu\cos\theta}{M+m}$

B. $\frac{mu\cos\theta}{M}$

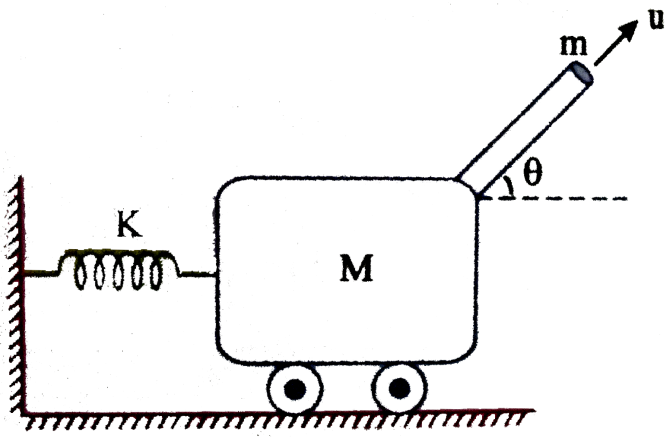
C. $\frac{Mu\cos\theta}{m}$

D. $\frac{mu\cos\theta}{M+m}$

Answer: D

Watch Video Solution

34. A bullet of mass $'m'$ is fired from a gum of mass M with a (muzzle) velocity u. If the cart on which gun is fixed can move on the smooth horizontal floor as shown



Find maximum compression of spring of spring constant (K) is

A. $\sqrt{\frac{M}{K}}\left(\frac{mu\cos\theta}{m}\right)$

B. $\sqrt{\frac{K}{M}}\left(\frac{Mu\cos\theta}{M+m}\right)$

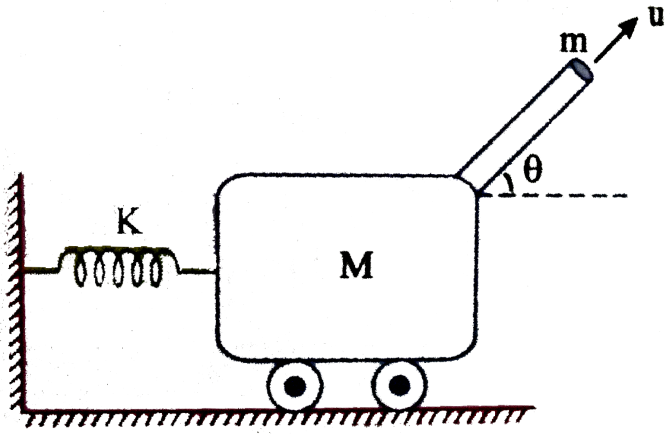
C. $\sqrt{\frac{M}{K}}\left(\frac{mu\cos\theta}{M+m}\right)$

D. $\sqrt{\frac{M}{K}}\left(\frac{mu\cos\theta}{M}\right)$

Answer: C

Watch Video Solution

35. A bullet of mass $'m'$ is fired from a gum of mass M with a (muzzle) velocity u. If the cart on which gun is fixed can move on the smooth horizontal floor as shown



Energy of explosion (or) change in kinetic energy of the system is

A. $\dfrac{m\left(M+m\sin^2\theta\right)u^2}{2(M+m)}$

B. $\frac{M\left(M+m\cos^2\theta\right)u^2}{(M+m)}$

C. $\frac{m(M+m)u^2}{M}$

D. None of these

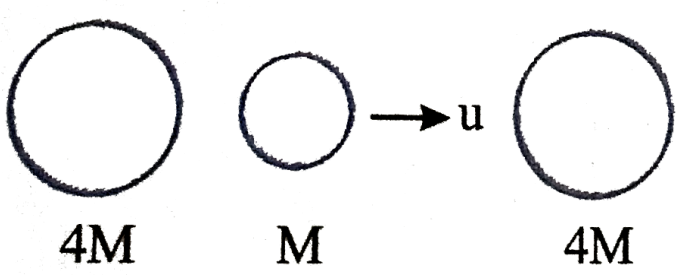
Answer: A

Watch Video Solution

Integer Type Questions

1. Two Particle of equal masses $4M$ are initially at rest. A particle of mass M moving at speed

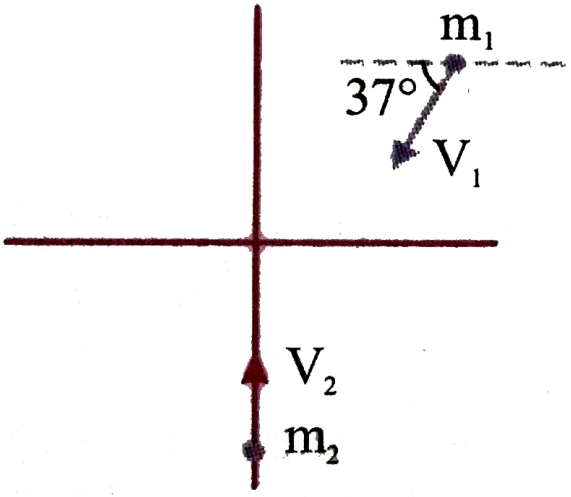
u collide elastically with one of the larger balls. How many collision occure?



Watch Video Solution

2. Two balls with masses $m_1 = 3kg$ and $m_2 = 5kg$ have identical velocity $V = 5m/s$ in the direction shwon in figure. They collide at origin. Find the distance of position of $C.M.$

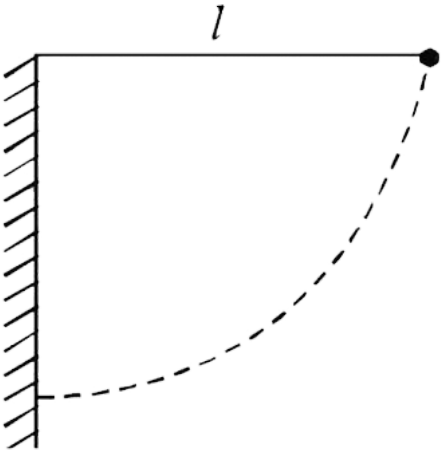
from the origin $2\,\text{sec}$ after the collision.



Watch Video Solution

3. A simple pendalum is suspended from a peg on a verticle wall . The pendulum is pulled away from the well is a horizental position

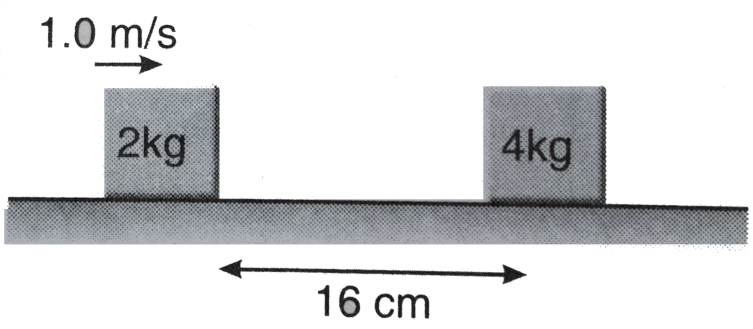
(see fig) and released . The bell his the well the coefficient of resitution being $\frac{2}{\sqrt{5}}$



what is the miximum number of colision after which the amplitube of secillections between less that 60 digree ?

Watch Video Solution

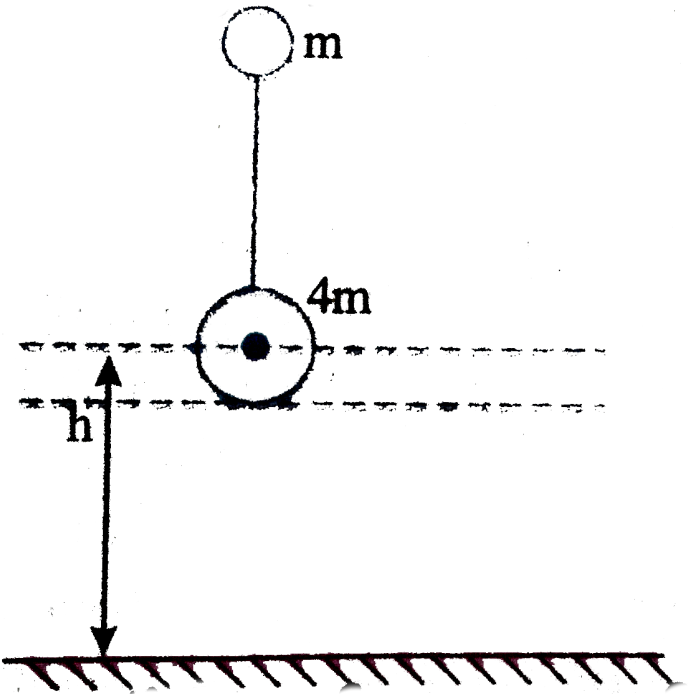
4. The friction coefficient between the horizontal surface and each of the block shown in the figure is 0.2. The collision between the blocks is perfectly elastic. Find the separation between them when they come to rest. (Take $g = 10m/s^2$).



Watch Video Solution

5. A small ball of mass $'m'$ is connected by an intextensible mass less string of length $('l' = 10m)$ with an another ball of mass $M = 4m$. They are released with zero tension in the string from a height $h(h = 5m)$ as shown. Find the time when the string becomes taut for the first time after the mass $'M'$ collides with the ground is $\_\_\_\_S$. (Take all

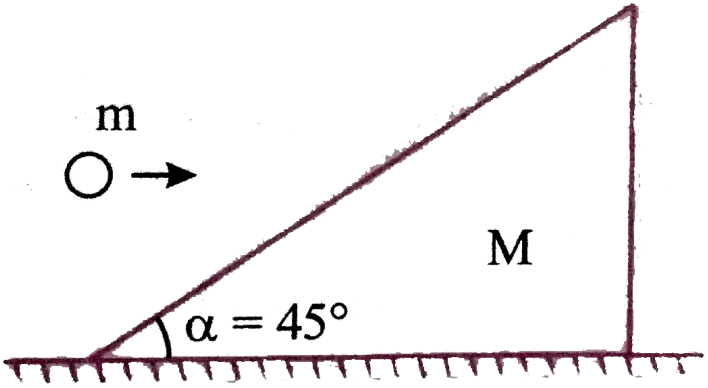
collisions to be elastic) $\left(g = 10m/s^2\right)$



Watch Video Solution

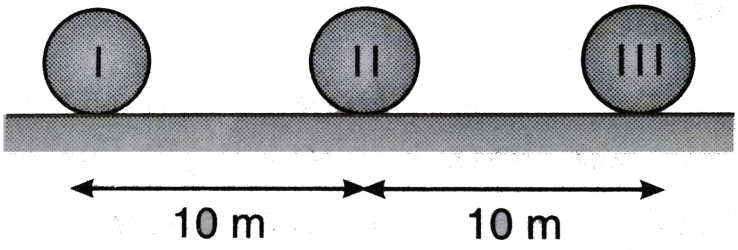
6. A small particle of mass $m = 2kg$ moving with constant horizontal velocity $u = 10m/s$

strikes a wedge shaped block of mass $M = 4kg$ placed on smooth horizontal surface on its inclined surface as shown in figure. After collision particle starts moving up the inclined plane. Calculate the velocity of wedge immediately after collision.



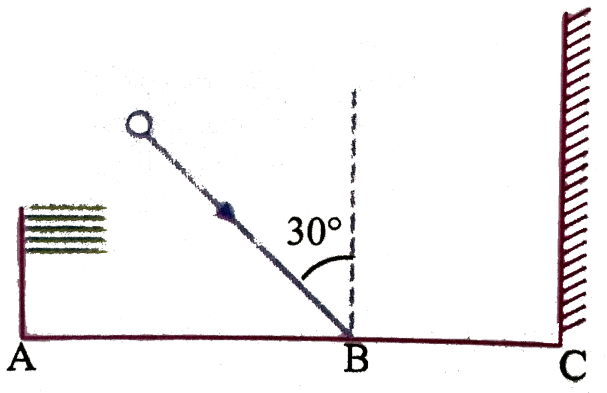
Watch Video Solution

7. Three identical balls, ball I, ball II and ball III are placed on a smooth floor on a straight line at the separation of $10m$ between balls as shown in figure. Initially balls are stationary. But I is given velocity of $10m/s$ towards ball II, collision between balls I and II is inelastic with coefficient of restitution 0.5 but collision between balls II and III is perfectly elastic. What is the time interval between two consecutive collisions between ball I and II?



Watch Video Solution

8. A ball collides at B with velocity $10m/s$ at 30° with vertical. There is a flag at A and a will at C. Collision of ball with groundis perfectly inelastic $(e = 0)$ and that with wall is elastic $(e = 1)$. Given $AB = BC = 10m$. Find the time after which ball will collide with the flag.

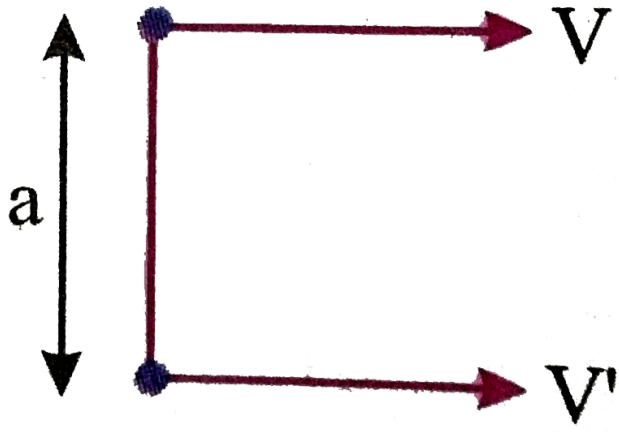


Watch Video Solution

Subjective Type Questions

1. Two particles of mases m and m' moving on parallel straight lines are at the distance $'a'$ apart with velocities v and $v'(v > v')$. The particles are connected by a string of length $(> a)$ which was loose in the beginning. Calculate the impluse of tension of the string

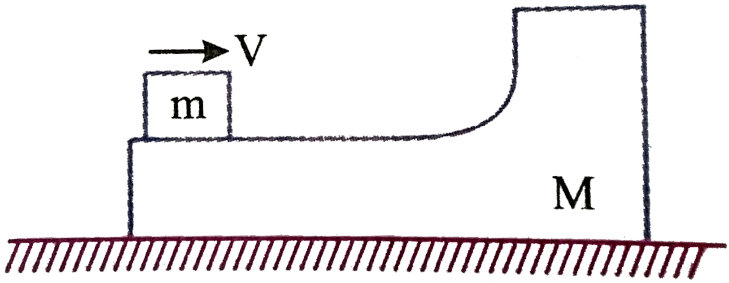
when it becomes taut.



Watch Video Solution

2. A body of mass M with a small block m placed on it rests on a smooth horizontal surface. The block is set in motion in the horizontal direction with a velocity v. To what

height relative to the initial level will the block rise after breaking off from the body M. Friction can be assumed to be absent.



Watch Video Solution

3. From a point on a smooth floor of a room a ball is shot to hit a wall. The ball then returns back to the point of projection. If the time

taken by the ball in returining is twice the time taken to reach the wall, find twice the time taken to reach the wall, find the coefficient of restitution between was and ball.

Watch Video Solution

4. Stationary particles of mass m_2 is hit by another particles of mass m_1. The stationary particle deviates through θ and the other by 90°. Find the value of θ if the collision is perfectly elastic.

Watch Video Solution

5. The blocks shown in figure have equal masses. The surface of A is smooth but that of B has a friction coefficietn of 0.10 with the floor. Block A is moving at a speed of 10 m/s towards B which is kept at rest. Fnd the distance travelled by B if (a). the collision is perfectly elastic and (b). the collisioni is perfectly inelastic. Take $g = 10\frac{m}{s^2}$.

Watch Video Solution

6. Two identical smooth balls are projected towards each other from points A and B on the horizontal ground with same speed of projection. The angle of projection in each case is 30°. The distance between A and B is $100m$. The balls collide in air and return to their respective points of projection. If coefficient of restitution is $e = 0.7$, find

(a) the speed of projection of either ball.

(b) coordinates of point with respect to a point of projection of A, where the balls

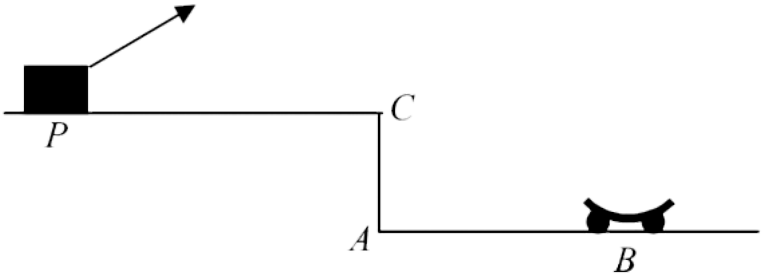
collide.

(Take $g = 10m/s^2$)

Watch Video Solution

7. A car P is moving with a uniform speed $5\sqrt{3}m/s$ towards a carriage of mass 9 kg at rest kept on the rails at a point B as shown in figure. The height AC is 120 m. Cannon balls of 1 kg are fired from the car with an initial velocity $100m/s$ at an angle 30° with the horizontal. The first cannon hall hits the

stationary carriage after a time t_0 and sticks to it. Determine t_0.



At t_0, the second cannon ball is fired. Assume that the resistive force between the rails and the carriage is constant and ignore the vertical motion of the carriage throughout. If the second ball also hits and sticks to the

carriage, what will be the horizontal velocity of the carriage just after the second impact?

Watch Video Solution

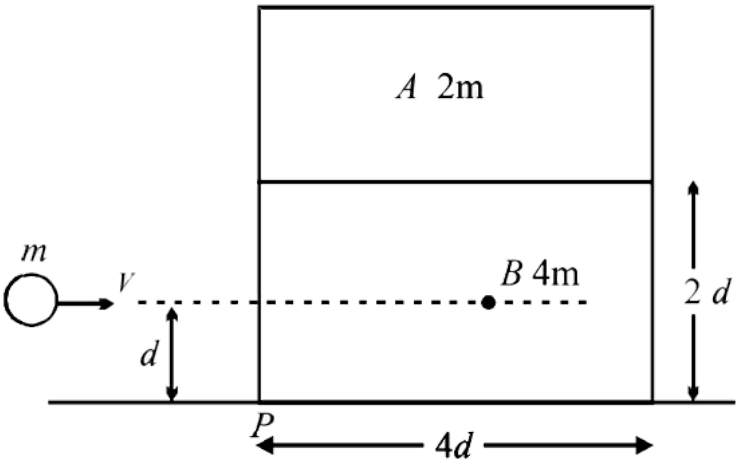
8. An object of mass 5 kg is projecte with a velocity of $20ms^{-1}$ at an angle of 60° to the horizontal. At the highest point of its path , the projectile explodes and breaks up into two fragments of masses 1kg and 4 kg. The fragments separate horizontally after the explosion, which releases internal energy such

that $K.E.$ of the system at the highest point is doubled. Calculate the separation betweent the two fragments when they reach the ground.

Watch Video Solution

9. A block 'A' of mass 2m is placed on another block 'B' of mass 4m which in turn is placed on a fixed table. The two blocks have a same length 4d and they are placed as shown in fig The coefficient of friction (both static and

kinetic) between the block 'B' and table is μ. There is no friction between the two blocks. A small object of mass m moving horizontally along a line passing through the centre of mass (cm.) of the block B and perpendicular to its face with a speed v collides elastically with the block B at a height d above the table.



(a) What is the minimum value of v(call it v_0)

required to make the block A topple?

(b) If $v = 2v_0$,find the distance (from the point P in the figure) at which the mass m falls on the table after collision. (Ignore the role of friction during the collision).

Watch Video Solution

Level I H W

1. If a force $\vec{F} = \left(\vec{i} + 2\vec{j} + \vec{k}\right)N$ acts on a body produces a displacement of

$\vec{S} = \left(4\vec{i} + \vec{j} + 7\vec{k}\right)m$, then the work done is

A. $9J$

B. $13J$

C. $5J$

D. $1J$

Answer: B

Watch Video Solution

2. Work done by the gravitational force on a body of mass $''m''$ moving on a smooth horizontal surface through a distance $'s'$ is

A. mgs

B. $-mgs$

C. 0

D. $2mgs$

Answer: C

Watch Video Solution

3. A body of mass $1kg$ is made to travel with a unitform acceleration of $30cm/s^2$ over a distance of $2m$, then work to be done is

A. $6J$

B. $60J$

C. $0.6J$

D. $0.3J$

Answer: C

Watch Video Solution

4. A uniform cylinder of radius $'r'$ length $'L'$ and mass $'m'$ is lying on the ground with the curved surface touching the ground. F it is to be oriented on the ground with the flat circular end in contact with ground, the work to be done is

A. $mg[(L/2) - r]$

B. $mL[(g/2) - r]$

C. $mr(gL - 1)$

D. $mgLr$

Answer: A

 Watch Video Solution

5. A meter scale of mass $400gm$ is lying horizontally on the floor. If it is to be held vertically with one end touching the floor, the work to be done is

A. $6J$

B. $4J$

C. $40J$

D. $2J$

Answer: D

Watch Video Solution

6. A force F is applied on a lawn move at an angle of 60° with the horizontal. If it moves through a distance x, the work done by the force is

A. $Fx/2$

B. $F / 2x$

C. $2Fx$

D. $2x / F$

Answer: A

Watch Video Solution

7. A weight lifter jerks $220kg$ vertically through 1.5 metre and holds still at that height for two minutes. The work done by him in lifting and in holding it still are respectively

A. $220J, 330J$

B. $3234J, 0J$

C. $2334J, 10J$

D. $0J, 3234J$

Answer: B

Watch Video Solution

8. A tennis ball has a mass of $56.7gm$ and is served by a player with speed of $180kmph$. The work done in serving the ball is nearly

A. $710J$

B. $71J$

C. $918J$

D. $91.8J$

Answer: B

Watch Video Solution

9. A body of mass $2kg$ is projected vertically up with velocity $5ms^{-1}$. The work done on the

body by gravitational force before it is brought to rest momentarily is

A. $250J$

B. $25J$

C. $0J$

D. $-25J$

Answer: D

Watch Video Solution

10. A force $F = (2 + x)$ acts on a particle in x-direction where F is in newton and x in metre. Find the work done by this force during a displacement form 1. 0 m to x = 2.0 m.

A. $2J$

B. $3.5J$

C. $4.5J$

D. $5J$

Answer: B

Watch Video Solution

Watch Video Solution

11. On increasing the speed of a bosy to $2ms^{-1}$, its kinetic energy is quadrupled. Then is original speed must be

A. $0.25ms^{-1}$

B. $1ms^{-1}$

C. $4ms^{-1}$

D. $2ms^{-1}$

Answer: D

Watch Video Solution

12. A bullet of mass $10gm$ strikes a target at $400m/s$ velocity and does half of its initial velocity. The loss of kinetic energy in joules is

A. 800

B. 200

C. 400

D. 600

Answer: D

Watch Video Solution

13. An object is acted on by a retarding force of $10N$ and at a particular instant its kinetic energy is $6J$. The object will come to rest after it has travelled a distance of

A. $3/5$

B. $5/3$

C. $4m$

D. $16m$

Answer: A

Watch Video Solution

14. A man standing on the edge of the roof of a $20m$ tall building projects a ball of mass $100gm$ vertically up with a speed of $10ms^{-1}$. The kinetic energy of the ball when it reaches the ground will be $[g = 10ms^{-2}]$

A. $5J$

B. $20J$

C. $25J$

D. Zero

Answer: C

Watch Video Solution

15. A river of salty water is flowing with a velocity $2m/\sec.$ If the density of water is $1.2gm/cc$, the kinetic energy of each of cubic metre of water is

A. $2.4J$

B. $24J$

C. $4.8KJ$

D. $2.4KJ$

Answer: D

Watch Video Solution

16. If the kinetic energy of a body increases by 125%, the percentage increases in its momentum is

A. $50\ \%$

B. $62.5\ \%$

C. $250\ \%$

D. $200\ \%$

Answer: A

Watch Video Solution

17. The kinetic energy of a body is $'K'$. If one-fourth of its mass is removed and velocity is doubled, its new kinetic energy is

A. K

B. $3K$

C. $4K$

D. $9K/4$

Answer: B

Watch Video Solution

18. An inelastic ball falls from a height of 100 metres. It loses 20% of its total energy due to impact. The ball will now rise to a height of

A. $80m$

B. $120m$

C. $60m$

D. $9.8m$

Answer: A

Watch Video Solution

19. A woman weighing $63kg$ eats plum cake whose energy content is 9800 calories. If all

this energy could be utilized by her, she can ascend a height of

A. $1m$

B. $67m$

C. $100m$

D. $42m$

Answer: B

Watch Video Solution

20. A spring of spring constant $5 \times 10^3 N/m$ is stretched initially by 5 cm from the unstretched position. The work required to further stretch the spring by another 5 cm is .

A. $6.25Nm$

B. $12.50Nm$

C. $18.75Nm$

D. $25Nm$

Answer: C

Watch Video Solution

Watch video solution

21. A spring with spring constant K when stretched through $1cm$, the potential energy is U. If it stretched by $4cm$, the potential energy will be

A. $4U$

B. $8U$

C. $16U$

D. $2U$

Answer: C

Watch Video Solution

22. A body moving with a kinetic energy of $6J$ cmes to rest at a distance of $1m$ due to a retarding force of

A. $4N$

B. $6N$

C. $5N$

D. $8N$

Answer: B

Watch Video Solution

23. A ship of mass $3 \times 10^7 kg$ initially at rest, is pulled by a force of $5 \times 10^5 N$ through a distance of 3m. Assuming that the resistance due to water is negligible, the speed of the ship is

A. $0.1m/s$

B. $1.5m/s$

C. $5m/s$

D. $60m/s$

Answer: A

Watch Video Solution

24. A vehicle of mass 1000 kg is moving with a velocity of $15ms^{-1}$.It is brought to rest by applying brakes and locking the wheels. If the slidding friction between the tyres and the

road is 6000 N, then the distance moved by the vehicle before coming to rest is

A. $37.5m$

B. $18.75m$

C. $75m$

D. $15m$

Answer: B

Watch Video Solution

25. The workdone to accelerate a body from $30ms^{-1}$ to $60ms^{-1}$ is three times the work done to accelerate it from $10ms^{-1}$ to $'v'$. The value of $'v'$ in ms^{-1} is

A. 30

B. $20\sqrt{2}$

C. $30\sqrt{3}$

D. $10\sqrt{10}$

Answer: D

Watch Video Solution

Watch Video Solution

26. A block of mass $4kg$ is initially at rest on a horizontal frixtionless surface. A horizontal force $\overrightarrow{F} = (3 + x)\hat{i}$ newtons acts on it, when the block is at $x = 0$. The maximum kinetic energy of the block between $x = 0$ and $x = 2m$ is

A. $6J$

B. $8J$

C. $9J$

D. $10J$

Answer: B

Watch Video Solution

27. A block of mass $4kg$ slides on a horizontal frictionless surface with a speed of $2m/s$. It is brought to rest in compressing a spring in its path. If the force constant of the spring is $400N/m$, by how much the spring will be compressed

A. $2 \times 10^{-2} m$

B. $0.2m$

C. $20m$

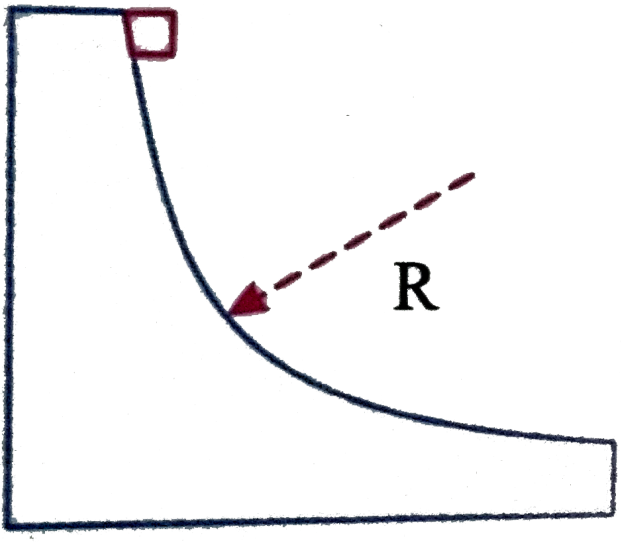
D. $200m$

Answer: B

Watch Video Solution

28. At what height above the ground must a mass of $5kg$ be to have its PE equal in value

to the KE possessed by it when it moves with



Watch Video Solution

29. A body slides down a fixed curved track that is one quadrant of a circle of radius R, as in the figure. If there is no friction and the

body starts from rest, its speed at the bottom of the track is

A. $5gR$

B. $\sqrt{5gR}$

C. $\sqrt{2gR}$

D. $\sqrt{gR}$

Answer: C

Watch Video Solution

30. An electric motor in a crane while lifting a load produces a tension of $4000N$ in the cable attached to the load. If the motor is winding the cable at the rate of $3ms^{-1}$, the power of the motor espressed in kilo watt units must be

A. 4

B. 3

C. 12

D. 6

Answer: C

Watch Video Solution

31. An electric motor operates with an efficiency of 90%. A pump operated by the motor has an efficiency of 80%. The overall efficiency of the system is

A. 85%

B. 100%

C. 72%

D. 60%

Answer: C

Watch Video Solution

32. A machine gun fires 420 bullets per minute. The velocity of each bullet is $300ms^{-1}$ and the mass of each bullet is $1gm$. The power of the machine gun is

A. $315W$

B. $315000W$

C. $630W$

D. $3150W$

Answer: A

Watch Video Solution

33. A $1kg$ mass at rest is subjected to an acceleration of $5m/s^2$ and travels $40m$. The average power during the motion is

A. $40W$

B. $8W$

C. $50W$

D. $200W$

Answer: C

Watch Video Solution

34. If the power of the motor of a water pump is $3kW$, then the volume of water in llitres that can be lifted to a height of $10m$ in one minute by the pump is $\left(g = 10ms^{-2}\right)$

A. 1800

B. 180

C. 18000

D. 18

Answer: A

Watch Video Solution

35. A particle moves with a velocity $\left(5\hat{i}+3\hat{j}+6\hat{k}\right)m/s$ under the influence of a

constant force $\left(5\hat{i}+5\hat{j}+10\hat{k}\right)N$. The instantaneous power applied to the particle is

A. $100W$

B. $40W$

C. $140W$

D. $170W$

Answer: A

Watch Video Solution

36. A body of mass m is rotated in a vertical circle of radius R by means of light string. If the velocity of body is $\sqrt{gR}$ while it is crossing highest point of vertical circle then the tension in the string at that instant is

A. $2mg$

B. mg

C. $\frac{mg}{2}$

D. Zero

Answer: D

Watch Video Solution

37. A body of mass m is rotated in a vertical circle with help of light string such that velocity of body at a point is equal to critical velocity at that point. If T_1, T_2 be the tensions in the string when the body is crossing the highest and the lowest positions then the following relation is correct

A. $T_2 - T_1 = 6mg$

B. $T_2 - T_1 = 4mg$

C. $T_2 - T_1 = 3mg$

D. $T_2 - T_1 = 2mg$

Answer: A

Watch Video Solution

38. A vehicle is travelling with uniform speed along a concave road of radius of curvature $19.6m$. At lowest point of concave road is the normal reaction on the vehicle is three times its weight, the speed of vehicle is

A. $4.9m/s$

B. $9.8m/s$

C. $14.7m/s$

D. $19.6m/s$

Answer: D

Watch Video Solution

39. A car is travelling along a flyover bridge which is a part of vertical circle of radius $10m$. At the highest point of it the normal reaction

on the car is half of it's weight, the speed of car is

A. $7m/s$

B. $10m/s$

C. $14m/s$

D. $20m/s$

Answer: A

Watch Video Solution

40. A very small particle rests on the top of a hemisphere of radius $20cm$. Calculate the smallest horizontal velocity to be given to it if it is to leave the hemisphere without sliding down its surface, take $g = 9.8m/s^2$.

A. $\sqrt{9.8}m/s$

B. $\sqrt{4.9}m/s$

C. $\sqrt{1.96}m/s$

D. $\sqrt{3.92}m/s$

Answer: C

Watch Video Solution

41. A ball of $4kg$ mass moving with a speed of $3ms^{-1}$ has a head on elastic collision with a $6kg$ mass initially at rest. The speeds of both the bodies after collision are respectively

A. $0.6ms^{-1}, 2.4ms^{-1}$

B. $-0.6ms^{-1}, -2.4ms^{-1}$

C. $-0.6ms^{-1}, 2.4ms^{-1}$

D. $-0.6ms^{-1}, -2.4ms^{-1}$

Answer: C

Watch Video Solution

42. A ping-pong ball strikes a wall with a velocity of $10ms^{-1}$. If the collision is perfectly elastic, find the velocity if ball after impact

A. $-20ms^{-1}$

B. $-5ms^{-1}$

C. $1.0ms^{-1}$

D. $-10ms^{-1}$

Answer: D

Watch Video Solution

43. Two identical balls collide head on. The initial velocity of one is $0.75ms^{-1}$, while that of the other is $-0.43ms^{-1}$. If the collision is perfectly elastic, then their respective final velocities are

A. $0.75ms^{-1}, -0.43ms^{-2}$

B. $-0.43ms^{-1}, 0.75ms^{-1}$

C. $-0.75ms^{-1}, 0.43ms^{-1}$

D. $0.43ms^{-1}, 0.75ms^{-1}$

Answer: B

Watch Video Solution

44. A truck of mass 15 tons moving with $1ms^{-1}$ collides with a stationary truck of mass 10 tons and automatically connected to move together. The common velocity is

A. $1ms^{-1}$

B. $0ms^{-1}$

C. $0.4ms^{-1}$

D. $0.6ms^{-1}$

Answer: D

Watch Video Solution

45. In the above problem the total KE before collision is

A. $4500J$

B. $7500J$

C. $3000J$

D. $0J$

Answer: B

Watch Video Solution

46. In the above problem loss of KE during collision is

A. $4500J$

B. $7500J$

C. $3000J$

D. $0J$

Answer: C

Watch Video Solution

47. A bullet of mass $'x'$ moves with a velocity y, hits a wooden block of mass z at rest and

gets embedded in it. After collision, the wooden block and bullet moves with a velocity

A. $\frac{x}{x+z}y$

B. $\frac{x+y}{x}y$

C. $\frac{z}{x+y}y$

D. $\frac{x+y}{z}y$

Answer: A

Watch Video Solution

48. A railway truck of mass $16000kg$ moving with a velocity of $5ms^{-1}$ strikes another truck of mass $4000kg$ at rest. If they move together after impact, their common velocity is

A. $2ms^{-1}$

B. $4ms^{-1}$

C. $6ms^{-1}$

D. $8ms^{-1}$

Answer: B

Watch Video Solution

Watch Video Solution

49. A ball falls from a height of $10m$ on to a horizontal plane. If the coefficient of restitution is 0.4, then the velocity with which it rebounds from the plane after second collision is

A. $2.24ms^{-1}$

B. $5.6ms^{-1}$

C. $2.8ms^{-1}$

D. $0.9ms^{-1}$

Answer: A

Watch Video Solution

50. A ball is dropped from a height of $3m$. If coefficient of restitution between the surface and ball is 0.5, then the total distance covered by the before it comes to rest is

A. $3m$

B. $4m$

C. $5m$

D. $6m$

Answer: C

Watch Video Solution

51. A glass sphere of mass $5mg$, falls from a height of 3 meters on to a horizontal surface. If the coefficient of restitution is 0.5, then after the impact the sphere will rise to a height of

A. $0.075m$

B. $0.75m$

C. $7.5m$

D. $75m$

Answer: B

 Watch Video Solution

52. A ball hits the floor and rebounds after an inelastic collision. In this case

A. the momentum of the ball just after the collision is the same as that just before the collision

B. the mechanical energy of the ball remains the same in the collision

C. the total momentum of the ball and earth is conserved

D. the total mechanical energy of the ball and therth is conserved

Answer: C

Watch Video Solution

Level Ii H W

1. A bicycle chain of length $1.6m$ and of mass $1kg$ is lying on a horizontal floor. If $g = 10ms^{-2}$, the work done in lifting it with one end touching the floor and the other end $1.6m$ above the floor is

A. $10J$

B. $3.2J$

C. $8J$

D. $16J$

Answer: C

Watch Video Solution

2. A bucket of mass $'m'$ tied to a light rope is lowered at a constant acceleration of $g/4$. IF the bucket is lowered by a distance $'d'$, the work done by the rope will be (neglect the mass of the rope)

A. $\frac{1}{4}mgd$

B. $\frac{3}{4}mgd$

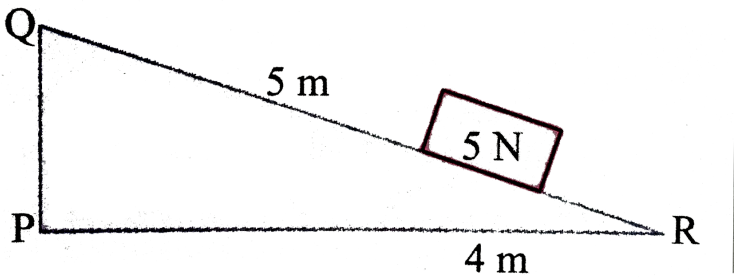
C. $-\frac{3}{4}mgd$

D. $-\frac{5}{4}mgd$

Answer: C

Watch Video Solution

3. A weight of $5N$ is moved up a frictionless inclined plane from R to Q as shown.



What is the work done in joules?

A. 15

B. 20

C. 25

D. 35

Answer: A

Watch Video Solution

4. A $5kg$ stone of relative density 3 is resting at the bed of a lake. It is raised through a height of $5m$ in the lake. If $g = 10m/s^2$, then work done is

A. $\frac{500}{3}J$

B. $\frac{350}{3}J$

C. $\frac{750}{3}J$

D. $\frac{550}{3}J$

Answer: A

Watch Video Solution

5. Water is drawn from a well in a $5kg$ drum of capacity $55L$ by two ropes connected to the top of the drum. The linear mass density of each rope is $0.5kgm^{-1}$. The work done in lifting water to the ground from the surface of water in the well $20m$ below is

$[g = 10ms^{-2}]$

A. $1.4 \times 10^4 J$

B. $1.5 \times 10^4 J$

C. $9.8 \times 6 \times 10J$

D. $18J$

Answer: A

Watch Video Solution

6. A ball is dropped from the top of a tower. The ratio of work done by force of gravity in 1^{st}, 2^{nd}, and 3^{rd} second of the motion of ball is

A. $1:2:3$

B. $1:4:16$

C. $1:3:5$

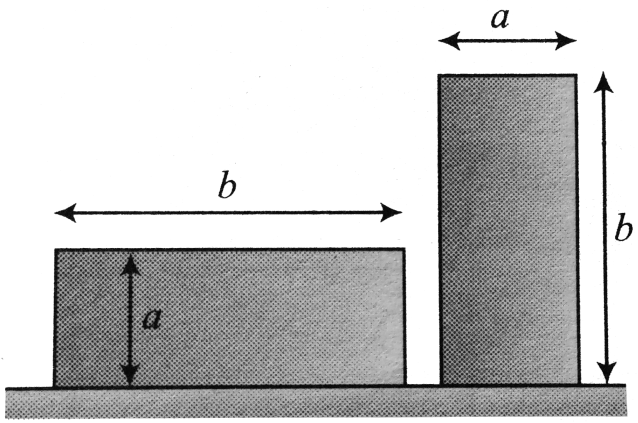
D. $1:9:5$

Answer: C

Watch Video Solution

7. A plate of mass m, length b, and breadth a is initially lying on a horizontal floor with length parallel to the floor and breath perpendicular to the floor. Find the work done to erect it on

its breadth.



A. $mg\frac{b}{2}$

B. $mg\left(a+\frac{b}{2}\right)$

C. $mg\left(\frac{b-a}{2}\right)$

D. $mg\left(\frac{b+a}{2}\right)$

Answer: C

Watch Video Solution

8. A block of mass $10kg$ slides down a rough slope which is inclined at 45^0 to the horizontal. The coeffficient of sliding friction is 0.30. When the block has to slide $5m$, the work done on the block by the force of friction is nearly

A. $115J$

B. $-75\sqrt{2}J$

C. $321.4J$

D. $-321.4J$

Answer: B

Watch Video Solution

9. A uniform rope of length $'L$ and linear density $'\mu'$ is on a smooth horizontal table with a length $'I'$ lying on the table. The wrok done in pulling the hanging part on to the table is

A. $\frac{\mu g(L-l)^2}{2}$

B. $\frac{\mu g(L-l)^2}{2l^2}$

C. $\frac{\mu g(L-l)^2}{2L^2}$

D. $\frac{\mu gL}{2(L-l)}$

Answer: A

Watch Video Solution

10. A uniform rod of mass 2kg and length l is lying on a horizontal surface. If the work done in raising one end of the rod through an angle

45° is $'W'$, then the work done in raising it further 45° is

A. W

B. $\sqrt{2}W$

C. $\frac{W}{\sqrt{2}}$

D. $\left(\sqrt{2}-1\right)W$

Answer: D

Watch Video Solution

11. A block is constrained to move along $x$axis under a force $F = -(2x)N$. Find the work done by the force when the block is displaced from $x = 2m$ to $x = 4m$

A. $12J$

B. $8J$

C. $-12J$

D. $-8J$

Answer: C

Watch Video Solution

Watch Video Solution

12. A force of $\left(4x^2 + 3x\right)N$ acts on a particle which displaces it from $x = 2m$ to $x = 3m$. The work done by the force is

A. $32.8J$

B. $3.28J$

C. $0.328J$

D. Zero

Answer: A

Watch Video Solution

13. A body of mass $6kg$ is under a force which causes displacement in it given by $S = \frac{t^2}{4}$ maters where t is time . The work done by the force in 2 sec is

A. $12J$

B. $9J$

C. $6J$

D. $3J$

Answer: D

Watch Video Solution

14. Two spheres of same material are moving with linetic energies in the ration $108:576$. If the ratio of their veloctities is $2:3$, then the ratio of their radii is

A. $1:1$

B. $2:3$

C. $3:4$

D. $4:3$

Answer: C

Watch Video Solution

15. If the momentum of a body decreases by 30%, then kinetic energy decreases by

A. 60%

B. 51%

C. 69%

D. $90\ \%$

Answer: B

Watch Video Solution

16. If the mass of a moving body decreased by one third of its initial mass and velocity is tripled, then the percentage change in its kinetic energy is

A. $500\ \%$

B. $600\ \%$

C. $300\ \%$

D. $200\ \%$

Answer: A

Watch Video Solution

17. The kinetic energy of a projectile at the highest point of its path is found to be $3/4^{th}$ of its initial kinetic energy. If the body is

projected from the ground, the angle of projection is

A. 0°

B. 30°

C. 60°

D. 40°

Answer: B

Watch Video Solution

18. The kinetic energy of a moving body is given by $k = 2v^2$, k being in joules and v in m/s. It's momentum when travelling with a velocity of $2m/s$ will be (in $kgms^{-1}$)

A. 16

B. 4

C. 8

D. 2

Answer: C

Watch Video Solution

Watch video solution

19. A simple pendulum is swinging vertical plane. The ratio of its potential energy when it is making 45° and 90° with the vertical is

A. $1:1$

B. $1:(\sqrt{2}+1)$

C. $\sqrt{2}:1$

D. $(\sqrt{2}-1):\sqrt{2}$

Answer: D

Watch Video Solution

20. A spring of force constant $800Nm^{-1}$ is stretched initially by $5cm$. The work done in stretching from $5cm$ to $15cm$ is

A. $12.50N - m$

B. $18.75N - m$

C. $25.00N - m$

D. $6.25N - m$

Answer: C

Watch Video Solution

21. When a spring is compressed by a distance $'x'$, the potential energy stored is U_1. It is further compressed by a distance $'2x'$, the increase in potential energy is U_2. The ratio of $U_1 : U_2$

A. $1:7$

B. $1:4$

C. $1:8$

D. $1:3$

Answer: C

Watch Video Solution

22. A massless spring with a force constant $K = 40N/m$ hangs vertically from the ceiling.A $0.2kg$ block is attached to the end of the spring and held in such a position that the spring has its natural length and suddenyl

released. The maximum elastic strain energy stored in the spring is $\left(g = 10m/s^2\right)$

A. $0.1J$

B. $0.2J$

C. $0.05J$

D. $0.4J$

Answer: B

Watch Video Solution

23. A bullet of mass $'m'$ fired with a velocity $'v'$ into a fixed log of wood and penetrates a distance $'s'$ before coming to rest. Assuming that the path of the bullet in the log of wood I horizontal, the average resistance offered by the log of wood is

A. $\frac{mv}{2s^2}$

B. $\frac{mv^2}{2s}$

C. $\frac{2s}{mv^2}$

D. $\frac{ms^2}{2v}$

Answer: B

Watch Video Solution

24. A ball of mass m is thrown in air with speed v_1 from a height h_1 and it is at a height $h_2(>h_1)$ when its speed becomes v_2 . Find the work done on the ball the air resistance.

A. $mg(h_2-h_1)+\frac{1}{2}m\left(v_2^2-v_1^2\right)$

B. $mg(h_2-h_1)$

C. $\frac{1}{2}m\left(v_2^2-v_1^2\right)$

D. $mg(h_2 - h_1) - \frac{1}{2}(v_2^2 - v_1^2)$

Answer: A

Watch Video Solution

25. An object of mass 5 kg falls from rest through a vertical distance of $20m$ and attains a velocity of 10 m/s. How much work is done by the resistance of the air on the objrct? $(g = 10m/s^2)$.

A. $750J$

B. $-750J$

C. $850J$

D. $-650J$

Answer: B

Watch Video Solution

26. The velocity of 2 kg body is changed from $\left(4\hat{i}+3\hat{j}\right)ms^{-1}$ to $6ms^{-1}$. The work done on the body is

A. $9J$

B. $11J$

C. $1J$

D. $5J$

Answer: B

Watch Video Solution

27. An out fielder throws a cricket ball with an initial kinetic energy of $800J$ and an nfielder catches the ball when its kinetic energy is

$600J$. If the path of the bal between them is assumed straight and is $20m$ long, the air resistance acting on the ball is

A. $26.6N$

B. $1.33N$

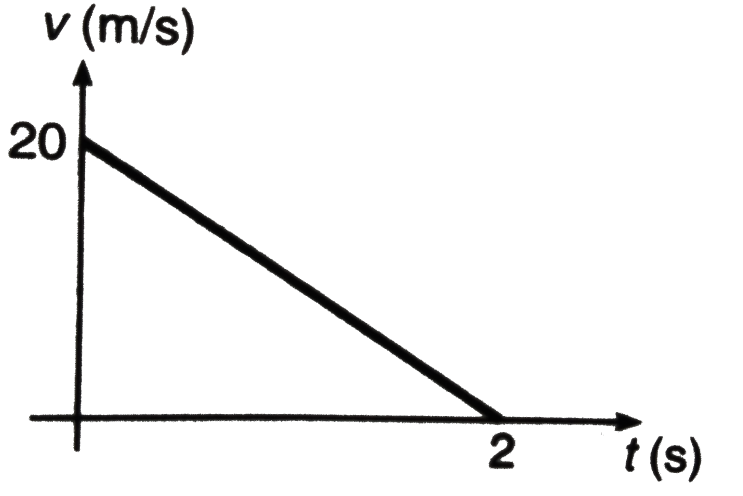
C. $100N$

D. $10N$

Answer: D

Watch Video Solution

28. Velocity-time graph of a particle of mass (2 kg) moving in a straight line is as shown in Fig. 9.20. Find the word done by all the forces acting on the particle.



A. $400J$

B. $-400J$

C. $-200J$

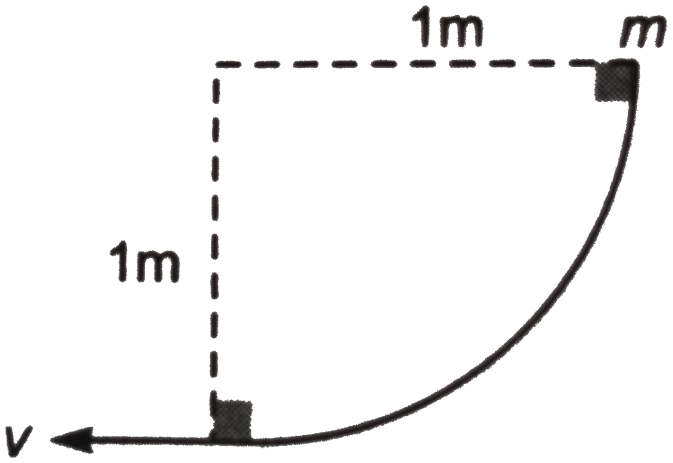
D. $200J$

Answer: B

Watch Video Solution

29. A block of mass $1kg$ slides down a curved track which forms one quadrant of a circle of radius $1m$ as shown in figure. The speed of block at the bottom of track is $v = 2ms^{-1}$.

The work done by the of friction is



A. $8J$

B. $-8J$

C. $4J$

D. $-4J$

Answer: B

Watch Video Solution

30. A block of mass $4kg$ is initially at rest on a horizontal frictionless surface. A force $\overrightarrow{F} = \left(2x + 3x^2\right)\hat{i}N$ acts horizontally on it. The maximum kinetic energy of the block between $x = 2m$ and $x = 4m$ in joules is

A. 40

B. 36

C. 68

D. 52

Answer: C

Watch Video Solution

31. A force $F = Ay^2 + By + C$ acts on a body at rest in the Y-direction. The kinetic energy of the body during a displacement $y = -a$ to $y = a$ is

A. $\frac{2Aa^3}{3}$

B. $\frac{2Aa^3}{3} + 2ca$

C. $\frac{2Aa^3}{3} + \frac{Ba^2}{2} + ca$

D. $\frac{2Aa^3}{3} + \frac{Ba^2}{2}$

Answer: B

Watch Video Solution

32. A $3kg$ model rocket is launched striaght up with sufficient initial speed to reach a maximum height of $100m$, even though air resistance (a non-conservative force)

performs-$900J$ of work on the rocket. The highest the rocket would have gone without air resistance will be

A. $70m$

B. $130m$

C. $180m$

D. $230m$

Answer: B

Watch Video Solution

33. A body of mass $2kg$ is thrown up vertically with kinetic energy of $490J$. If $g = 9.8m/s^2$, the height at which the kinetic energy of the body becomes half of the original value, is

A. $50m$

B. $25m$

C. $12.5m$

D. $19.6m$

Answer: C

Watch Video Solution

34. A simple pendulum bob has a mass $''m''$ and length $''L''$. The bob is drawn aside such that the string is horizontal and then it is released. The velocity of the bob while it crosses the equilibrium position is

A. $\sqrt{gL}$

B. $\sqrt{2gL}$

C. $\sqrt{5gL}$

D. $\sqrt{3gL}$

Answer: B

Watch Video Solution

35. A $100gm$ light bulb dropped from a tower reaches a velocity of $20m/s$ after falling through $100m$. The energy transferred to the air due to viscous force is

A. $98J$

B. $20J$

C. $118J$

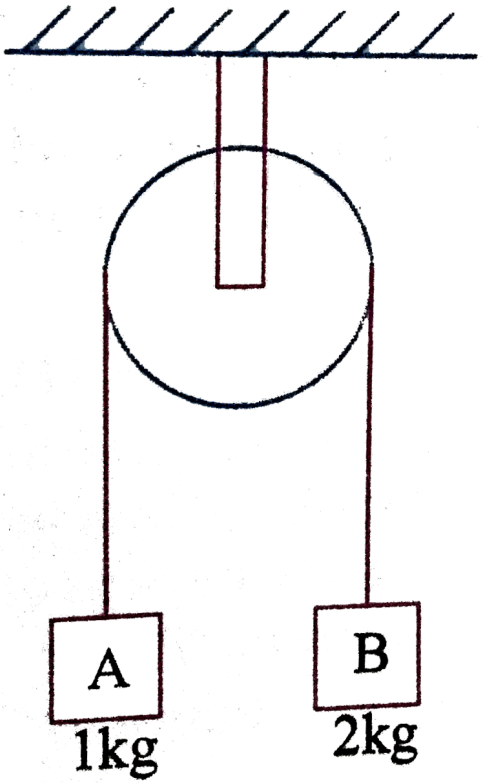
D. $78J$

Answer: D

Watch Video Solution

36. In the arrangement shown in figure, string is light and inextensible and friction is absent every where. The speed of bothblocks after the block $'A'$ has ascend a height of $1m$ will be

$(g = 10m/s^2)$



A. $2m/s$

B. $2.58m/s$

C. $3m/s$

D. $3.58m/s$

Answer: B

Watch Video Solution

37. A car drives along a straight level frictionless road by an engine delivering constant power. Then velocity is directly proportional to

A. t

B. $\frac{1}{\sqrt{t}}$

C. $\sqrt{t}$

D. t^2

Answer: C

Watch Video Solution

38. The input power to an elctric motor is $200KW$. Its efficiency is $80\,\%$. It operates a crane of efficiency $90\,\%$. If the crane is lifting a

load of 3.6 tonnes, the velocity with which the load moves is

A. $8ms^{-1}$

B. $4ms^{-1}$

C. $2ms^{-1}$

D. $40ms^{-1}$

Answer: B

Watch Video Solution

39. The human heart discharges $75cm^3$ of blood per beat against an average pressure of $10cm$ of Hg. Assuming that the pulse frequency is 75 per minute, the power of the heart is (density of $Hg = 13.6gmcm^{-3}$)

A. $1.25W$

B. $12.5W$

C. $0.125W$

D. $125W$

Answer: A

Watch Video Solution

40. An elevator can carry a maximum load of $1800kg$ (elevator + passengers) is moving up with a constant speed of $2ms^{-1}$. The friction force opposite the motion is $4000N$.What is minimum power delivered by the motor to the elevator?

A. 59

B. 8

C. 22

D. 20

Answer: A

Watch Video Solution

41. A body is initially at rest. It undergoes one-dimensional motion with constant acceleration. The power delivered to it at time t is proportional to (i) $t^{1/2}$ (ii) t (iii) $t^{3/2}$ (iv) t^2

A. $t^{\frac{1}{2}}$

B. t

C. $t^{\frac{2}{3}}$

D. t^2

Answer: B

Watch Video Solution

42. A dam is situated at a height of $550m$ above sea level and supples water to a power house which is at a height of $50m$ above sea level. $2000kg$ of water passes through the

turbines per second. What would be the maximum electrical power output of the power house if the whole system were $80\,\%$ efficient

A. $8MW$

B. $10MW$

C. $12.5MW$

D. $16MW$

Answer: A

Watch Video Solution

43. A stone tied to a string of length L is whirled in a vertical circle with the other end of the string at the centre. At a certain instant of time the stone is at lowest position and has a speed u . Find the magnitude of the change in its velocity as it reaches a position, where the string is horizontal.

A. $\sqrt{u^2 - 2gL}$

B. $\sqrt{2gL}$

C. $\sqrt{u^2 - gL}$

D. $\sqrt{2\left(u^2 - gL\right)}$

Answer: D

Watch Video Solution

44. A pilote of mass m can withstand a maximum apparent weight 6 times of mg. The minimum radius curvature of vertical circle in which the aeroplane dives up from lowest point with a speed $504kmph$ is

A. $200m$

B. $300m$

C. $400m$

D. $500m$

Answer: C

Watch Video Solution

45. A simple pendulum is oscillating with angular displacement 90° For what angle with vertical the acceleration of bob direction horizontal?

A. $\sin^{-1}\left(\frac{1}{3}\right)$

B. $\cos^{-1}\left(\frac{1}{3}\right)$

C. $\sin^{-1}\left(\frac{1}{\sqrt{3}}\right)$

D. $\cos^{-1}\left(\frac{1}{\sqrt{3}}\right)$

Answer: D

Watch Video Solution

46. A steel wire can withstand a load up to $2940N$. A load of $150kg$ is suspended from a

rigid support. The maximum angle through which the wire can be displaced from the mean position, so that the wire dose not break when the load passs through the position of equilibrium, is

A. 30°

B. 60°

C. 80°

D. 85°

Answer: B

Watch Video Solution

47. A small block is freely sliding down from top of a smooth inclined plane. The block reaches bottom of inclined plane then the block describes a vertical circle of radius $0.5m$ along smooth track. The minimum vertical height of inclined plane should be

A. $1m$

B. $1.25m$

C. $3m$

D. $2.5m$

Answer: B

Watch Video Solution

48. A stone of mass $6kg$ is revolved in a vertical circle of diameter $6m.$, such that its speed is minimum at a point. If the $K.E$ at the same point is $250J$, then minimum PE at that point is

A. $200J$

B. $150J$

C. $100J$

D. $450J$

Answer: A

Watch Video Solution

49. The breaking strength of a string is $55kgwt$. The maximum permissible speed of a stone of mass $5kg$ which is revolved in a

vertical circle of radius $4m$ with the help of this string is $\left(g = 10m/s^2\right)$

A. $10m/\sec$

B. $15m/\sec$

C. $20m/\sec$

D. $25m/\sec$

Answer: C

Watch Video Solution

50. A $16gm$ mass is moving in the $+x$ direction at $30cm/s$ while a $4gm$ is moving in the $-x$ direction at $50cm/s$. They collide head - on and stick together. Their common velocity after impact is

A. $0.14cm/s$

B. $0.14m/s$

C. $0ms^{-1}$

D. $0.3m/s$

Answer: B

Watch Video Solution

51. A bullet of mass 50 grams going at a speed of $200ms^{-1}$ strikes a wood block of mass $950gm$ and gets embedded in it. The velocity of the block after the impact is

A. $5ms^{-1}$

B. $10ms^{-1}$

C. $20ms^{-1}$

D. $50ms^{-1}$

Answer: B

Watch Video Solution

52. A block of mass $1kg$ moving with a speed of $4ms^{-1}$, collides with another block of mass $2kg$ which is at rest. If the lighter block comes to rest after collision, then the speed of the heavier body is

A. $2ms^{-1}$

B. $1ms^{-1}$

C. $1.5ms^{-1}$

D. $0.5ms^{-1}$

Answer: A

 Watch Video Solution

53. A neutron travelling with a velocity v and kinetic energy E collides perfectly elastically head on with the nucleus of an atom of mass number A at rest. The fraction of the total kinetic energy retained by the neutron is

A. $\left(\frac{A-1}{A+1}\right)^2$

B. $\left(\frac{A+1}{A-1}\right)^2$

C. $\left(\frac{A-1}{A}\right)^2$

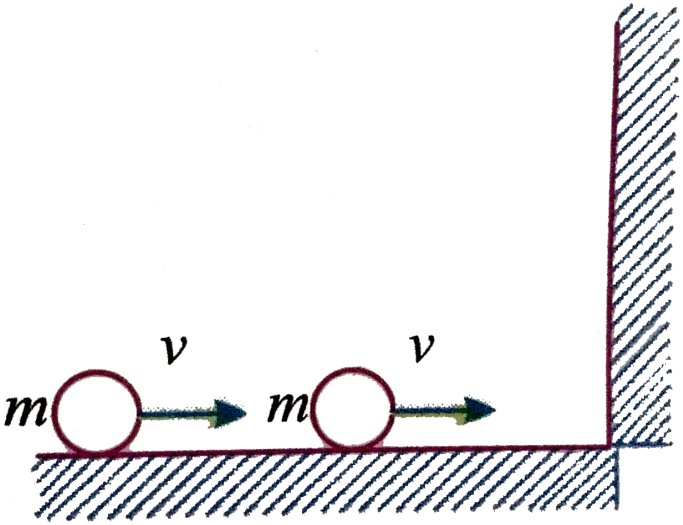
D. $\left(\frac{A+1}{A}\right)^2$

Answer: A

Watch Video Solution

54. Two balls each of mass $'m'$ are moving with same velocity v on a smooth surface as shown in figure. If all collisions between the

balls and balls with the wall are perfectly elastic, the possible number of collisions between the balls and wall together is



A. 1

B. 2

C. 3

D. Infinity

Answer: C

 Watch Video Solution