PHYSICS

AIMED AT STUDENTS PREPARING FOR IIT JEE EXAMS

WORK , ENERGY & POWER

ILLUSTRATION

1. If the magnitude of two vectors are 4 and 6 and the magnitude of their scalar product is $12\sqrt{2}$ what is the angle between the vectors?

Watch Video Solution

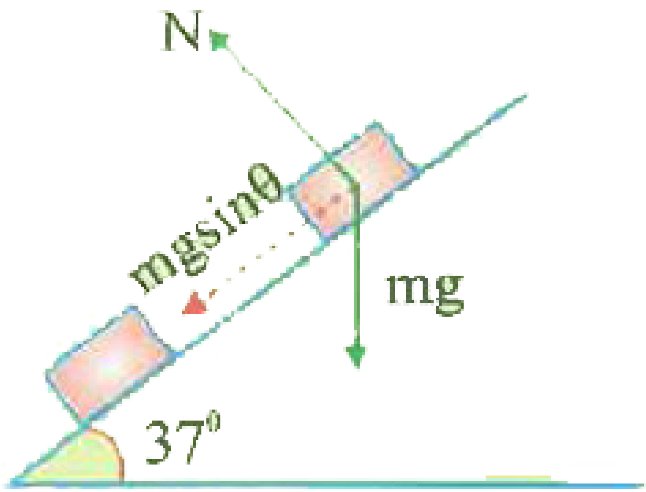
2. Find the angle between force $\overrightarrow{F} = \left(5\hat{i} + 4\hat{j} + 5\hat{k}\right)$ unit and displacement $\overrightarrow{d} = \left(3\hat{i} + 4\hat{j} - 3\hat{k}\right)$ unit. Also find the projection of $\overrightarrow{F} \, ond \, \overrightarrow{d}$.

Watch Video Solution

3. A block of mass $5kg$ is being raised vertically upwards by the help of a string attached to it. It rises with an acceleration of $2ms^{-2}$. Find the work done by the tension in the string if the block rises by $2.5m$. Also find the work done by the gravity and the net work done.

Watch Video Solution

4. A block of mass 4 kg slides down a plane inclined at 37° with the horizontal. The length of plane is 3 m. find work done by normal force , gravity and frictional force .

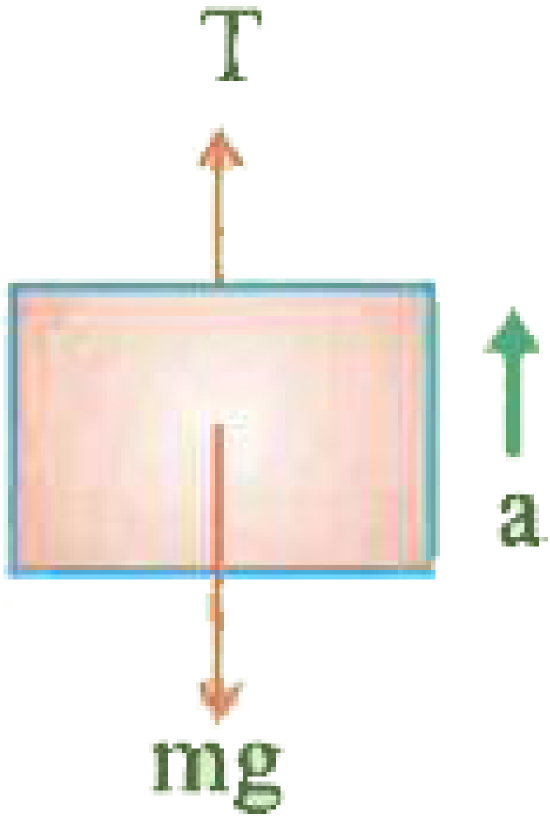


Watch Video Solution

5. A box is moved over a horizontal path by applying force $F = 60N$ at an angle $\theta = 30^{\circ} w.r.t$ the horizontal. What is the work done during the displacement of the box over a distance of $0.5km$.

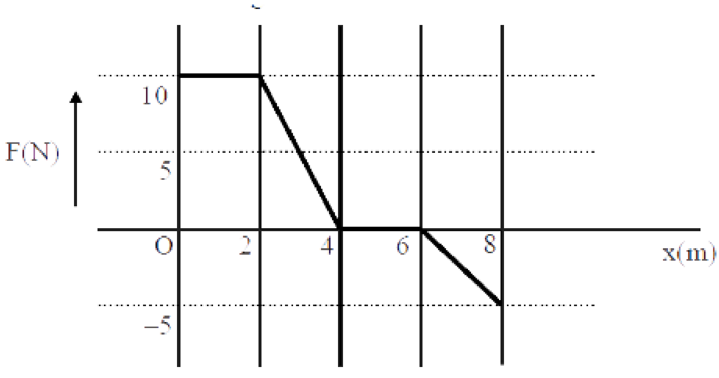
Watch Video Solution

6. A load of mas m = 300kg is lifted by a winch with an acceleration $a = 2\frac{m}{s^2}$. Find the work done during the first one and a half seconds from the beginning of motion.



Watch Video Solution

7. A 5 kg block moves in a straight line on a horizontal frictionless surface under the influence of a force that varies with position as shown in the figure. Find the work done by this force as the block moves from the origin to x = 8m.



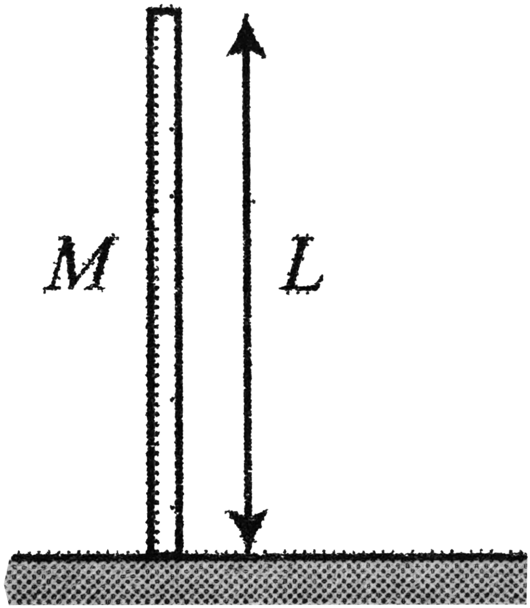
Watch Video Solution

8. A block of mass m = 4 kg is dragged 2 m along a horizontal surface by a force F = 30 N acting at 53° to the horizontal. The initial speed is $3m/s$ and $\mu_k = 1/8$.

Find its final speed

Watch Video Solution

9. A uniform rod of mass M and length L is held vertically upright on a horizontal surface as shown in figure. Assuming zero potential energy at the base of the rod, determine the potential energy of the rod.



Watch Video Solution

10. A particle is projected at $60(\circ)$ to the horizontal with a kinetic energy K. The kinetic energy at the highest point is

Watch Video Solution

Watch Video Solution

11. An athlete in the Olympic gamed covers a distance of $100m$ in $10s$. His kinetic energy can be estimated to be in range.

(1) $200J - 500J$

(2) $2 \times 10^5 J - 3 \times 10^5 J$

(3) $20, 000J - 50, 000J$

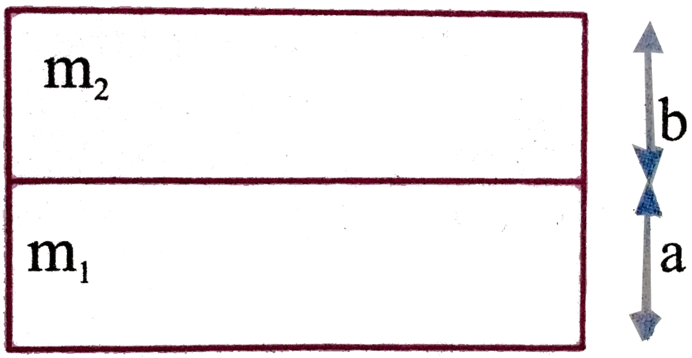
(4) $2, 000J - 5, 000J.$

Watch Video Solution

12. Kinetic energy of a particle moving along a circle of radisu R depends on the distance covered as $K = as^2$ where a is a constant . Find the force acting on the particle as a function of s.

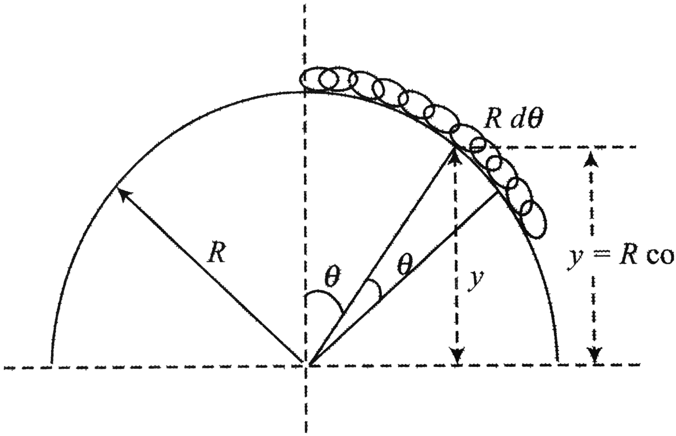
Watch Video Solution

13. A rectangular plank of mass m_1 and height 'a' is on a horizontal surface. On the top of it another rectangular plank of mass m_2 and height 'b' is placed. Find the potential energy of the system ?



Watch Video Solution

14. A chain of length l and mass m lies of the surface of a smooth hemisphere of radius $R > l$ with one end tied to the top of the hemisphere. Taking base of the hemisphere as reference line, find the gravitational potential energy of the chain.



Watch Video Solution

15. An elastic spring of unstretched length L and force constant k is stretched by a small length x. It is further stretched by another small length y. Work done during the second stretching is

Watch Video Solution

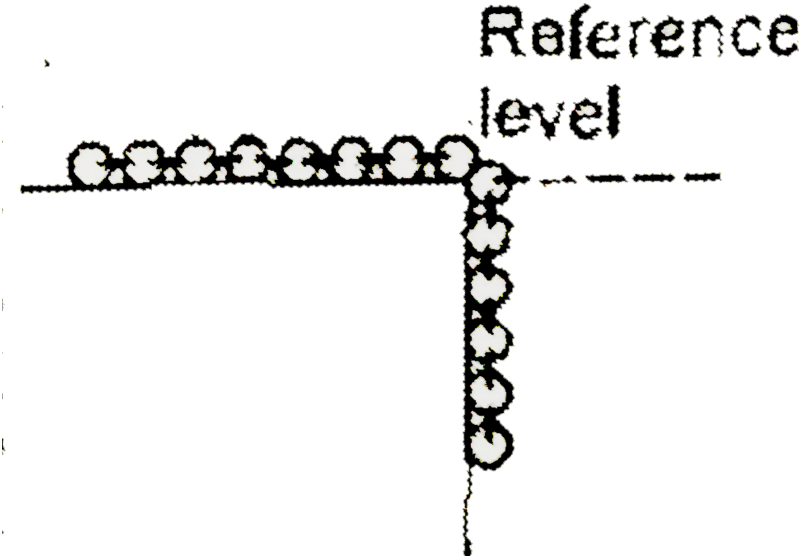
16. The position (x) of a particle of mass 1 kg moving along x-axis at time t is given by $\left(x = \frac{1}{2}t^2\right)$ metre. Find the work done by force acting on it in time interval from t=0 to t=3 s.

Watch Video Solution

17. Under the action of a force, a $2kg$ body moves such that its position x as a function of time is given by $x = \frac{t^3}{3}$ where x is in metre and t in second. The work done by the force in the first two seconds is .

Watch Video Solution

18. A uniform chain of length 1 and mass m is kept on a smooth table. It is released from rest when the overhaning part was n^{th} fraction of total length. Find the kinetic energy of the chain as it completely slips off the table

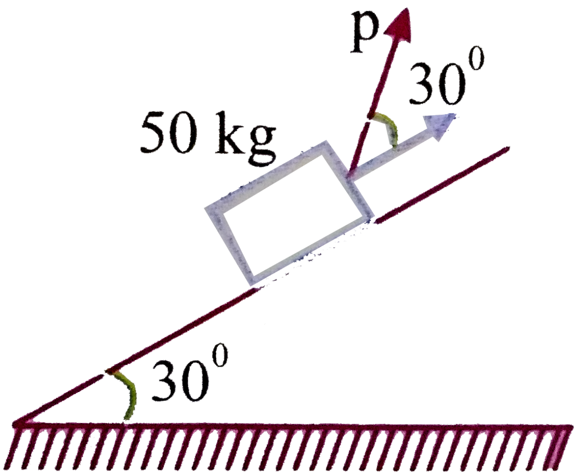


Watch Video Solution

19. A 2 kg block slides on a horizontal floor with a speed of 4 m/s. It strikes an uncompressed spring, and compresses it till the block is motionless. The kinetic friction force is 15 N and spring constant is 10000 N/m. The spring is compressed by (in cm):

Watch Video Solution

20. In the below figure, what constant force 'P' is requried to bring the $50kg$ body, which starts from rest to a velocity of $10m/s$ in moving $7m$ along the plane ? (Neglect friction).



Watch Video Solution

21. In a molecule, the potential energy between two atoms is given by $U(x) = \frac{1}{x^{12}} - \frac{b}{x^6}$. Where 'a' and 'b' are positive constants and 'x' is the distance between atoms. Find the value of 'x' at which force is zero and minimim $P.E$ at that point.

Watch Video Solution

22. The potential energy for a conservative force system is given by $U = ax^2 - bx$. Where a and b are constants find out (a) The expression of force (b) Potential energy at equilibrium.

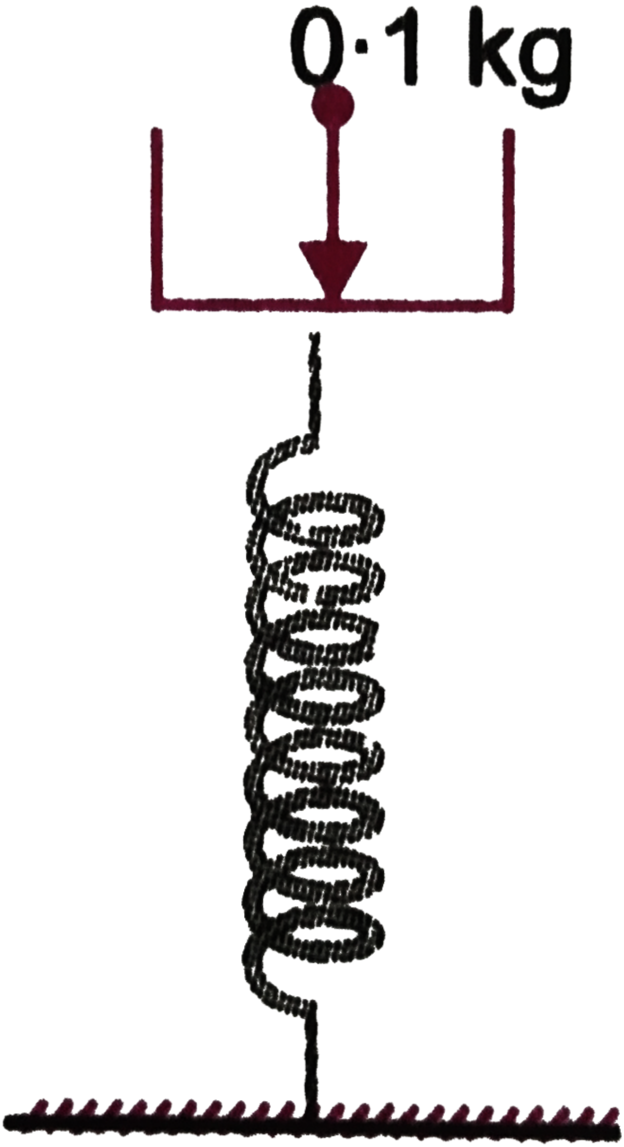
Watch Video Solution

23. The potential energy of a particle of mass 1 kg free to move along x-axis is given by $U(x) = \left(\frac{x^2}{2} - x\right)$ joule. If total mechanical energy of the particle is 2J then find the maximum speed of the particle. (Assuming only conservative force acts on particle)

Watch Video Solution

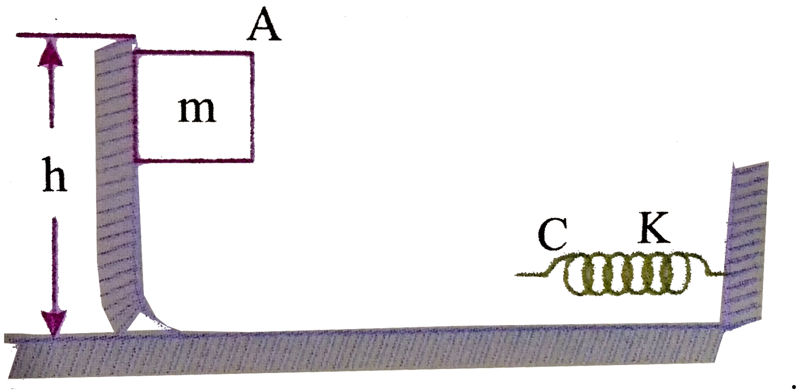
24. A massless platform is kept on a light elastic spring as shown in figure. When a small stone of mass 0.1 kg is dropped on the pan from a height of 0.24 m, the spring compresses by 0.01m. From what height should the

stone be droppped to cause a compression of 0.04m in the spring ?



Watch Video Solution

25. A small mass 'm' is sliding down on a smooth curved incline form a height 'h' and finally moves through a horizontal smooth surface. A light spring of force constant K is fixed with a vertical rigid stand on the horizontal surface, as shown in the figure. Find the value for the maximum compression in the spring if mass 'm' is released from rest from height 'h' and hits the spring in the horizontal surface.



Watch Video Solution

26. A vehicle of mass 15 quintal climbs up a hill $200m$ high. It then moves on a level road with a speed of $30ms^{-1}$. Calculate the potential energy gained by it and its total mechanical energy while running on the top of the hill.

Watch Video Solution

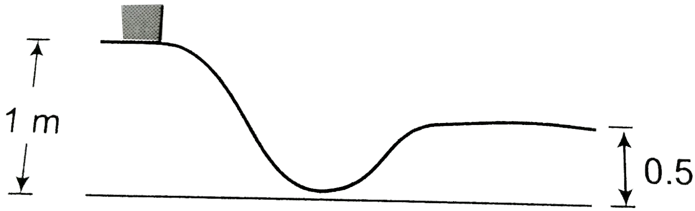
Watch Video Solution

27. A particle is released from height H. At cartain height from the ground its kinetic energy is twice its gravitational potential energy. Find the height and speed of particle at that height.

Watch Video Solution

28. The potential energy of a 1kg particle free to move along the x-axis is given by $V(x) = \left(\frac{x^4}{4} - \frac{x^2}{2}\right)J$ The total mechanical energy of the particle is 2J then the maximum speed $(\in m/s)$ is

Watch Video Solution



29.

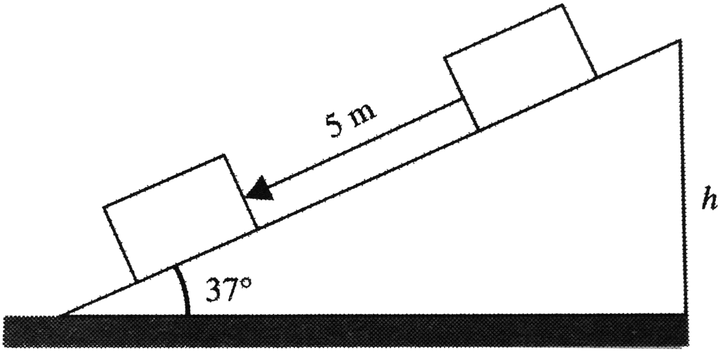
The figure shown a particle sliding on a frictionless track, which teminates in a straight horizontal section. If the particle starts slipping from the point A, how far away from the track will the particle hit the ground?

Watch Video Solution

30. Two equal masses are attached to the two ends of a spring of spring constant k. The masses are pulled out symmetricaly tostretch the spring by a length x over its natural length. The work doen by the spring oneach mass is

Watch Video Solution

31. A block is placed on the top of a plane inclined at 37° with horizontal. The length of the plane is $5m$. The block slides down the plane and reaches the bottom.



a. Find the speed of the block at the bottom if the inclined plane is smooth.

b. Find the speed of the block at the bottom if the coefficient of friction is 0.25.

Watch Video Solution

32. 1 kg block collides with a horizontal massless spring of force constant $2N/m$. The block compresses the spring by 4m. If the coefficient of kinetic friction between the block and the· surface is 0.25, what was the speed of the block at the instant of collision? (take $g = 10 m/s^2$)

Watch Video Solution

33. A uniform chain of length l and mass m lies on a smooth table. A very small part of this chain hangs from the table. It begins to fall under the weight of hanging part. Find the velocity of chain when the length of hanging part becomes y.

Watch Video Solution

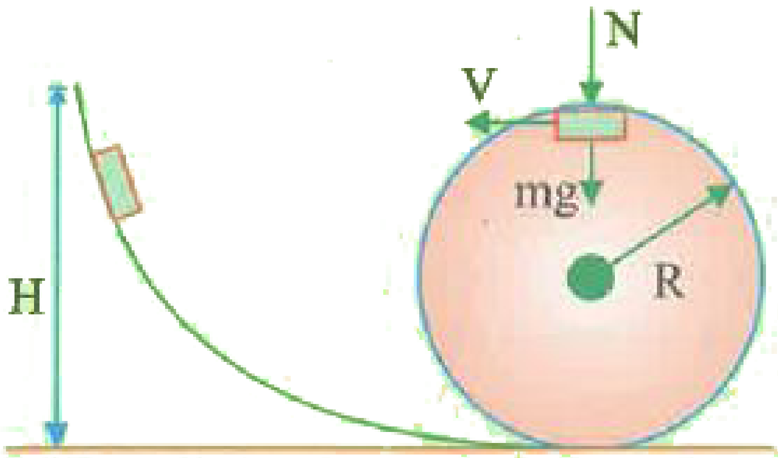
34. A mass m is tied to a string of length l and is rotated in a vertical circle with centre at the other end of the string.

(a) Find the minimum velocity of the mass at the top of the circle so that it is able to complete the circle.

(b) Find the minimum velocity at the bottom of the circle corresponding to the above condition.

Watch Video Solution

35. A body slides down an inclined surface which ends into a vertical loop of radius R = 40cm.



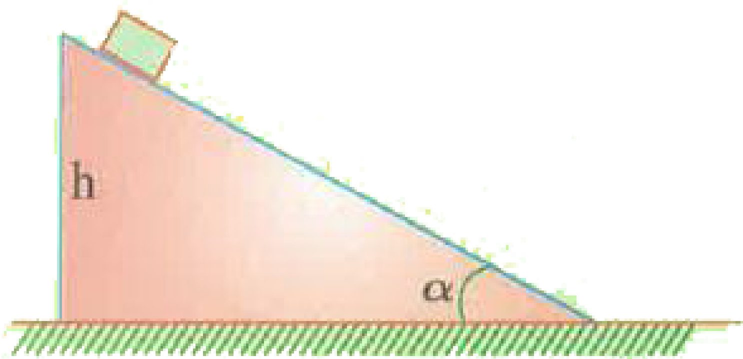
What must be the height H of the inclined surface for the body so that it does not leave contact with the surface even at the uppermost point of the loop? Assume friction to be absent.

Watch Video Solution

36. The potential energy of a particle in a certain field has the form $U = (a/r^2) - (b/r)$, where a and b are positive constants and r is the distance from the centre of the field. Find the value of r_0 corresponding to the equilibrium position of the particle, examine whether this position is stable.

Watch Video Solution

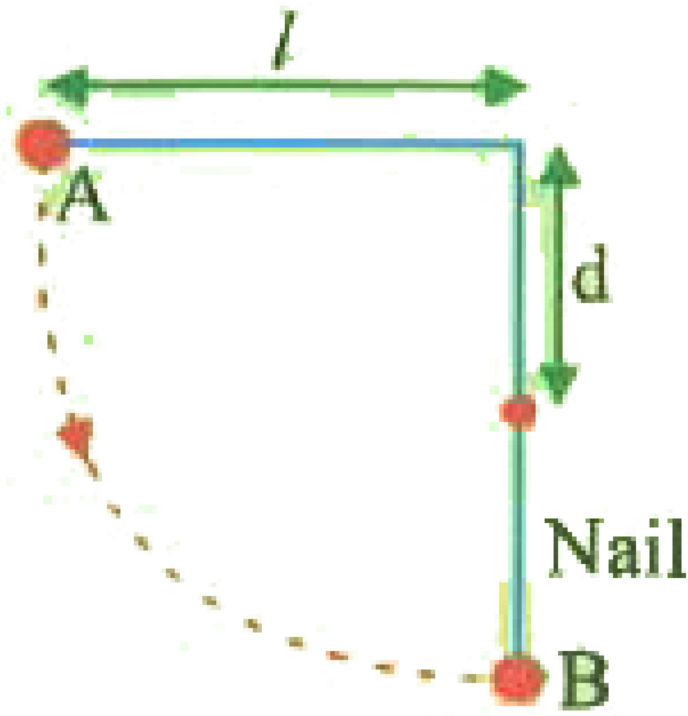
37. A mass m slides down a fixed plane inclined at an angle a to the horizontal plane after covering the entire length of the inclined plane. The height of the inclined plane is h and the coefficient of friction over both surfaces is μ.



Watch Video Solution

38. In the given system, when the ball of mass m is released, it will swing down the dotted circular are. A nail is located at a distance d below the point of suspension as shown in figure.

(a) How fast will it reach the lowest point in its swing?



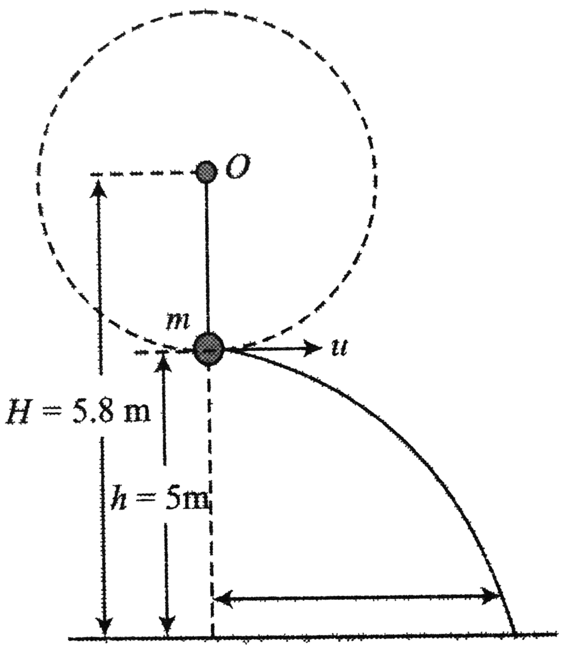
(b) Show that d must be at least $0.6l,$ if the ball is to swing completely around a circle centered along the nail.

(c) If `d = 0.6 l, find the change in tension in the string just after it touches the nail.

View Text Solution

39. A small sphere tied to the string of length $0.8m$ is describing a vertical circle so that the maximum and minimum tensions in the string are in the ratio $3:1$. The fixed end of the string is at a height of $5.8m$ above ground.

(a) Find the velocity of the sphere at the lowest position.



(b) If the string suddenly breaks at the lowest position, when and where will the sphere hit the ground?

Watch Video Solution

40. A pump is required to lift $1000kg$ of water per minute from a well $20m$ deep and eject it at a rate of $20ms^{-1}$.

a. How much work is done in lifting water?

b. How much work is done in giving in KE?

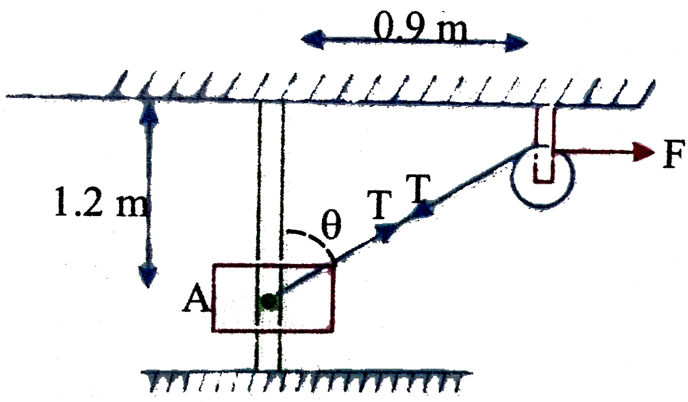
c. What HP(horsepower) engine is required for the purpose of lifting water?

Watch Video Solution

41. An automobile is moving at $100kmph$ and is exerting attractive force of $3920N$. What horse power must the engine develop, if 20% of the power developed is wasted ?

Watch Video Solution

42. The $50N$ collar starts from rest at A and is lifted with a constant speed of $0.6m/s$ along the smooth rod. Determine the power developed by the force F at the instant shown.



Watch Video Solution

43. A machine delivers power to a body which is directly proportional to velocity of the body. If the body starts with a velocity which is almost negligible, find the distance covered by the body in attaining a velocity v.

Watch Video Solution

44. Find the power of an engine which can draw a train of 400 metric ton up the inclined plane of 1 in 98 at the rate $10ms^{-1}$. The resistance due to friction acting on the train is $10N$ per ton.

Watch Video Solution

45. A hose pipe has a diameter of $2.5cm$ and is required to direct a jet of water to a height of atleast $40cm$. Find the minimum power of the pump needed for this hose.

Watch Video Solution

46. A body of mass m accelerates uniformly from rest to velocity v_0 in time t_0, find the instantaneous power delivered to body when velocity is $\frac{v_0}{2}$.

Watch Video Solution

47. Two billiard balls of same size and mass are in contact on a billiard table. A third ball of same mass and size strikes them symmetrically and remains at rest after the impact. Find the coefficient of restitution between the balls?

Watch Video Solution

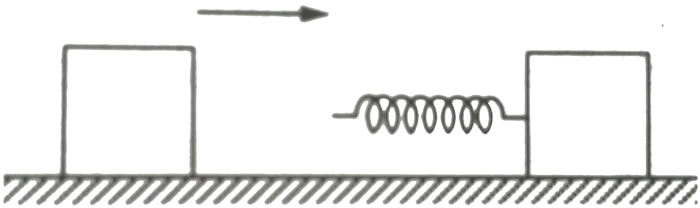
48. A ball drops from a ceiling of a room and after rebounding twice from the floor reaches a height equal to half that of the ceiling. Show that the coefficient of restitution is $\sqrt{\frac{1}{2}}$

Watch Video Solution

49. A bullet of mass $2g$ travelling at a speed of $500m/s$ is fired into a ballistic pendulum of mass $1.0kg$ suspended from a cord $1.0m$ long. The bullet penetrates the pendulum and emerges with a velocity of $100m/s$. Through what vertical height will the pendulum rise?

Watch Video Solution

50. Each of the blocks shown in figure has mass 1 kg. The rear block moves with a speed of 2 m/s towards the front block kept at rest. The spring attached to the front block is light and has a spring constant 50 N/m. find the maximum compression of the spring.



Watch Video Solution

EVALUATE YOURSELF-1

1. if a number of forces act on a body and the body is in static or dynamic force equilibrium , then .

A. Work done by individual forces must be zero

B. Net work done is $+ve$

C. Net work done is $-ve$

D. Net work done is zero

Answer: D

Watch Video Solution

2. When a body moves in a circle, the work done by the centripetal forces is always

A. > 0

B. < 0

C. Zero

D. Minimum

Answer: C

Watch Video Solution

3. In case of circular motion a body , if tangential forcealso acts on the body in addition to centripeyal force , then work done:

A. By both the forces is zero

B. By both the forces is positive

C. By centripetal force is zero but work done by tangential force is not zero

D. By tangential force is zero but work done by centripetal force is not zero

Answer: C

Watch Video Solution

4. A uniform chain has mass Mand length L. It is lying on a smooth horizontal table with half of its length hanging vertically downward. The work done in pulling the chain up the table is:

A. MgL/2

B. MgL/4

C. MgL/8

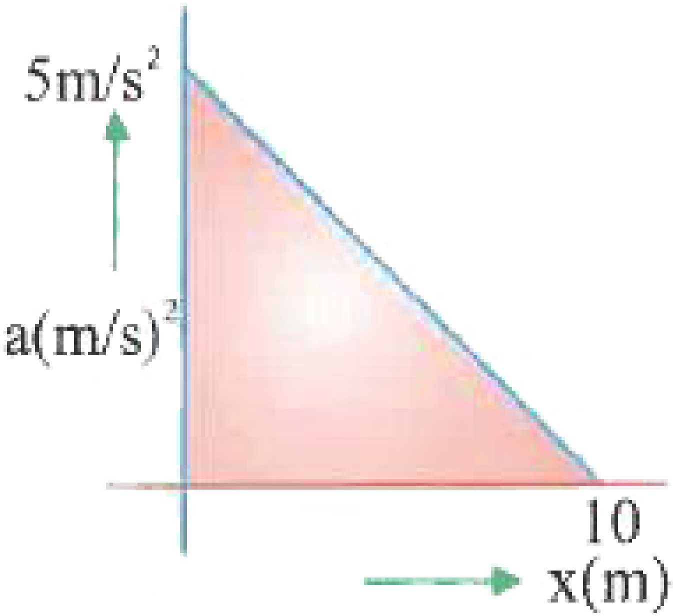
D. MgL/16

Answer: C

Watch Video Solution

5. A particle of mass 1 kg is moving in straight line and its acceleration v/s displacement graph is shown in figure. Work done by the force during x =

0 to x = 10 m is



A. 25 J

B. 26 J

C. 28 J

D. 30 J

Answer: A

Watch Video Solution

6. A particle moved from position $\overrightarrow{r}_1 = 3\hat{i} + 2\hat{j} - 6\hat{k}$ to position $\overrightarrow{r}_2 = 14\hat{i} + 13\hat{j} + 9\hat{k}$ under the action of a force $\left(4\hat{i} + \hat{j} + 3\hat{k}\right)$ newton. Find the work done

A. 10 J

B. 100 J

C. 0.01 J

D. 1 J

Answer: B

Watch Video Solution

7. If a body is moving on a horizontal rough road and the body is in dynamic equilbrium then net work done is

A. $+ve$

B. $-ve$

C. Zero

D. Unity

Answer: C

Watch Video Solution

8. A body, constrained to move in the Y-direction is subjected to a force given by $\overrightarrow{F} = \left(-2\hat{i} + 15\hat{j} + 6\hat{k}\right)N$. What is the work done by this force in moving the body a distance 10 m along the Y-axis

A. 20 J

B. 150 J

C. 160 J

D. 190 J

Answer: B

Watch Video Solution

Evaluate Yourself - 2

1. A body constrained to move along y-axis is subjected to a constant force $\overrightarrow{F} = -\hat{i} + 2\hat{j} + 3\hat{k}N$. The work done by this force in moving the body a distance of 4 m along y-axis is

A. 12 J

B. 4 J

C. 2 J

D. 6 J

Answer: A

Watch Video Solution

2. Which of the following vector is perpendicular to the vector $\overrightarrow{A} = 2\hat{i} + 3\hat{j} + 4\hat{k}$?

Watch Video Solution

3. A block of mass 2 kg is plased on a smooth horizontal surface. Two forces $F_1 = 20$ N and $F_2 = 5$ N start acting on the block in opposite directions as shown. If block gets displaced by 5 m in the direction of net force then work done by F_2 is :-

A. $-75J$

B. $75J$

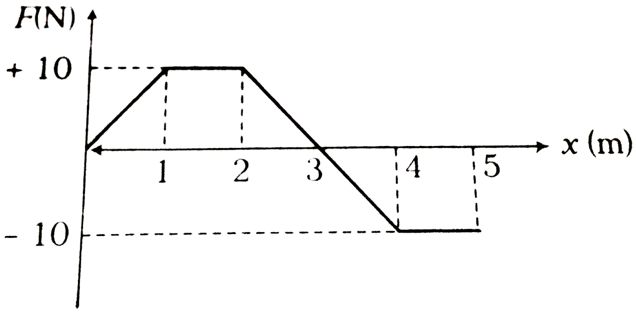
C. $-25J$

D. $25J$

Answer: C

Watch Video Solution

4. A position dependent force F ia acting on a particle and its force-position curve is shown in the figure. Work done on the particle, when its displacement is from 0 to 5 m is



A. $35J$

B. $25J$

C. $15J$

D. $5J$

Answer: D

Watch Video Solution

5. A man of mass 50 kg is standing in an elevator. If elevator is moving up with an acceleration $\frac{g}{3}$ then work done by normal reaction of elevator floor on man when elevator moves by a distance 12 m is $\left(g = 10m/s^2\right)$:-

A. $2000J$

B. $4000J$

C. $6000J$

D. $8000J$

Answer: D

Watch Video Solution

6. A particle moves along x -axis under the action of a position dependent force F $= \left(5x^2 - 2x\right)N$. Work done by forces on the particle when it moves from origin to $x = 3m$ is

A. $45J$

B. $36J$

C. $32J$

D. $42J$

Answer: B

Watch Video Solution

7. What should be the angel between the direction of force and displacement for maximum and minimum work?

A. 90° and 0°

B. 0° and 90°

C. 0° and 180°

D. 180° and 0°

Answer: C

Watch Video Solution

8. A body of mass $3kg$ is under a constant force which causes a displacement s metre in it, given by the relation $s = \frac{1}{3}t^2$, where t is in seconds. Work done by the force in 2 seconds is

A. $\frac{19}{5}J$

B. $\frac{5}{19}J$

C. $\frac{3}{8}J$

D. $\frac{8}{3}J$

Answer: D

Watch Video Solution

Evaluate Yourself - 3

1. When a conservative force does positive work on a body, the potential energy of the body

A. Increases

B. Decreases

C. Remains unaltered

D. Can't say

Answer: B

Watch Video Solution

2. Work done by the conservative force on a system is equal to :

A. Change in potential energy of the system

B. Change in kinetic energy of the system

C. The change in total mechanical energy of the system

D. None of these

Answer: D

Watch Video Solution

3. When a long spring is stretched by 2cm, its potential energy is U. If the spring is stretched by 10cm, the potential energy stored in it will be

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

B. $\frac{U}{5}$

C. $5U$

D. $25U$

Answer: D

Watch Video Solution

4. The elastic potential energy of a spring

A. Increases only when it is stretched

B. Decreases only when it is stretched

C. Decreases only when it is compressed

D. Increases whether stretched or compressed

Answer: D

Watch Video Solution

5. A particle of mass m moving with velocity V_0stick a simple pendulum of mass m and stick to it. The maximum height attained by the pendulum will be

A. $\frac{v_0^2}{8}g$

B. $\frac{v_0^2}{2}g$

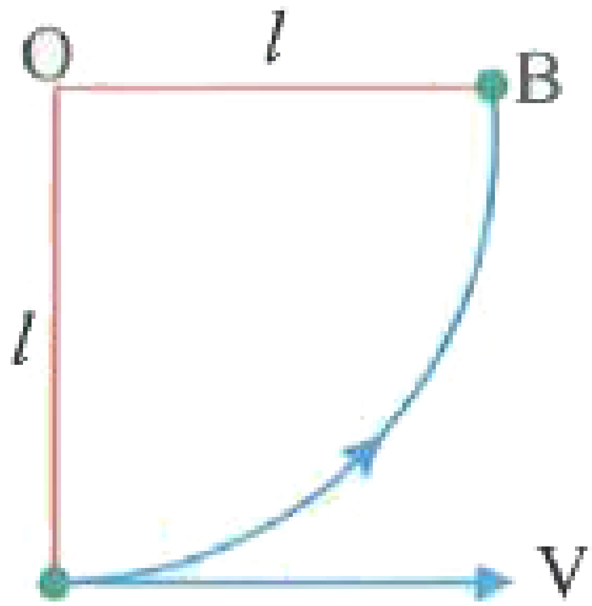
C. $\sqrt{2}v_0g$

D. $\sqrt{v_0}g$

Answer: A

Watch Video Solution

6. A particle of mass m is suspended from a string of length l fixed to the point O. What velocity should be imparted to the particle in its lowermost position so that the string is just able to reach the horizontal diameter of the circle?



A. $v = \sqrt{2gl}$

B. $v = \sqrt{3gl}$

C. $v = \sqrt{gl}$

D. $v = 2gl$

Answer: A

Watch Video Solution

7. A particale moves under the effect of a force $F = Cs$ from $x = 0$ to $x = x_1$. The work down in the process is

A. cx_1

B. cx_1^2

C. $c\frac{x_1^2}{2}$

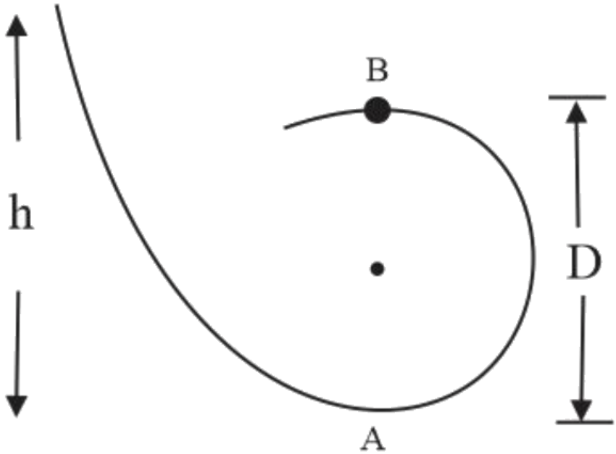
D. 0

Answer: C

Watch Video Solution

Evaluate Yourself - 4

1. A body slides down on a frictionless track which ends in a circular loop of diameter D. The minimum height h in terms of D so that the body may just complete the circular loop, is



A. $h = 5\frac{D}{2}$

B. $h = 5\frac{D}{4}$

C. $h = 3\frac{D}{4}$

D. $h = \frac{D}{4}$

Answer: B

Watch Video Solution

2. The tension in the string revolving in a vertical circle with a mass m at the end which is at the lowest position

A. $m\frac{v^2}{r}$

B. $m\frac{v^2}{r} - mg$

C. $m\frac{v^2}{r} + mg$

D. mg

Answer: C

Watch Video Solution

3. With what angular velocity should a 20 m long cord be rotated such that tension in it, while reaching the highest point, is zero

A. $0.5ra\frac{d}{\sec}$

B. $0.2ra\frac{d}{\sec}$

C. $7.5ra\frac{d}{\sec}$

D. $0.7ra\frac{d}{\sec}$

Answer: D

Watch Video Solution

4. 300J of work is done in slinding a 2 kg block up an inclined plane of height 10m. Taking g $=10m/s^2$, work done against friction is

A. $100J$

B. $200J$

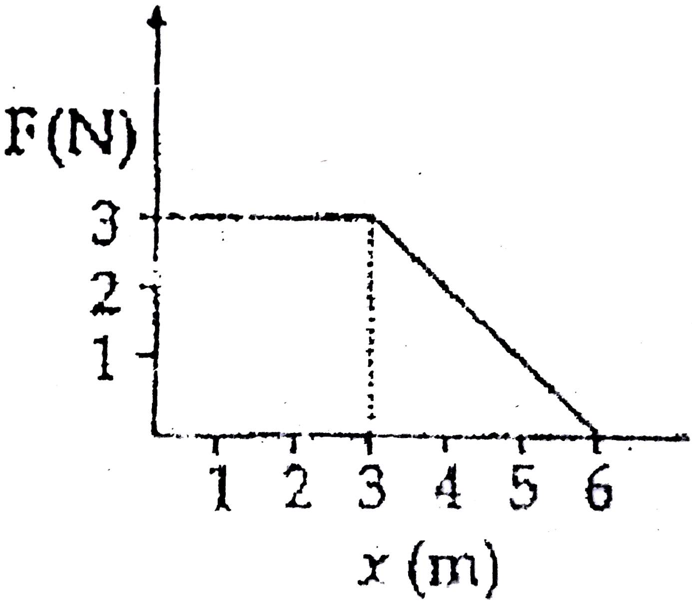
C. $100J$

D. Zero

Answer: C

Watch Video Solution

5. A force F acting on an object varies which distance x as shown in the figure. The force is in N and x in m. The work done by the force in moving the object from x = 0 to x = 6 m is



A. $18.0J$

B. $13.5J$

C. $4.5J$

D. $9.0J$

Answer: B

Watch Video Solution

Evaluate Yourself - 5

1. An engine pumps up $100kg$ water through a height of $10m$ in $5s$. If efficiency of the engine is 60%. What is the power of the engine? $Take g = 10ms^2$.

A. 33 kW

B. $3.3kW$

C. $0.33kW$

D. $0.033kW$

Answer: B

Watch Video Solution

2. Power supplied to a particle of 1 kg varies with times as $P = \frac{t^2}{2}$ watt.

At t = 0, v= 0, the velocity of the particle at time t = 3s is

A. 3 m/s

B. 4 m/s

C. 2 m/s

D. 1 m/s

Answer: A

Watch Video Solution

3. A body is moving undirectionally under the influence of a source of constatn power. It displacement in time t is proportional to (i) $t^{1/2}$ (ii) t (iii) $t^{3/2}$ (iv) t^2

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

B. t°

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

D. t

Answer: A

Watch Video Solution

4. The power of a heart which pumps 5×10^3 of blood per minute at a pressure of $120mm$ of meteury $\left(g = 10ms^{-2}\right.$ and density of $\left.Hg = 13.6 \times 10^3 km^3\right)$ is

A. $1.36W$

B. $13.6W$

C. $0.136W$

D. $136W$

Answer: C

Watch Video Solution

5. 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. None of these

Answer: C

Watch Video Solution

6. The work done by the external forces on a system equals the change in

A. Kinetic energy only

B. Potential energy only

C. Thermal energy only

D. None of these

Answer: A

Watch Video Solution

7. A ball is dropped from a height of 100 m. At the surface of the earth, 20% of its energy is lost. To what height the ball will rise?

A. 80 m

B. 40 m

C. 60 m

D. 20 m

Answer: A

Watch Video Solution

8. The power of a water pump is 2 kW. If $g = 10m/s^2$, the amount of water it can raise in 1 min to a height of 10 m is :

A. $2000lit.$

B. $1000lit$

C. $100lit.$

D. $1200lit$

Answer: D

Watch Video Solution

9. A car of mass 1000kg accelerates uniformly from rest to a velocity of $54km/h$ in 5 seconds. Calculate (i) its acceleration (ii) its gain in KE (iii) average power of the engine during this period.

A. 2000 W

B. 22500 W

C. 5000 W

D. 2500 W

Answer: B

Watch Video Solution

Evaluate Yourself - 6

1. In one dimeensional collision of two particles velocities are interchanged when

(a)Collision is elastic and masses are equal

(b)Collision is inelastic but masses are unequal

A. Only 'a' is correct

B. Only 'b' is correct

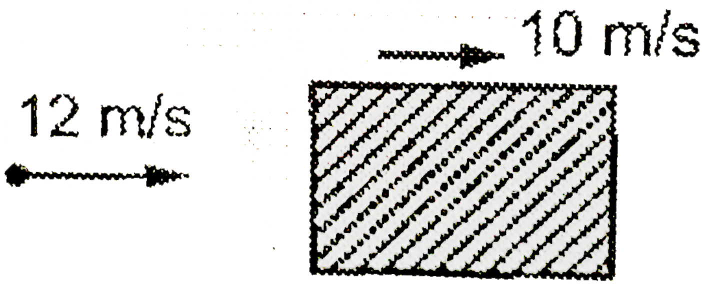
C. a' and 'b' both are correct

D. None of these

Answer: A

Watch Video Solution

2. A light particle moving horizontally with a speed of $12m/s$ strikes a very heavy block moving in the same direction at $10m/s$. The collision is one-dimensional and elastic. After the collision, the particle will



A. Move at 2 m/s in its original direction

B. Move at 8 m/s in its original direction

C. Move at 8 m/s opposite to its original direction

D. Move at 12 m/s opposite to its original direction

Answer: B

Watch Video Solution

3. During collision kinetic energy is conserved at each instant

A. Of inelastic collision

B. Of elastic colllision

C. Both (1) and (2)

D. None of these

Answer: D

Watch Video Solution

4. Which of the following statement is correct?

A. Kinetic energy of a system can be changed without changing its momentum

B. Kinetic energy of a system cannot to be changed without changing its momentum

C. Momentum of a system cannot be changed without changing its kinetic energy

D. Body cannot have energy without having momentum.

Answer: A

View Text Solution

5. A particle of mass m_1 makes an elastic, one-dimensional collision with a stationary particle of mass m_2.What fraction of the kinetic energy of m_1 is carried away by m_2?

A. $\frac{m_1}{m_2}$

B. $\frac{m_2}{m_1}$

C. $2m_1\frac{m_2}{(m_1+m_2)^2}$

D. $4m_1 \dfrac{m_2}{(m_1 + m_2)^2}$

Answer: D

Watch Video Solution

6. A bomb of mass $9kg$ explodes into 2 pieces of mass $3kg$ and $6kg$. The velocity of mass $3kgis1.6m/s$. The $K.E. ofmass6kg$ is

A. 96

B. 384

C. 192

D. 768

Answer: C

Watch Video Solution

7. A particle of mass 4 m which is at rest explodes into three fragments. Two of the fragments each of mass m are found to move with a speed v each in mutually perpendicular directions. The total energy released in the process of explosion is ....

A. $3mv^2$

B. $\frac{7}{2}mv^2$

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

D. $4mv^2$

Answer: C

Watch Video Solution

8. Two equal masses m_1 and m_2 moving along the same straight line with velocites $+3m/s$ and $-5m/s$ respectively collide elastically. Their velocities after the collision will be respectively.

A. $+4ms^{-1}$

B. $-3ms^{-1}$ and $+5ms^{-1}$

C. $-4ms^{-1}$ and $+4ms^{-1}$

D. $-5ms^{-1}$ and $+3ms^{-1}$

Answer: D

Watch Video Solution

C.U.Q

1. If the amount of work done by a force depends only on the initial and final positions of the object which has been moved, then such a force is called

A. Gravitational

B. Dissipative

C. Conservative

D. Retarding

Answer: C

Watch Video Solution

2. In which of the following, the work done by the mentioned force is negative ? The work done by

A. The work done by

The tension in the cable while the lift is ascending

B. The gravitaional force when a body slides down an inclined plane

C. The applied force to maintain uniform motion of a block on a rough horizontal surface

D. The gravitaional force when a body is thrown up

Answer: D

Watch Video Solution

3. A weight lifter lifts a weight off the ground and holds is up, then

A. Work done in lifting as well as holding the weight

B. No work is done in both lifting and holding he weight

C. Work is done in lifting the weight but no work is required to be done in holding it up

D. No work is done in lifting the weight but work is required to be done in holding it up

Answer: D

Watch Video Solution

4. A man pushes a wall and fails to displace it.He does

A. negative work

B. positive but not maximum work

C. maximum work

D. no work at all

Answer: D

Watch Video Solution

5. A bucket full of water is drawn up by a person. In this case the work done by gravitational force is

A. negative because the force and displacement are in opposite directions

B. positive because the force and displacement are in the same direction

C. negative because the force and displacement are in the same direction

D. positive because the force and displacement are in opposite directions

Answer: A

Watch Video Solution

6. A man is rowing a boat upstream and inspite of that the boat is found to be not moving with respect to the bank. The work done by the man is

A. zero

B. positive

C. negative

D. may be $+ve \text{ or } -ve$

Answer: A

Watch Video Solution

7. A ball is thrown vertically upwards from the ground. Work done by air resistance during its time of flight is

A. positive during ascent and negative during descent

B. positive during ascent and decent

C. negative during ascent and positive during descent

D. negative during ascent and decent

Answer: D

Watch Video Solution

8. An agent is moving a positively charged body towards another fixed positive charge. The work done by the agent is

A. positive

B. negative

C. zero

D. may be positive or negative

Answer: A

Watch Video Solution

9. Work done by the force of friction

A. can be zero

B. can be positive

C. can be negative

D. any of the above

Answer: D

Watch Video Solution

10. The slope of the kinetic energy versus position vector curve gives the rate of change of :-

A. work

B. force

C. power

D. momentum

Answer: D

Watch Video Solution

11. Which of the following statement is correct?

A. Kinetic energy of a system can be changed without changing its momentum

B. Kinetic energy of a system cannot to be changed without changing its momentum

C. Momentum of a system cannot be changed without changing its kinetic energy

D. Body cannot have energy without having momentum.

Answer: A

Watch Video Solution

12. The change in kinetic energy per unit 'space' (distance) is equal to

A. power

B. momentum

C. force

D. pressure

Answer: C

Watch Video Solution

13. When the momentum of a body a doubled, the kinetic energy is

A. doubled

B. halved

C. becomes four times

D. becomes three times

Answer: C

Watch Video Solution

14. For the same kinetic energy, the momentum shall be maximum for which of the following particle ?

A. Electron

B. Proton

C. Deuteron

D. Alpha particle

Answer: D

Watch Video Solution

15. If the momentum of a particle is plotted on $X-$ axis and its kinetic energy on the $Y-$ axis, the graph is a

A. straight line

B. parabola

C. rectangular hyperbola

D. circle

Answer: B

Watch Video Solution

16. When two identical balls are moving with equal speed in opposite direction, which of the following is true ? For the system of two bodies.

A. momentum is zero, kinetic energy is zero

B. momentum is not zero, kinetic energy is zero

C. momentum is zero, kinetic energy is not zero

D. momentum is not zero, kinetic energy is not zero

Answer: C

Watch Video Solution

17. The product of linear momentum and velocity of a blood represents.

A. half of the kinetic energy of the body

B. kinetic energy of the body

C. twice the kinetic energy of the body

D. mass of the body

Answer: C

Watch Video Solution

18. The KE of a freely falling body

A. is directly proportional to height of its fall

B. is inversely proportional to height of its fall

C. is directly proportinal to square of time of its fall

D. 1 and 3 are true

Answer: D

Watch Video Solution

19. Consider the following two statements:

A. Linear momentum of a system of partcles is zero.

B. Kinetic energ of a system of particles is zero.

A. A does not imply B & B does not imply A

B. A implies B and B does not imply A

C. A does not imply B but B implies A

D. A implies B and B implies A

Answer: C

Watch Video Solution

20. Internal forces can change

A. Linear momentum as well as kinetic energy

B. Linear momentum but not the kinetic energy

C. Kinetic energy but not linear momentum

D. neither the linear momentum nor the kinetic energy

Answer: C

Watch Video Solution

21. If the force acting on a body is inversely proportional to its speed, then its kinetic energy is

A. linearly related to time

B. inversely proportional to time.

C. inversely proportional to the square of time

D. a constant

Answer: A

Watch Video Solution

22. Which of the following statement is correct

A. KE of a system cannot be changed without changing its momentum

B. KE of a system can be changed without changing its momentum

C. Momentum of a system cannot be changed without changing its KE

D. A system cannot have energy without having momentum

Answer: A

Watch Video Solution

23. Two bodies of unequal masses have same linear momentum. Which one has greater K.E. ?

A. lighter body

B. heavier body

C. both

D. none of the body

Answer: A

Watch Video Solution

24. Two bodies of masses m_1 and m_2 have equal KE. Their momenta is in the ratio

A. $\sqrt{m_2} : \sqrt{m_1}$

B. $m_1 : m_2$

C. $\sqrt{m_1} : \sqrt{m_2}$

D. $m_1^2 : m_2^2$

Answer: C

Watch Video Solution

25. A body can have

A. changing momentum and finite kinetic energy

B. zero kinetic energy and finite momentum

C. zero acceleration and increasing kinetic energy

D. finite acceleration and zero kinetic energy

Answer: A

Watch Video Solution

26. A rock of mass m is dropped to the ground from a height h. A second rock, with mass $2m$, is dropped from the same height. When the second rock strikes the ground, what is its kinetic energy? (a) Twice that of the first rock, (b) four times that of the first rock, (c) same as that of the first rock, (d) half as much as that of the first rock, (e) impossible to determine.

A. twice that of the first rock

B. four times that of the first rock

C. the same as that of the first rock

D. half that of the first rock

Answer: A

Watch Video Solution

27. Kilowatt hour is the unit of

A. Energy

B. Time

C. Power

D. Force

Answer: A

Watch Video Solution

28. Two unequal masses are ties together with a cord with a compressed spring in between.

When the cord is burnt with a match releasing the spring, the two masses fly apart with equal

A. Kinetic energy

B. Speed

C. Momentum

D. Acceleration

Answer: C

Watch Video Solution

29. When a spring is wound, a certain amount of PE is stored in it. If this wound spring is dissolved in acid, the stored energy

A. is completely lost

B. appears in the form of electromagnetic waves

C. appears in the form of heart raising the temperature of the acid

D. appears in the form of KE by splashing acid drops

Answer: C

Watch Video Solution

30. Two springs have their force constants K_1 and K_2 and they are stretched to the same extension. If $K_2 > K_1$ work done is

A. same in both the springs

B. more in spring K_1

C. more in spring K_2

D. independent of spring constant K

Answer: C

Watch Video Solution

31. Two spring have their force constants K_1 and $K_2(K_2 > K_1)$. When they are stretched by the same force, work done is

A. same in both the springs

B. more in spring K_1

C. more in spring K_2

D. independent of spring constant K

Answer: B

Watch Video Solution

32. Which of the following statements is true for work done by conservative forces :–

A. it does not depend on path

B. it is equal to the difference of initial and final potential energy function

C. it can be recovered completely

D. all of the above

Answer: D

Watch Video Solution

33. Which of the following statement is incorrect for a conservative field?

A. Work done is going from initial to final position is equal to change in kinetic energy for the particle

B. Work done depends on path but not on initial and final positions

C. Work done does not depend on path but depends only on initial and final positions

D. Work done on a particle in the field for a round trip is zero.

Answer: B

Watch Video Solution

34. Change in Potential energy is defined for

A. non-conservative forces only

B. conservative forces only

C. both conservative & non-conservative forces

D. neither conservative nor non-conservative forces

Answer: B

Watch Video Solution

35. Which of the following forces is called a conservative force?

A. Frictional force

B. Air resistance

C. Electrostatic force

D. Viscous force

Answer: C

Watch Video Solution

36. Identify the non-conservative force in the following

A. Weight of a body

B. Force between two ions

C. Magnetic force

D. Air resistance

Answer: D

Watch Video Solution

37. If x, F and U denote the displacement force acting on and potential energy of a particle:

A. $U = F$

B. $F = +d\frac{U}{dx}$

C. $F = -d\frac{U}{dx}$

D. $F = \frac{1}{x}\left(d\frac{U}{dx}\right)$

Answer: C

Watch Video Solution

38. In the case of conservative force

A. work done is independent of the path

B. work done in a closed loop is zero

C. work done against conservative force is stored is the form of potential energy

D. all of the above

Answer: D

Watch Video Solution

39. The total work done on a particle is equal to the change in its kinetic energy

A. always

B. only if the conservative forces are acting on it

C. only in inertial frames

D. only when pseudo forces are absent

Answer: A

Watch Video Solution

40. A lorry and a car moving with the same KE are brought to rest by applying the same retarding force. Then

A. lorry will come to rest in a shorter distance

B. car will come torest in a shorter distance

C. both come to rest in same distance

D. any of the above

Answer: C

Watch Video Solution

41. A shell is fired into air at an angle θ with the horizontal form the ground. On reaching the maximum height

A. its kinetic energy is not equal to zero

B. its kinetic energy is equal to zero

C. its potential energy is equal to zero

D. both its potential and kinetic energies are zero

Answer: A

Watch Video Solution

42. A cricket ball and a ping-pong ball are dropped in a vacuum chamber from same height. When they have fallen half way down, they have the same

A. velocity

B. potential energy

C. kinetic energy

D. mechanical energy

Answer: A

Watch Video Solution

43. A cyclist free-wheels from the top of a hill, gathers speed going down the hill, applies the brakes and eventually comes to rest at the bottom of the hill. Which one of the following energy changes take place.

A. Potential to kinetic and to heat energy

B. Kinetic to potential and to heat energy

C. chemical to heat and to potentia energy

D. Kinetic to heat and to chemical energy

Answer: A

Watch Video Solution

44. If 'E' represents total mechanical energy of a system while 'U' represents the potential energy, then $E - U$ is

A. always zero

B. negative

C. either positive or negative

D. positive

Answer: D

Watch Video Solution

45. For a body thrown vertically upwards, its direction of motion changes at the point where its total mechanical energy is

A. greater than the potential energy

B. less than the potential energy

C. equal to the potential energy

D. Zero

Answer: C

Watch Video Solution

46. Internal forces can change

A. Kinetic energy

B. Mechanical energy

C. Momentum

D. 1 and 2

Answer: D

Watch Video Solution

47. The negative of the work done by the conserative internal forces on a system equals the change iln

A. the change in kinetic energy of the system

B. the change in potential energy of the system

C. the change in total mechanical energy of the system

D. the change in the momentum of the system

Answer: B

Watch Video Solution

48. Which of the following statement is wrong?

A. KE of a body is independent of the direction of motion

B. In an elastic collision of two bodies, the momentum and energy of each body is conserved

C. If two protons are brought towards ech other, the PE of the system increases

D. A body can have energy without momentum

Answer: B

Watch Video Solution

49. When a body falls from an aeroplane there is increase in its :

A. acceleration

B. potential energy

C. kinetic energy

D. mass

Answer: C

Watch Video Solution

50. A body is projected from ground obliquely. During downward motion, power delivered by gravity of it

A. Increases

B. Decreases

C. Remains constant

D. First decreases and then becomes constant

Answer: A

Watch Video Solution

51. The blades of a wind mill sweep out a circle of area A. If wind flows with velocity v perpendicular to blades of wind mill and its density is p, then the mechanical power received by wind mill is

A. $pA\frac{v^3}{2}$

B. $pA\frac{v^2}{2}$

C. pAv^2

D. $2pAv^2$

Answer: D

Watch Video Solution

52. A pump is used to pump a liquid of density ρ continuously through a pipe of cross, sectional area A. If liquid is flowing with speed v, then average power of pump is

A. $\frac{1}{3}pAV^2$

B. $\frac{1}{2}pAV^2$

C. $2pAV^2$

D. $\frac{1}{2}pAV^3$

Answer: D

Watch Video Solution

53. A body is moved from rest along a staight line by a machine delivering constant power .Calcualte the velo0city and distance moved by the body as a funidion of time .

A. $x \infty v^{\frac{1}{2}}$

B. $x \infty v^{3}$

C. $x \infty v$

D. $x \infty v^{3}$

Answer: D

Watch Video Solution

54. A pump motor is used to deliver water at a certain rate from a given pipe. To obtain 'n' times water from the same pipe in the same time, by what amount the power of the motor should be increased?

A. n times

B. $n^2 \times$

C. $n^3 \times$

D. $\frac{1}{n} \times$

Answer: B

Watch Video Solution

55. A body is moved along a straight line by a machine delivering constant power . The distance moved by the body is time t is proptional to

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

B. $t^{\frac{3}{4}}$

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

D. t^2

Answer: C

Watch Video Solution

56. A body starts from rest and acquires velocity V in time T. The instantaneous power delivered to the body in time 't' proportional to

A. $\frac{V}{T}t$

B. $\frac{V^2}{T}t^2$

C. $\frac{V^2}{T^2}t$

D. $\frac{V^2}{T^2}t^2$

Answer: C

Watch Video Solution

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

A. t

B. $1\sqrt{t}$

C. $\sqrt{t}$

D. t^2

Answer: C

Watch Video Solution

58. A motor car of m travels with a uniform speed v on a convex bridge of radius r. When the car is at the middle point of the bridge, then the force exterted by the car on the bridge is

A. mg

B. $mg + m\frac{v^2}{r}$

C. $mg - m\frac{v^2}{r}$

D. $mg \pm m\frac{v^2}{r}$

Answer: C

Watch Video Solution

59. A gramphone record is revolving with an angular velocity omega. A coin is placed at a distance r from the centre of the record. The static coefficient of friction is mu. The coin will revolve with the record if.

A. $R > \mu\frac{g}{\omega^2}$

B. $R = \mu\frac{g}{\omega^2} only$

C. $R < \mu\frac{g}{\omega^2}$

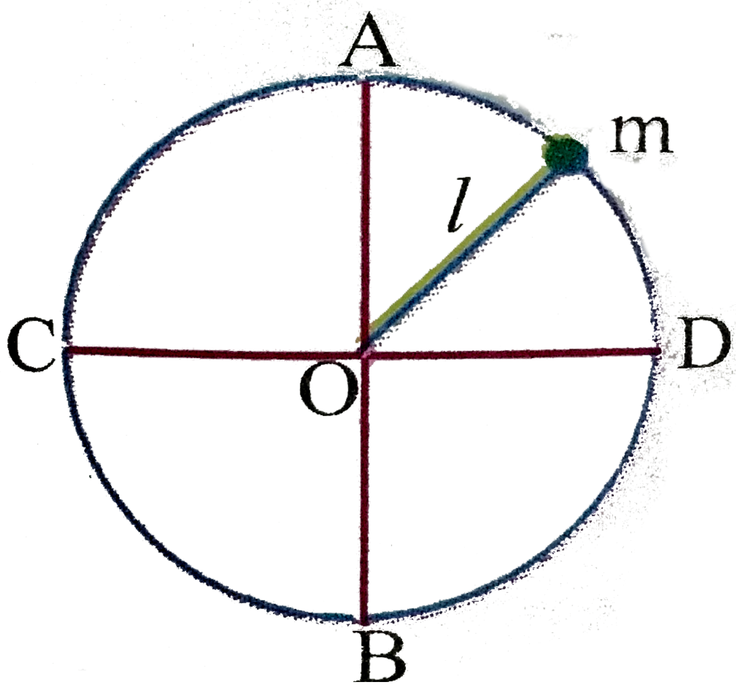
D. $R \leq \frac{\mu}{\omega^2}$

Answer: D

Watch Video Solution

60. A small sphere of mass 'm' is attached to a cord and rotates in a vertical plane about a point O. If the average speed of the sphere is increased, the cord is most likely to break at the orientation when the

mass is at :



A. bottom point B

B. the point C

C. the point D

D. top point A

Answer: A

Watch Video Solution

61. A car is moving up with uniform speed along a fly over bridge which is part of a vertical circle. The true statement from the following is

A. Normal reaction on the car gradually decreases and becomes minimum at highest position of bridge

B. Normal reaction on the car gradually increases and becomes maximum at highest position

C. Normal reaction on car does not change

D. Normal reaction on the car gradually decreases and becomes zero at highest position.

Answer: B

Watch Video Solution

62. A bottle of soda water is rotated in a vertical circle with the neck held in hand. The air bubbles are collected

A. near the neck

B. near the bottom

C. at the middle

D. uniformaly in the bottle

Answer: A

Watch Video Solution

63. A vehicle is moving with uniform speed along horizontal, concave and convex surface roads. The surface on which, the normal reaction on the vehicle is maximum is

A. concave

B. convex

C. horizontal

D. same at all surfaces

Answer: A

Watch Video Solution

64. Which of the following statement is incorrect?

A. Most of the collisions on the macroscopic scale are ineleastic collisions.

B. In a perfectly ineleastic collision, there is complete loss of KE

C. Forces involved in an elastic collision are conservative in nature.

D. Oblique collision is that collision in which the colliding bodies do not move along at the same staright line path.

Answer: B

Watch Video Solution

65. A bullet is fired from the gun. The gun recoils, the kinetic energy of the recoil shall be-

A. Less than that of bullet

B. Equal to that of bullet

C. Greater than that of bullet

D. Zero

Answer: A

Watch Video Solution

(C.U.Q) MOTION IN A VERTICAL CIRCLE

1. Select the false statement

A. Inelastic collision, kinetic energy during the collision is not conserved

B. The coeffficient of restitution for a collision between two steel balls lies between zero and one

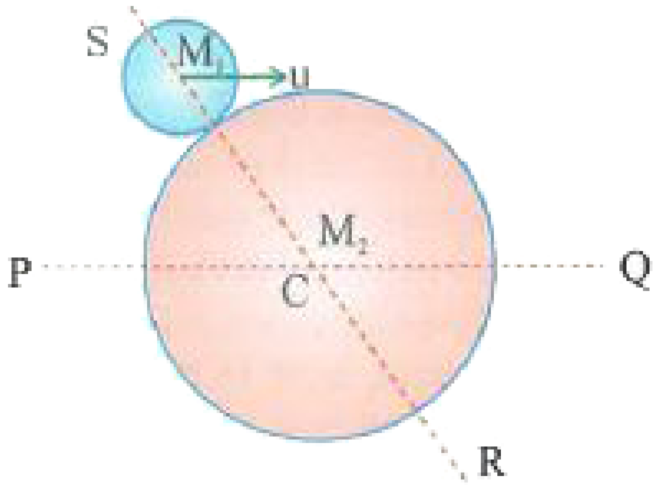
C. The momentum of a ball colliding elastically with the floor is conserved

D. In an oblique elastic collision between two indentical bodies with initially one of them at rest, final velocities are perpendicular

Answer: C

Watch Video Solution

2. An object of mass M_1 moving horizontally with speed u collides elastically with another object of mass M_2 at rest. Select correct statement.



A. The momentum of system is conserved only in direction PQ

B. Momentum of M_1 is conserved in direction perpendicular to SR

C. Momentum of M_2 will change in direction normal to CR

D. All of these

Answer: B

Watch Video Solution

3. A bullet of mass P is fired with velocity Q in a large body of mass R. The final velocity of the system will be

A. $\frac{R}{P} + R$

B. $P\frac{Q}{P} + R$

C. $\frac{P+Q}{R}$

D. $\frac{P+R}{P}Q$

Answer: B

Watch Video Solution

4. Which of the following statement is false?

A. Momentum is conserved in all types of collisions

B. Energy is conserved in all types of collisions

C. During elastic collision conservative forces are involved

D. Work-energy theorem is not applicable to inelastic collisions

Answer: B

Watch Video Solution

5. A nuclide at rest emits an alpha-particle. In this process:

A. α - particle moves with large velocity and the nucleus remains at rest.

B. Both α-particle and nucleus move with equal speed in opposite directions

C. Both move in opposite directions but nucleus with greater speed

D. Both move in opposite directions but α-particle with greater speed

Answer: D

Watch Video Solution

6. 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 the earth is conserved

D. the total energy of the ball and the earth is conserved

Answer: C

Watch Video Solution

(C.U.Q) COLLISIONS

1. A ball with initial momentum $\overrightarrow{P}$ collides with rigid wall elastically. If $\overrightarrow{P^1}$ be its momentum after collision then

A. $\overrightarrow{P}^{1} = \overrightarrow{P}$

B. $\overrightarrow{P}^{1} = -\overrightarrow{P}$

C. $\overrightarrow{P}^{1} = 2\overrightarrow{P}$

D. $\overrightarrow{P}^{1} = -2\overrightarrow{P}$

Answer: B

Watch Video Solution

2. Choose the false statement

A. In a perfect elastic collision the relative velocity of approach is equal to the relative velocity of separation

B. In an inelastic collision the relative velocity of approach is less than the relative velocity of seperation

C. In an inelastic collision the relative velocity of separation is less than the relative velocity of approach

D. In perfect inelastic collision relative velocity of seperation is zero.

Answer: B

Watch Video Solution

3. Two particles of different masses collide head on. Then for the system

A. loss of KE is zero, if it was perfect elastic collision

B. If it was perfect inelastic collision, the loss of KE of the bodies moving in opposite directions is more than that of the bodies moving in the same direction

C. loss of momentum is zero for both elastic and inelastic collision

D. 1,2 and 3 are correct

Answer: D

Watch Video Solution

4. A $2kg$ mass moving on a smooth frictionless surface with a velocity of $10ms^{-1}$ hits another $2kg$ mass kept at rest, in a perfect inelastic collision. After collision, if they move together

A. they travel with a velocity of $5ms^{-1}$ in the same direction

B. they travel with a velocity of $10ms^{-1}$ in the same direction

C. they travel with a velocity of $10ms^{-1}$ in the opposite direction

D. they travel with a velocity of $5ms^{-1}$ in opposite direction

Answer: A

Watch Video Solution

5. A body of mass m moving with a constant velocity v hits another body of the same mass moving with the same velocity v but in the opposite direction and sticks to it. The velocity of the compound body after collision is

A. 2v

B. v

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

D. zero

Answer: D

Watch Video Solution

6. In an inelastic collision, the kinetic energy after collision

A. is smae as before collision

B. is always less than before collision

C. is always greater than before collision

D. may be less or greater than before collision

Answer: B

Watch Video Solution

7. 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 the earth is conserved

D. the total kinetic energy of the ball and the earth is conserved

Answer: C

Watch Video Solution

8. About a collision which is not correct

A. physical contact is must

B. colliding particles can change their direction of motion

C. the effect of the external force is not considered

D. linear momentum is conserved

Answer: A

Watch Video Solution

9. In one-dimensional elastic collision, the relative velocity of approach before collision is equal to

A. relative velocity of separation after collision

B. e' times relative velocity of separation after collision

C. $\frac{1}{e}$ times relative velocity of separation after collision

D. sum of the velocities after collision

Answer: A

Watch Video Solution

10. Two identical bodies moving in opposite direction with same speed, collide with each other. If the collision is prefectly elastic then

A. after the collision both comes to rest

B. after the collision forst comes to rest and second moves in the opposite direction with same speed.

C. after collision they recoil with same speed

D. both and 1 and 2

Answer: C

Watch Video Solution

11. A body of mass 'm' moving with certain velocity collides with another identical body at rest. If the collision is perfectly elastic and after the collision both the bodies moves

A. in the same direction

B. in opposite direction

C. in perpendicular direction

D. at 45° to each other

Answer: C

Watch Video Solution

12. Six steel balls of identical size are lined up along a straight frictionless groove. Two similar balls moving with speed v along the groove collide with this row on the extreme left end. Then

A. one ball from the right end will move on with speed v

B. two balls from the extreme right end will move on with speed v and the remaining balls will be at rest

C. all the balls will start moving to the right with speed $\frac{v}{8}$

D. all the six balls originally at rest will move on with speed $\frac{v}{6}$ and the incident balls will come to rest.

Answer: B

Watch Video Solution

13. A lighter body moving with a velocity v collides with a heavier body at rest. Then

A. the lighter body rebounced with twice the velocity of bigger body

B. the lighter body retraces its path with the same velocity in magnitude

C. the heavier body does not move practically

D. both (2) and (3)

Answer: D

Watch Video Solution

14. Six steel balls of identical size are lined up long a straight frictionless groove. Two similar balls moving with a speed V along the groove collide with this row on the extreme left hand then-

A. all the balls will start moving to the right with speed $\frac{V}{8}$

B. all the six balls initially at rest will move on with speed $\frac{V}{6}$ each and two identical balls will come to rest

C. two balls from the extreme right end will move on the speed V each and the remaining balls will remain at rest.

D. one ball from the right end will move on with speed $2v$, the remaining balls will be at rest.

Answer: C

Watch Video Solution

EXERCISE - 1 (C.W)

1. A particle moves along X-axis from $x=0$ to $x=1$ m under the influence of a force given by $F=3x^2+2x-10$. Work done in the process is

A. $+4J$

B. $-4J$

C. $+8J$

D. $-8J$

Answer: (4)

Watch Video Solution

2. A body constrained to move in z direction is subjected to a force given by $\overrightarrow{F}=\left(3\hat{i}-10\hat{j}+5\hat{k}\right)N$. What is the work done by this force in moving the body through a distance of 5 m along z-axis?

A. $15J$

B. $-15J$

C. $50J$

D. $25J$

Answer: (4)

Watch Video Solution

3. A uniform chain of length L and mass M is lying on a smooth table and one third of its length is hanging vertically down over the edge of the table. If g is acceleration due to gravity, calculate work required to pull the hanging part on the table.

A. MgL

B. $Mg\frac{L}{3}$

C. $Mg\frac{L}{9}$

D. $Mg\frac{L}{18}$

Answer: (4)

Watch Video Solution

4. A person holds a bucket of weight 60 N. He walks 7 m along the horizontal path and then climbs up a vertical distance of 5 m. The work done by the man is

A. $300N - m$

B. $420N - m$

C. $720N - m$

D. $210N - m$

Answer: (1)

Watch Video Solution

5. If a force $\overrightarrow{F} = \left(\overrightarrow{i} + 2\overrightarrow{j} + \overrightarrow{k}\right)N$ acts on a body produces a displacement of $\overrightarrow{S} = \left(4\overrightarrow{i} + \overrightarrow{j} + 7\overrightarrow{k}\right)m$, then the work done is

A. $9J$

B. $13J$

C. $5J$

D. $1J$

Answer: (2)

Watch Video Solution

6. 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. Zero

D. $2mgs$

Answer: (3)

Watch Video Solution

7. 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: (3)

Watch Video Solution

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

A. $F\frac{x}{2}$

B. $\frac{F}{2}x$

C. $2Fx$

D. $2\frac{x}{F}$

Answer: (1)

Watch Video Solution

9. 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. $0J, 323J$

Answer: (2)

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: (2)

Watch Video Solution

11. KE of a body is increased by 44%. What is the percent increse in the momentum ?

A. 10%

B. 20%

C. 30%

D. 44%

Answer: (2)

Watch Video Solution

12. A 120 g mass has a velocity $\vec{v} = 2\hat{i} + 5\hat{j} ms^{-1}$ at a certain instant. Its kinetic energy is

A. $5J$

B. $2J$

C. $3J$

D. $8J$

Answer: (3)

Watch Video Solution

13. A body of mass 5 kg initially at rest is subject to a force of 20 N. What is the kinetic energy acquired by the body at the end of 10 s ?

A. $4000J$

B. $400J$

C. $40J$

D. $4J$

Answer: (1)

Watch Video Solution

14. If a body of mass 3 kg is droped from the top of a tower of height 25 metre, then its kinetic energy after 1 second will be $\left(g = 10\frac{m}{s^2}\right)$

A. $1126J$

B. $1048J$

C. $735J$

D. $150J$

Answer: (4)

Watch Video Solution

15. 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. $mg\left[\left(\frac{L}{2}\right) - r\right]$

B. $mL\left[\left(\frac{g}{2}\right)-r\right]$

C. $mr(gL-1)$

D. $mgLr$

Answer: (1)

Watch Video Solution

16. 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: (4)

Watch Video Solution

17. 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 $\left[g = 10ms^{-2}\right]$

A. $5J$

B. $20J$

C. $25J$

D. Zero

Answer: (3)

Watch Video Solution

18. 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. $9\frac{K}{4}$

Answer: (2)

Watch Video Solution

19. 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. 80 m

B. 120 m

C. 60 m

D. $9.\ m$

Answer: (1)

Watch Video Solution

20. 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. 1 m

B. 67 m

C. 100 m

D. 42 m

Answer: (2)

Watch Video Solution

21. A spring of spring constant 5×10^2Nm is streched initially by $5cm$ from the unstriched position . Then the work required to streach is further by another $5cm$ is

A. $6.25 Nm$

B. $12.50 Nm$

C. $18.75 Nm$

D. $25 Nm$

Answer: (3)

Watch Video Solution

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

A. $4U$

B. $8U$

C. $16U$

D. $2U$

Answer: (3)

Watch Video Solution

23. The energy required to accelerate a car from 10 m/s to 20 m / s is how many times the energy required to accelerate the car from rest to 10 m /s

A. E

B. 2E

C. 3E

D. 4E

Answer: (3)

Watch Video Solution

24. 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. 6 N

C. 5 N

D. 8 N

Answer: (2)

Watch Video Solution

25. 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. $0.1\frac{m}{s}$

B. $1.5\frac{m}{s}$

C. $5\frac{m}{s}$

D. $60\frac{m}{s}$

Answer: (1)

Watch Video Solution

26. 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: (2)

Watch Video Solution

27. 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: (4)

Watch Video Solution

28. A block of mass $4kg$ is initially at rest on a horizontal frictionless 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: (2)

Watch Video Solution

29. 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: (2)

Watch Video Solution

30. 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: (4)

Watch Video Solution

31. 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. $\frac{3}{5}m$

B. $\frac{5}{3}m$

C. $4m$

D. $16m$

Answer: (1)

Watch Video Solution

32. 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. 50 m

B. 25 m

C. $12.5m$

D. $19.6m$

Answer: (3)

Watch Video Solution

33. A body is falling under gravity . When it loses a gravitational potential energy U, its speed is$v$. The mass of the body shell be

A. $\frac{U^2}{2}v$

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

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

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

Answer: (4)

Watch Video Solution

34. 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. $2X10^{-2}m$

B. $0.2m$

C. $20m$

D. $200m$

Answer: (2)

Watch Video Solution

35. At what height above the ground must a mass of 5 kg be to have its PE equal in value to the KE possessed by it when it moves with a velocity of 10 m/s? $\left(g = 10\frac{m}{s^2}\right)$

A. $1m$

B. $5m$

C. $10m$

D. $50m$

Answer: (2)

Watch Video Solution

36. 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: (4)

Watch Video Solution

37. A force $F = \left(2\vec{i} + \vec{j} + \vec{k}\right)N$ is acting on a particle moving with constant velocity $\vec{v} = \left(\vec{i} + 2\vec{j} + \vec{k}\right)\frac{m}{s}$. Power delivered by force is

A. 4 watt

B. 5 watt

C. 6 watt

D. 8 watt

Answer: (2)

Watch Video Solution

38. The power of water pump is 4 kW. If $g = 10ms^{-2}$, the amount of water it can raise in 1 minute to a height of 20 m is

A. 100 litre

B. 1000 litre

C. 1200 litre

D. 2000 litre

Answer: (3)

Watch Video Solution

39. From a waterfall, water is falling down at the rate of 100kg / s on the blades of turbine. If the height of the fall is 100 m , then the power delivered to the turbine is approximately equal to

A. 100 kW

B. 10 kW

C. 1 kW

D. 100 W

Answer: (1)

Watch Video Solution

40. A crane can lift up $10,000kg$ of coal in 1 hour form a mine of $180m$ depth. If the efficiency of the crane is 80%, its input power must be $(g = 10ms^{-2})$.

A. 4 kW

B. $6.25kW$

C. 50 k

D. $62.5kW$

Answer: (2)

Watch Video Solution

41. A pump is required to lift $600kg$ of water per minute from a well $25m$ deep and to eject it with a speed of $50ms^{-1}$. The power required to perform the above task is

A. 10 Kw

B. 15 kW

C. 20 kW

D. 25 kW

Answer: (2)

Watch Video Solution

42. A cable pulls a box with force of 5 kN and raises it at the rate of $2ms^{-1}$. What is the power of the engine providing tension to the cable?

A. 2 Kw

B. $3.5kW$

C. 5 kW

D. 10 kW

Answer: (4)

Watch Video Solution

43. 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 expressed in kilo watt units must be

A. 4

B. 3

C. 12

D. 6

Answer: (3)

Watch Video Solution

44. 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: (3)

Watch Video Solution

45. 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: (1)

Watch Video Solution

46. 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: (3)

Watch Video Solution

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

A. 1800

B. 180

C. 18000

D. 18

Answer: (1)

Watch Video Solution

48. A body of mass m is tied to one end of a string of length l and revolves vertically in a circular path. At the lowest point of circle, what must be the K.E. Of the body so as to complete the circle

A. 5 mgl

B. 4 mgl

C. `2.5 mgl

D. 2 mgl

Answer: (3)

Watch Video Solution

49. A mass m is revolving in a vertical circle at the end of a string of length 20 cm. By how much does the tension of the string at the lowest point exceed the tension at the top most point?

A. 2 mg

B. 4 mg

C. 6 mg

D. 8 mg

Answer: (3)

Watch Video Solution

50. 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. $m\frac{g}{2}$

D. Zero

Answer: (4)

Watch Video Solution

51. 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: (1)

Watch Video Solution

52. 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. $4.9\frac{m}{s}$

B. $9.8\frac{m}{s}$

C. $14.7\frac{m}{s}$

D. $19.6\frac{m}{s}$

Answer: (4)

Watch Video Solution

53. 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. $7\frac{m}{s}$

B. $10\frac{m}{s}$

C. $14\frac{m}{s}$

D. $20\frac{m}{s}$

Answer: (1)

Watch Video Solution

54. A very small particle rests on the top of a hemisphere of radius 20 cm. The smallest horizontal velocity to be given to it, if it is to leave the hemisphere without sliding down its surface, taking $g = 9.8ms^{-2}$

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

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

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

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

Answer: (3)

Watch Video Solution

55. Two steel balls A and B of mass 10 kg and 10 g rolls towards each other with 5 m/s and 1 m/s respectively on a smooth floor. After collision, with what speed B moves (perfectly elastic collision)?

A. $8\frac{m}{s}$

B. $10\frac{m}{s}$

C. $11\frac{m}{s}$

D. Zero

Answer: (3)

Watch Video Solution

56. Two identical balls moving in opposite direction with speed 20 m/s and 25 m/s undergo head on perfectly inelastic collision. The spped of combined mass after collision is

A. $20\frac{m}{s}$

B. $22.5\frac{m}{s}$

C. $25\frac{m}{s}$

D. $2.5\frac{m}{s}$

Answer: (4)

Watch Video Solution

57. A ball of mass 5 kg moving with speed 8 m/s collides head on with another stationary ball of mass 15 kg. If collision is perfecty inelastic, then loss in kinetic energy is

A. 160 J

B. 80 J

C. 40 J

D. 120 J

Answer: (4)

Watch Video Solution

58. A ball is dropped on a horizontal surface from height h. If it rebounds upto $\frac{h}{2}$ after first collision then coefficient of restitution between ball and surface is

A. $1\sqrt{2}$

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

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

D. $\frac{1}{2}+\sqrt{2}$

Answer: (1)

Watch Video Solution

59. 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. $0.6ms^{-1}, 24ms^{-1}$

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

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

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

Answer: (3)

Watch Video Solution

60. 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: (4)

Watch Video Solution

61. 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. $0.75ms^{-1}, \ -0.43ms^{-1}$

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

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

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

Answer: (2)

Watch Video Solution

62. 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: (4)

Watch Video Solution

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

A. 4500J

B. 7500J

C. 3000J

D. 0J

Answer: (2)

Watch Video Solution

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

A. 4500J

B. 7500J

C. 3000J

D. 0J

Answer: (2)

Watch Video Solution

65. 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. $\frac{x}{x}+zy$

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

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

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

Answer: (1)

Watch Video Solution

66. 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: (2)

Watch Video Solution

67. 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: (1)

Watch Video Solution

68. 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: (3)

Watch Video Solution

69. 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: (2)

Watch Video Solution

70. A particle falls from a height h upon a fixed horizontal plane and rebounds. If e is the coefficient of restitution, the total distance travelled before rebounding has stopped is

A. $h\frac{1+e^2}{1-e^2}$

B. $h\frac{1-e^2}{1+e^2}$

C. $\frac{h}{2}\frac{1-e^2}{1+e^2}$

D. $\frac{h}{2}\frac{1+e^2}{1-e^2}$

Answer: (1)

Watch Video Solution

EXERCISE -1 (H.W)

1. The work done by a force $\overrightarrow{F} = \left(-6x^3\hat{i}\right)$ N in displacing a particle from x = 4m to x = - 2m is

A. $360J$

B. $240J$

C. $-240J$

D. $-360J$

Answer: (1)

Watch Video Solution

2. A particle is displaced from a position $\left(2\vec{i}-\vec{j}+\vec{k}\right)$ metre to another position $\left(3\vec{i}+2\vec{j}-2\vec{k}\right)$ metre under the action of force $\left(2\vec{i}+\vec{j}-\vec{k}\right)$N. Work done by the force is

A. $8J$

B. $10J$

C. $12J$

D. $36J$

Answer: (1)

Watch Video Solution

3. A particle moves along the X-axis from x=0 to x=5 m under the influence of a force given by $F = 7 - 2x + 3x^2$. Find the work done in the process.

A. 70

B. 135

C. 270

D. 35

Answer: (2)

Watch Video Solution

4. If $\overrightarrow{F} = 2\hat{i} + 3\hat{j} + 4\hat{k}$ acts on a body and displaces it by $\overrightarrow{S} = 3\hat{i} + 2\hat{j} + 5\hat{k}$, then the work done by the force is

A. 12 J

B. 20 J

C. 32 J

D. 64 J

Answer: (3)

Watch Video Solution

5. A force of $1200N$ acting on a stone by means of a rope slides the stone through a distance of $10m$ in a direction inclined at 60° to the force. The work done by the force is

A. $6000\sqrt{J}$

B. $6000J$

C. $12000J$

D. $8000J$

Answer: (2)

Watch Video Solution

6. A man weighing $80kg$ climbs a staircase carrying a $20kg$ load. The staircase has 40 steps, each of $25cm$ height. If he takes 20 seconds to climb, the work done is

A. $9800J$

B. $490J$

C. $98X10^5 J$

D. $7840J$

Answer: (1)

Watch Video Solution

7. The work done by a force $\overrightarrow{F} = 3\hat{i} - 4\hat{j} + 5\hat{k}$ displaces the body from a point $(3, 4, 6)$ to a point $(7, 2, 5)$ is

A. 15 units

B. 25 units

C. 20 units

D. 10 units

Answer: (1)

Watch Video Solution

8. A force $\overrightarrow{F} = \left(6\hat{i} - 8\hat{j}\right)N$, acts on a particle and displaces it over $4m$ along the X-axis and $6m$ along the Y-axis. The work done during the total displacement is

A. 72 J

B. 24 J

C. $-24J$

D. Zero

Answer: (3)

Watch Video Solution

9. A lawn roller is pulled along a horizontal surface through a distance of $20m$ by a rope with a force of $200N$. If the rope makes an angle of 60° with the vertical while pulling, the amount of work done by pulling force is

A. $4000J$

B. $1000J$

C. $2000\sqrt{J}$

D. $2000J$

Answer: (3)

Watch Video Solution

10. An object is displaced from position vector $\overrightarrow{r_1} = \left(2\hat{i} + 3\hat{j}\right)m to \overrightarrow{r_2} = \left(4\hat{i} + 6\hat{j}\right)m$ under a force

$\overrightarrow{F} = \left(3x^2\hat{i} + 2y\hat{j}\right)$N. Find the work done by this force.

A. 24J

B. 33J

C. 83J

D. 45J

Answer: (3)

Watch Video Solution

11. When momentum of a body increases by 200% its KE increases by

A. 200%

B. 300%

C. 400%

D. 800%

Answer: (4)

Watch Video Solution

12. 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: (4)

Watch Video Solution

13. 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: (1)

Watch Video Solution

14. A shot is fired at 30° with the vertical from a point on the ground with kinetic energy K. If air resistance is ignored, the kinetic energy at the top of the trajectory is

A. $3\frac{K}{4}$

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

C. K

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

Answer: (4)

Watch Video Solution

15. A body starts from rest and is acted on by a constant force. The ratio of kinetic energy gained by it in the first five seconds to that gained in the next five seconds is

A. $2:1$

B. $1:1$

C. $3:1$

D. $1:3$

Answer: (4)

Watch Video Solution

16. The mass of a simple pendulum bob is 100 gm. The length of the pendulum is 1 m. The bob is drawn aside from the equilibrium position so that the string makes an angle of 60° with the vertical and let go. The kinetic energy of the bob while crossing its equilibrium position will be

A. $0.49J$

B. $0.94J$

C. $1J$

D. $1.2J$

Answer: (1)

Watch Video Solution

17. A body starts from rest and moves with uniform acceleration. What is the ratio of kinetic energies at the end of $1st$, $2nd$ and $3rd$ seconds of its journey ?

A. $1:8:27$

B. $1:2:3$

C. $1:4:9$

D. $3:2:1$

Answer: (3)

Watch Video Solution

18. A liquid of specific gravity 0.8 is flowing in a pipe line with a speed of $2m/s$. The $K.E$ per cubic meter of it is

A. $160J$

B. $1600J$

C. $160.5J$

D. $1.6J$

Answer: (2)

Watch Video Solution

19. A $60kg$ boy lying on a surface of negligible friction throws horizontally a stone of mass $1kg$ with a speed of $12m/s$ away from him. As a result with what kinetic energy he moves back ?

A. $2.4J$

B. $72J$

C. $1.2J$

D. $36J$

Answer: (3)

Watch Video Solution

20. Two stones of masses m and $2m$ are projected vertically upwards so as to reach the same height. The ratio of the kinetic energies of their projection is

A. $2:1$

B. $1:2$

C. $4:1$

D. $1:4$

Answer: (2)

Watch Video Solution

21. A neutron, one of the constituents of a nucleus, is found to pass two points 60 metres apart in a time interval of 1.8×10^{-4} sec. The mass of the neutron is $1.67 \times 10^{-27} kg$. Assuming that the speed is constant, its kinetic energy is

A. $9.3 \times 10^{-17} jo\underline{e}$

B. $9.3 \times 10^{-14} jo\underline{e}$

C. $9.3 \times 10^{-21} jo\underline{e}$

D. $9.3 \times 10^{-11} jo\underline{e}$

Answer: (1)

Watch Video Solution

22. A tank of size $10m \times 10m \times 10m$ is full of water and built on the ground. If $g = 10ms^{-2}$, the potential energy of the water in the tank is

A. $5 \times 10^7 J$

B. $1 \times 10^8 J$

C. $5 \times 10^4 J$

D. $5 \times 10^5 J$

Answer: (1)

Watch Video Solution

23. A bob of mass 0.3 kg falls from the ceiling of an elevator moving down with a uniform speed of $7ms^{-1}$. If hits the floor of the elevator (length of the elevator $=$ 3m) and does not rebound. What is the heat produced by the impact ? Would your answer be different if the elevator were stationary ?

A. $8.82J$

B. $7.72J$

C. $6.62J$

D. $5.52J$

Answer: (1)

Watch Video Solution

24. A spring of force constant K is cut in two parts at its one third length. When both the parts are stretched by same amount, the work done in the two parts, will be : $-$

A. equal in both

B. greater for the longer part

C. greater for the shorter part

D. data insufficient

Answer: (3)

Watch Video Solution

25. A spring when compressed by $4cm$ has $2J$ energy stored in it. The force requried to extend it by $8cm$ will be

A. 20 N

B. 2 N

C. 200 N

D. 2000 N

Answer: (3)

Watch Video Solution

26. The elastic potential enegry of a stretched spring is given by $E = 50x^2$. Where x is the displacement in meter and and E is in joule, then the force constant of the spring is

A. 50Nm

B. $100Nm^{-1}$

C. $100\frac{N}{m^2}$

D. $100Nm$

Answer: (2)

Watch Video Solution

27. A body of mass $2kg$ is projected with an initial velocity of $5ms^{-1}$ along a rough horizontal table. The work done on the body by the frictional forces before it is brought to rest is

A. $250J$

B. $25J$

C. $-250J$

D. $-25J$

Answer: (4)

Watch Video Solution

28. 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. $\frac{3}{10}m$

B. $\frac{5}{3}m$

C. $4m$

D. $16m$

Answer: (1)

Watch Video Solution

29. By applying the brakes without causing skid, the driver of a car is able to stop his car with in a distance of $5m$, if it is going at $36kmph$. If the car were going at $72kmph$. Using the same brakes, he can stop the car over a distance of

A. 10 m

B. $2.5m$

C. 20 m

D. 40 m

Answer: (3)

Watch Video Solution

30. A bullet fired into a trunk of a tree loses $1/4$ of its kinetic energy in travelling a distance of 5 cm`. Before stopping it travels s further distance of

A. 150 cm

B. $1.5cm$

C. $1.25cm$

D. 15 cm

Answer: (4)

Watch Video Solution

31. A cradle is 'h' meters above the ground at the lowest position and 'H' meters when it is at the highest point. If 'v' is the maximum speed of the swing of total mass 'm' the relation between 'h' and 'H' is

A. $\frac{1}{2}mv^2 + h = H$

B. $\left(\frac{v^2}{2}g\right) + h = H$

C. $\left(\frac{v^2}{g}\right) + 2h = H$

D. $\left(\frac{v^2}{2}g\right) + H = h$

Answer: (2)

Watch Video Solution

32. A stone of mass "m" initially at rest and dropped from a height "h" strikes the surface of the earth with a velocity "v". If the gravitational force acting on the stone is W, then which of the following identities is correct ?

A. $mv - mh = 0$

B. $\frac{1}{2}mv^2 - Wh^2 = 0$

C. $\frac{1}{2}mv^2 - Wh = 0$

D. $\frac{1}{2}mv^2 - mh = 0$

Answer: (3)

Watch Video Solution

33. A particle moves with the velocity $\overrightarrow{v} = \left(5\overrightarrow{i} + 2\overrightarrow{j} - \overrightarrow{k}\right)ms^{-1}$ under the influence of a constant force, $\overrightarrow{F} = \left(2\overrightarrow{i} + 5\overrightarrow{j} - 10\overrightarrow{k}\right)N.$ The instantaneous power applied is

A. 5 W

B. `10 W

C. 20 W

D. 30 W

Answer: (4)

Watch Video Solution

34. A motor boat is going in a river with a velocity $\overrightarrow{V} = \left(4\hat{i} - 2\hat{j} + \hat{k}\right)ms^{-1}$. If the resisting force due to stream is $\overrightarrow{F} = \left(5\hat{i} - 10\hat{j} + 6\hat{k}\right)N$, then the power of the motor boat is

A. 100 W

B. 50 W

C. 46 W

D. 23 W

Answer: (3)

Watch Video Solution

35. Two riffles fire the same number of bullets in a givem interval of time. The second fires bullets of mass twice that fired by the first and with a velocity that is half that of the first. The ratio of their powers is

A. $1:4$

B. $4:1$

C. $1:2$

D. $2:1$

Answer: (4)

Watch Video Solution

36. A car weighing $1000kg$ is going up an incline with a slope of 2 in 25 at a steady speed of $18kmph$. If $g = 10ms^{-2}$, the power of its engine is

A. 4 kW

B. 50 kW

C. 625 kW

D. 25 kW

Answer: (1)

Watch Video Solution

37. A crane can lift up $10,000kg$ of coal in 1 hour form a mine of $180m$ depth. If the efficiency of the crane is 80%, its input power must be $(g = 10ms^{-2})$.

A. 5 kW

B. 8.3 kW

C. 50 kW

D. 62.5 kW

Answer: (2)

Watch Video Solution

38. A man carries a load of $50kg$ through a height of $40m$ in 25 seconds. If the power of the man is $1568W$, his mass is

A. 5 kg

B. 1000 kg

C. 200 kg

D. 50 kg

Answer: (4)

Watch Video Solution

39. An electric motor creates a tension of 4500 newton in a hoisting cable and reels it at the rate of $2m/s$. What is the power of the motor ?

A. 15 kW

B. 9 kW

C. 225 W

D. 9000 kW

Answer: (2)

Watch Video Solution

40. A juggler throws continuously balls at the rate of three in each second, each with a velocity of $10ms^{-1}$. If the mass of each ball is $0.05kg$ his power is

A. 2 W

B. 50 W

C. $0.5W$

D. $7.5W$

Answer: (4)

Watch Video Solution

41. A bucket tied at the end of a $1.6m$ long string is whirled in a verticle circle with constant speed. What should be the minimum speed so that the water from the bucket does not spill, when the bucket is at the highest position $\left(Take g = 10m/s^2\right)$

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

B. $6.25\frac{m}{\sec}$

C. $16\frac{m}{\sec}$

D. $8.9\frac{m}{\sec}$

Answer: (4)

Watch Video Solution

42. A body of mass $2kg$ attached at one end of light string rotated along a vertical circle of radius $2m$. If the string can withstand a maximum tension of $140.6N$, the maximum speed with which the stone can be rotated is

A. $22\frac{m}{s}$

B. $44\frac{m}{s}$

C. $33\frac{m}{s}$

D. $11\frac{m}{s}$

Answer: (4)

Watch Video Solution

43. A pilot of mass m can bear a maximum apparent weight 7 times of mg. The aeroplane is moving in a vertical circle. If the velocity of aeroplane is $210m/s$ while diving up from the lowest point of vertical circle, then the minimum radius of vertical circle should be

A. 375 m

B. 420 m

C. 750 m

D. 840 m

Answer: (3)

Watch Video Solution

44. The length of ballistic pendulum is $1m$ and mass of its block is $0.98kg$. A bullet of mass 20 gram strikes the block along horizontal direction and gets embedded in the block. If block + bullet completes vertical circle of radius $1m$, then the striking velocity of bullet is

A. $280\frac{m}{s}$

B. $350\frac{m}{s}$

C. $420\frac{m}{s}$

D. $490\frac{m}{s}$

Answer: (2)

Watch Video Solution

45. A simple pendulum is oscillating with an angular amplitude 60°. If mass of bob is 50 gram, then the tension in the string at mean position is $(g = 10ms^{-2})$

A. $0.5N$

B. $1N$

C. $1.5N$

D. $2N$

Answer: (2)

Watch Video Solution

46. A body is moving in a vertical circle such that the velocities of body at different points are critical. The ration of velocities of body at angular displacements 60° and 120° from lowest point is

A. $\sqrt{5}:\sqrt{2}$

B. $\sqrt{3}:\sqrt{2}$

C. $\sqrt{3}:1$

D. $\sqrt{2}:1$

Answer: (4)

Watch Video Solution

47. A ball of mass $0.6kg$ attached to a light inextensible string rotates in a vertical circle of radius $0.75m$ such that it has speed of $5ms^{-1}$ when the string is horizontal. Tension in the string when it is horizontal on other side is $\left(g = 10ms^{-2}\right)$.

A. 30N

B. 26N

C. 20N

D. 6N

Answer: (3)

Watch Video Solution

48. Two particles of same mass m moving with velocities u_1 and u_2 collide perfectly inelastically. The loss of energy would be :

A. $\frac{1}{2}m(u_1 - u_2)^2$

B. $\frac{1}{4}m(u_1 - u_2)^2$

C. $m(u_1 - u_2)^2$

D. $2m(u_1 - u_2)^2$

Answer: (2)

Watch Video Solution

49. A ball impinges directly on a similar ball at rest. If $\frac{1}{4^{th}}$ of the kinetic energy is lost by the impact, the value of coefficient of restitution is:-

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

B. $\frac{1}{\sqrt{3}}$

C. $\frac{1}{\sqrt{2}}$

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

Answer: (3)

Watch Video Solution

50. n bullets per sec each of mass m moving with velocity v strike normally on a wall. The collision is elastic then force on wall is-

A. zero

B. mnv

C. 2 mnv

D. 4 mnv

Answer: (3)

Watch Video Solution

51. A heavy nucleus at rest breaks into two fragments which fly off with velocities in the ratio $8 : 1$. The ratio of radii of the fragments is.

A. $1 : 2$

B. $1 : 4$

C. $4:1$

D. $2:1$

Answer: (1)

Watch Video Solution

52. A $6kg$ mass travelling at $2.5ms^{-1}$ collides head on with a stationary $4kg$ mass. After the collision the $6kg$ mass travels in its original direction with a speed of $1ms^{-1}$. The final velocity of $4kg$ mass is

A. $1ms^{-1}$

B. $2.25ms^{-1}$

C. $2ms^{-1}$

D. $0ms^{-1}$

Answer: (2)

Watch Video Solution

53. A body of mass $10kg$ moving with a velocity of $5ms^{-1}$ hits a body of $1gm$ at rest. The velocity of the second body after collision. Assuming it to be perfectly elastic is

A. $10ms^{-1}$

B. $5ms^{-1}$

C. $15ms^{-1}$

D. $0.10ms^{-1}$

Answer: (1)

Watch Video Solution

54. A block of mass $1kg$ moving with a speed of $4ms^{-1}$, collides with another block of mass $2kg$ which is at rest. The lighter block comes to rest after collision. The loss in KE of the system is

A. $8J$

B. 4×10^{-7} J

C. $4J$

D. $0J$

Answer: (3)

Watch Video Solution

55. A marble going at a speed of $2ms^{-1}$ hits another marble of equal mass at rest. If the collision is perfectly elastic, then the velocity of the first marble after collision is

A. $4ms^{-1}$

B. $0ms^{-1}$

C. $2ms^{-1}$

D. $3ms^{-1}$

Answer: (2)

Watch Video Solution

56. A massive ball moving with speed v collieds with a tiny ball which is intially at rest having a mass very much smaller than the mass of the first ball. The collision is elastic, then immediately after the impact, the second ball will move with a speed approximately equal to :-

A. v

B. $2v$

C. $\frac{v}{3}$

D. infinite

Answer: (2)

Watch Video Solution

57. A $1kg$ ball moving at $12m/s$ collides head on with a $2g$ ball moving in the opposite direction at $24m/s$. The velocity of each ball after the impact, if the coefficient of restitution is $2/3$ is

A. $-28\frac{m}{s}, \ -4\frac{m}{s}$

B. $28\frac{m}{s}, \ -4\frac{m}{s}$

C. $20\frac{m}{s}, 24\frac{m}{s}$

D. $-20\frac{m}{s}, \ -4\frac{m}{s}$

Answer: (1)

Watch Video Solution

58. A $6kg$ mass collides with a body at rest. After the collision, they travel together with a velocity one third the velocity of $6kg$ mass. The mass of the second body is

A. 6 kg

B. 3 kg

C. 12 kg

D. 18 kg

Answer: (3)

Watch Video Solution

59. A body of mass m moving at a constant velocity v hits another body of the same mass moving with a velocity $v/2$ but in the opposite direction and sticks to it. The common velocity after collision is

A. v

B. $\frac{v}{4}$

C. $2v$

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

Answer: (2)

Watch Video Solution

60. An $8gm$ bullet is fired horizontally into a $9kg$ block of wood and sticks in it. The block which is free to move, has a velocity of $40cm/s$ after impact. The initial velocity of the bullet is

A. $450\frac{m}{s}$

B. $450c\frac{m}{s}$

C. $220\frac{m}{s}$

D. $220cm.\ s$

Answer: (1)

Watch Video Solution

EXERCISE -II (C.W)

1. A particle is moved from (0, 0) to (a, a) under a force a $F = \left(3\hat{i} + 4\hat{j}\right)$ from two paths. Path 1 is OP and path 2 is OPQ. Let W_1 and W_2 be the work done by this force in these two paths. Then,

A. $W_1 = W_2$

B. $W_1 = 2W_2$

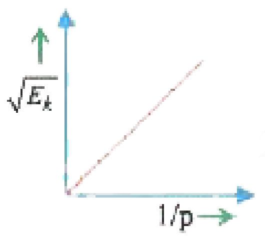
C. $W_2 = 2W_1$

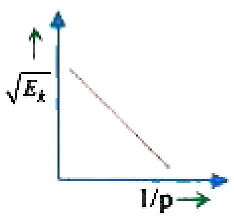
D. $W_1 = 4W_2$

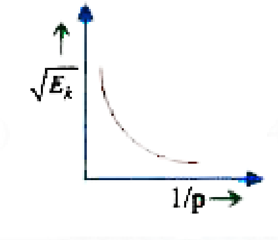
Answer: (1)

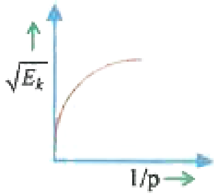
Watch Video Solution

2. The graph betwee $\sqrt{E}$ and $\frac{1}{p}$ is (E=kinetic energy and p= momentum)

A. 

B. 

C. 

D. 

Answer: (3)

Watch Video Solution

3. A body of mass $3kg$ is under a constant force which causes a displacement s metre in it, given by the relation $s = \frac{1}{3}t^2$, where t is in seconds. Work done by the force in 2 seconds is

A. $\frac{3}{8}J$

B. $\frac{8}{3}J$

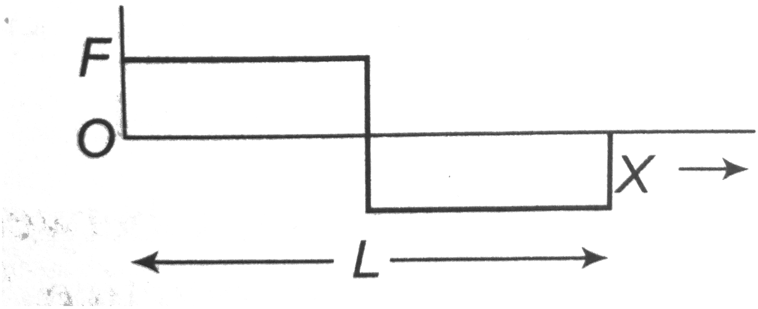
C. $\frac{19}{5}J$

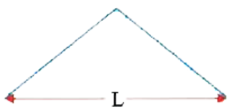
D. $\frac{5}{19}J$

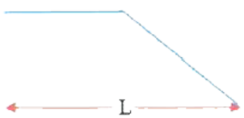
Answer: (2)

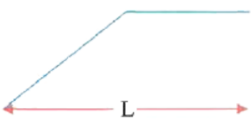
Watch Video Solution

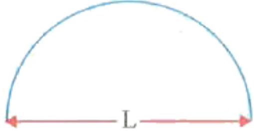
4. A person used force (F) , shown in figure to move a load with constant velocity on given surface. Identify the correct surface profile:



A. 

B. 

C. 

D. 

Answer: (1)

Watch Video Solution

5. 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: (3)

Watch Video Solution

6. 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. $14 \times 10^4 J$

B. $1.5 \times 10^4 J$

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

D. $18J$

Answer: (1)

Watch Video Solution

7. 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. $-75\sqrt{J}$

C. $321.4J$

D. $-321.4J$

Answer: (2)

Watch Video Solution

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

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

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

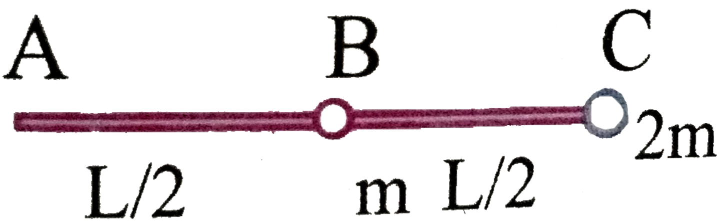
C. $\mu \frac{g(L-l)^2}{2} L^2$

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

Answer: (1)

Watch Video Solution

9. A long rod ABC of mass "m" and length "L" has two particles of masses "m" and "2m" attached to it as shown in the figure. The system is initially in the horizontal position. The work to be done to keep it vertical with A hinged at the bottom is



A. 2mgL

B. 3mgL/2

C. 5mgL/2

D. 3mgL

Answer: (4)

Watch Video Solution

10. A particle of mass $0.5kg$ travels in a straight line with velocity $v = ax^{3/2}$ where $a = 5m^{-1/2}s^{-1}$. What is the work done by the net force during its displacement from $x = 0$ to $x = 2m$?

A. 50 J

B. 20 J

C. 80 J

D. 45.5 J

Answer: (1)

Watch Video Solution

11. A block of mass M is kept on a platform which starts accelerating upwards from rest with a constant acceleration a. During the time interval T, the work done by contact froce on mass M is

$(\#\#NAR_N \exists T_P HY_X I_P 2_C 06_E 09_{011} \_ Q01\#\#)$

A. $\frac{1}{2}Ma^2T^2$

B. zero kinetic energy and finite momentum

C. $\frac{1}{2}M(g+a)^2T^2$

D. $\frac{1}{2}M(g-a)^2T^2$

Answer: (3)

Watch Video Solution

12. In the figure shown all the surfaces are frictionless, and mass of the block 'm' is 1 kg. The block and wedge are held initially at rest. Now wedge is given a horizontal acceleration of $5\frac{m}{s^2}$ by applying a force on the wedge, so that the block does not slip on the wedge. Then work done by the normal force in ground frame on the block in 2 sec is :

` (##NAR_NEET_PHY_XI_P2_C06_E09_012_Q01.png" width="80%">

A. 30 J

B. 50 J

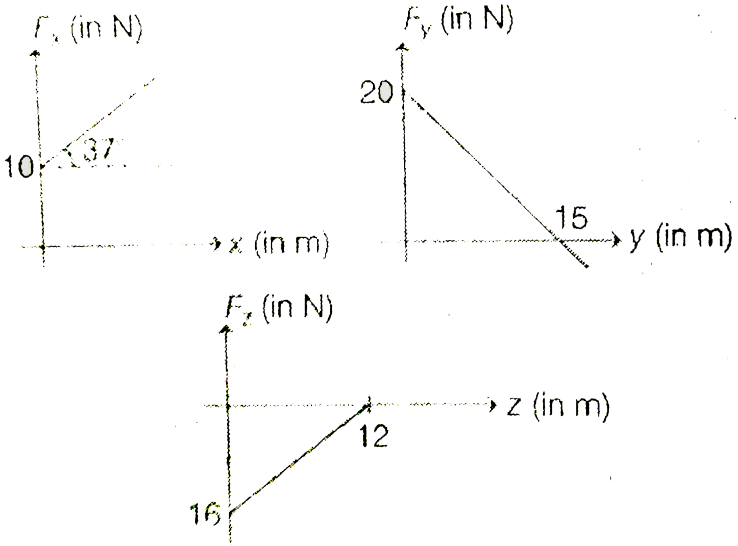
C. 100 J

D. 150 J

Answer: (2)

Watch Video Solution

13. Three components of a force acting on a particle are varying according to the graphs as shown. To reach at point B(8, 20, 0)m from point A(0, 5, 12)m the particle moves on paths parallel to x-axis then y-axis and then z-axis, then work done by this force is:



A. 192 J

B. 58 J

C. 250 J

D. 125 J

Answer: (3)

Watch Video Solution

14. A force $\overrightarrow{F} = \left(3\overrightarrow{i} + 4\overrightarrow{j}\right)N$, acts on a particle moving in x-y plane. Starting from origin, the particle first goes along x-axis to thepoint (4,0)m and then parallel to the y -axis to the point(4, 3)m. The total work done by the force on the particle is

` (##NAR_NEET_PHY_XI_P2_C06_E09_014_Q01.png" width="80%">

A. $+12J$

B. $-6J$

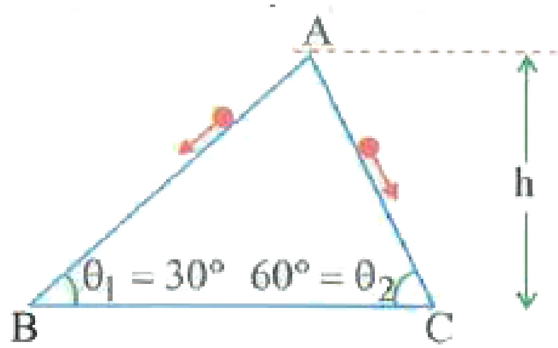
C. $+24J$

D. $-12J$

Answer: (3)

Watch Video Solution

15. Two inclined frictionless tracks, one gradual and other steep meet at 'A' from where two stones are allowed to slide down from rest, one on each track as shown in figure. The speed of two stones on reaching at bottom are v_1 and v_2 respectively. $v_1 \& v_2$ are related as



A. $v_1 > v_2$

B. $v_1 < v_2$

C. $v_1 = v_2$

D. data insufficient

Answer: (3)

Watch Video Solution

16. Two spheres of same material are moving with kinetic energies in the ratio $108:576$. If the ratio of their velocities is $2:3$, then the ratio of their radii is

A. $1:1$

B. $2:3$

C. $3:4$

D. $4:3$

Answer: (3)

Watch Video Solution

17. 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: (1)

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

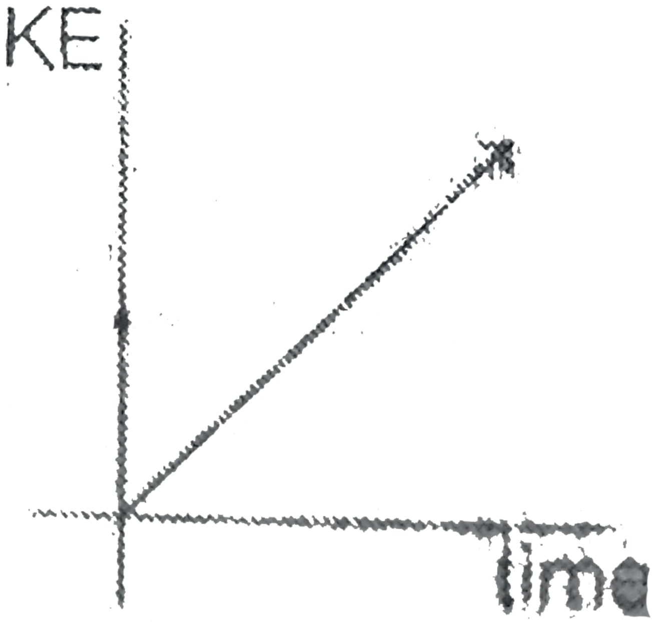
D. 2

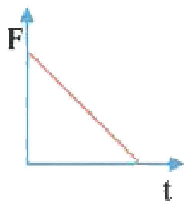
Answer: (3)

Watch Video Solution

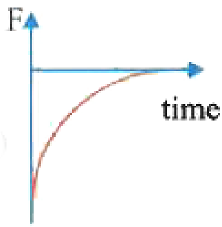
19. The kinetic energy (KE) versus time graph for a particle moving along a straight line is as shown in the figure. The force versus time graph for the

particle may be

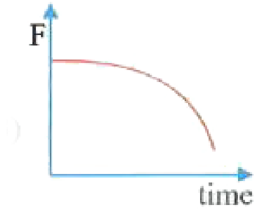


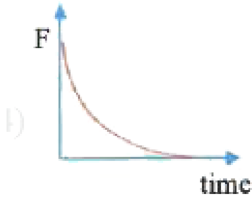


A.



B.

C. 

D. 

Answer: (4)

Watch Video Solution

20. A uniform chain of length 2 m is kept on a table such that a length of 60 cm hangs freely from the edge of the table. The total mass of the chain is 4 kg. What is the work done in pulling the entire chain on the table?

A. $7.2J$

B. $3.6J$

C. $120J$

D. $1200J$

Answer: (2)

Watch Video Solution

21. The potential energy of a body mass m is $U = ax + by$ the magnitude of acceleration of the body will be-

A. $\frac{(a^2 + b^2)^{\frac{1}{2}}}{m}$

B. $a^2 + \frac{b^2}{m}$

C. $(a + b)^{\frac{1}{2}}$/m`

D. $a + \frac{b}{m}$

Answer: (1)

Watch Video Solution

22. A block of mass M is hanging over a smooth and light pulley through a light string. The other end of the string is pulled by a constant force F. The kinetic energy of the block increases by 20 J in 1 s:-

A. The tension in the string is Mg.

B. The tension in the string is F

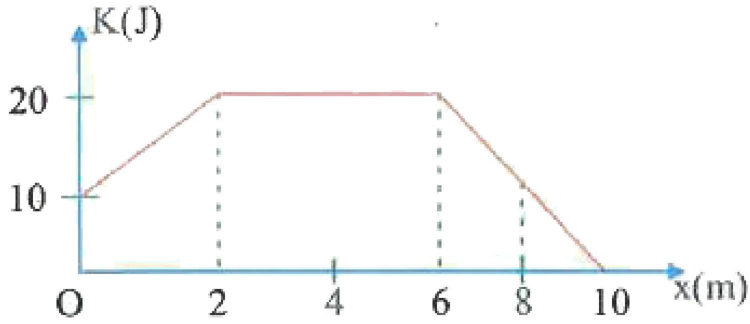
C. The work done by the tension on the block is 20 J in the above 1 s.

D. The work done by the force of gravity is 20J in the above 1 s.

Answer: (2)

Watch Video Solution

23. The kinetic energy K of a particle moving along x - axis varies its position (x) as shown in figure.



The magnitude of force acting on particle at x = 9m is

A. zero

B. 5 N

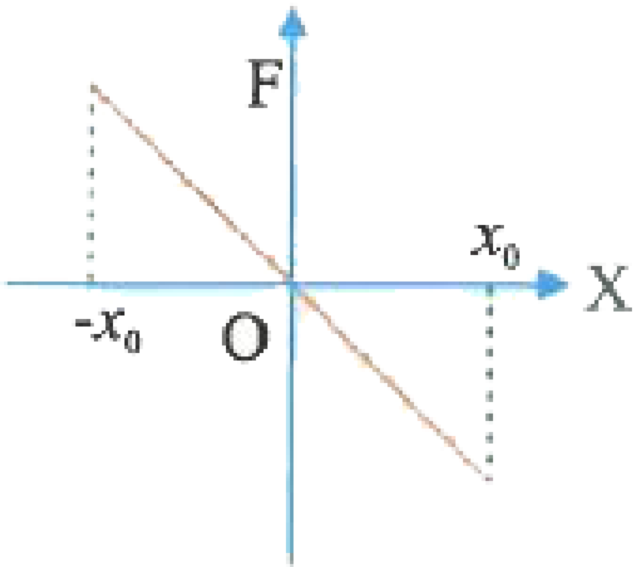
C. 20 N

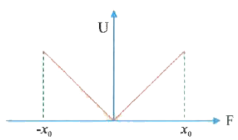
D. $7.5N$

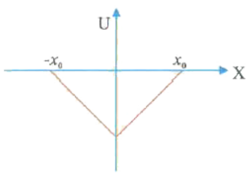
Answer: (2)

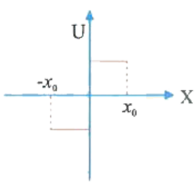
Watch Video Solution

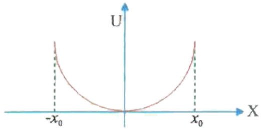
24. Figure given below shows the plot of the conservative force F, in a unidimensional field. The plot representing the function corresponding to the potential energy (U) in the field is :



A. 

B. 

C. 

D. 

Answer: (4)

Watch Video Solution

25. Match the following

Column I

(A) Example of conservative force

(B) Potential energy defined for only

(C) If two spring are stretched by same force, then ratio of their potential

(D) Change in kinetic energy is equal

A. $A - q, B - p, C - s, D - r$

B. $A - r, B - q, C - p, D - s$

C. $A - r, B - s, C - q, D - p$

D. $A - q, B - r, C - s, D - p$

Answer: (3)

Watch Video Solution

Watch Video Solution

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

A. $0.1J$

B. $0.2J$

C. $0.05J$

D. $0.4J$

Answer: (3)

Watch Video Solution

27. A block of mass m moving at a speed v compresses as spring thrugh a distance x before its speed is halved. Find the spring constant of the spring.

A. $3m\frac{v^2}{4}x^2$

B. $m\frac{v^2}{4}x^2$

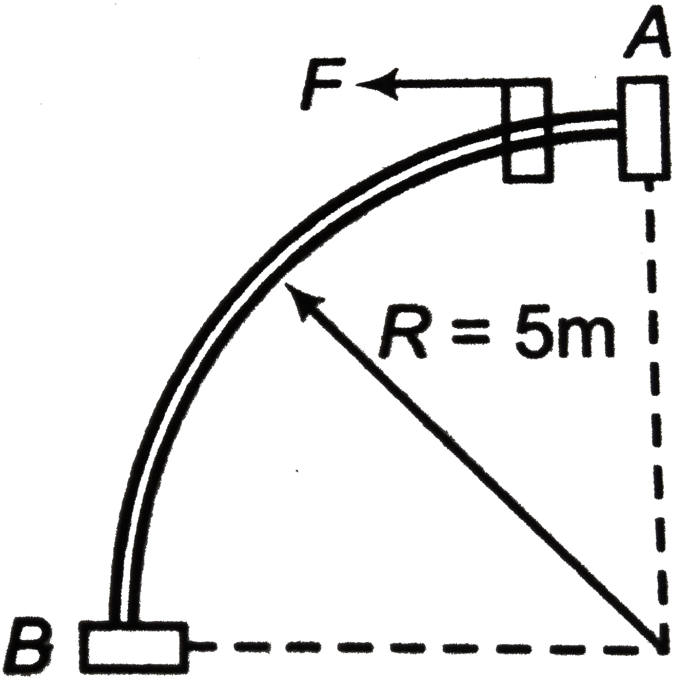
C. $m\frac{v^2}{2}x^2$

D. $2m\frac{v^2}{x^2}$

Answer: (1)

Watch Video Solution

28. A bead of mass $\frac{1}{2}kg$ starts from rest from A to move in a vertical place along a smooth fixed quarter ring of radius $5m$, under the action of a constant horizontal force $f = 5N$ as shown. The speed of bead as it reaches the point (B) is [Take $g = 10 ms^{-2}$]



A. $14.14 \frac{m}{s}$

B. $7.07 \frac{m}{s}$

C. $5 \frac{m}{s}$

D. $25 \frac{m}{s}$

Answer: (1)

Watch Video Solution

29. An outfielder throws a cricket ball with an initial kinetic energy of $800J$ and an infielder catches the ball when its kinetic energy is $600J$. If the path of the ball between them is assumed straight and is $20m$ long, the air resistance acting on the ball is

A. $26.6N$

B. $1.33N$

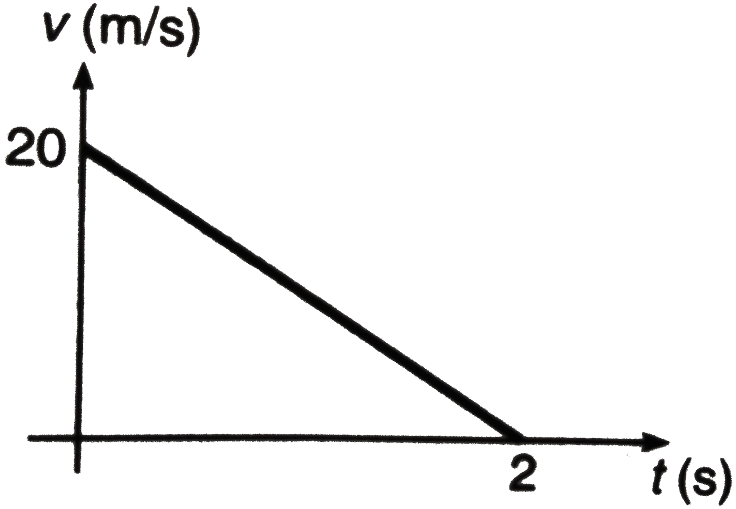
C. $100N$

D. $10N$

Answer: (4)

Watch Video Solution

30. 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. $-400J$

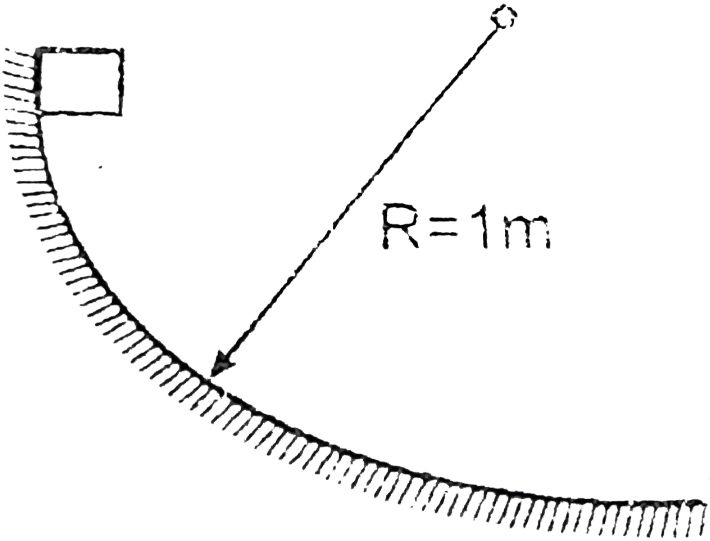
C. $-200J$

D. $200J$

Answer: (2)

Watch Video Solution

31. A block of mass 1 kg slides down a vertical curved track that is one quadrant of a circle of radius 1m. Its speed ast the the bottom si $2m/s$. The work done by frictional force is :



A. $8J$

B. $-8J$

C. $4J$

D. $-4J$

Answer: (2)

Watch Video Solution

32. 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. $2A\frac{a^3}{3}$

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

C. $2A\frac{a^3}{3} + B\frac{a^2}{2} + ca$

D. $2A\frac{a^3}{3} + B\frac{a^2}{2}$

Answer: (2)

Watch Video Solution

33. A block of mass $m = 1kg$ moving on a horizontal surface with speed $v_i = 2ms^{-1}$ enters a rough patch ranging from $x0.10m \rightarrow x = 2.01m$. The retarding force F_r on the block in this range ins inversely proportional to x over this range

$$F_r = -\frac{k}{x} for 0.1 < x < 2.01m$$

$= 0$ for $< 0.1m$ and $x > 2.01m$ where $k = 0.5J$. What is the final K.E. and speed v_f of the block as it crosses the patch?

A. $2m^{-1}$

B. $1m^{-1}$

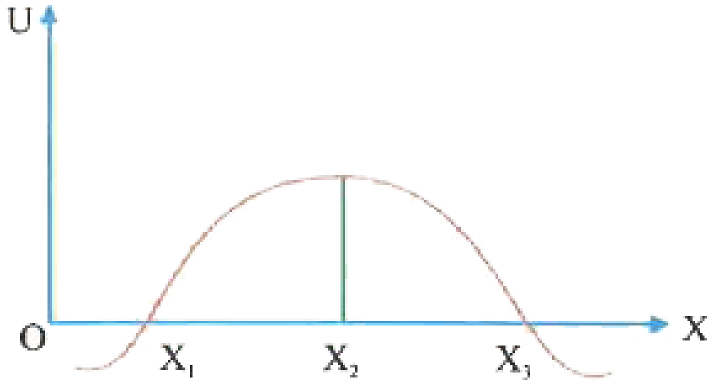
C. $3m^{-1}$

D. $0.5m^{-1}$

Answer: (2)

Watch Video Solution

34. In the fig. The potential energy U of a particle plotted against its position x from origin. Which of the following statement is correct



A. at x_1 particle is in stable equilivrium

B. at x_2 particle is in stable equilibrium

C. at x_3 particle is in stable equilibrium

D. at x_1, x_2 and x_3 particle is in unstable equilibrium

Answer: (4)

Watch Video Solution

35. If $F = 2x^2 - 3x - 2$, then choose correct option:-

A. $x = -\frac{1}{2}$ is position of stable equilibrium

B. $x = 2$ is position of stable equilibrium

C. $x = -\frac{1}{2}$ is position of unstable equilibrium

D. $x = 2$ is position of neutral equilibrium

Answer: (3)

Watch Video Solution

36. The potential energy of a 1kg particle free to move along the x-axis is given by $V(x) = \left(\frac{x^4}{4} - \frac{x^2}{2}\right)J$ The total mechanical energy of the particle is 2J then the maximum speed $(\in m/s)$ is

A. $\sqrt{2}$

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

C. 2

D. $\frac{3}{\sqrt{2}}$

Answer: (4)

Watch Video Solution

37. A particle located in one dimensional potential field has potential energy function$U(x) = \frac{a}{x^2} - \frac{b}{x^3}$, where a and b are positive constants. The position of equilibrium corresponds to x equal to

A. $\frac{3a}{2b}$

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

C. $\frac{2a}{3b}$

D. $\frac{3b}{2a}$

Answer: (4)

Watch Video Solution

38. A block of mass 30.0 kg is being brought down by a chain. If the block acquires as speed of 40.0cm/s` in dropping down 2.00 m ,find the work done by the chain during the process.

A. 586 J

B. 590 J

C. 596 J

D. 582 J

Answer: (1)

Watch Video Solution

39. A body of mass 2 kg is thrown vertically upwards with K.E of 245 J. The acceleration due to gravity is $9.8ms^{-2}$. The K.E. Of the body will become half at the height of

A. 25 m

B. $12.5m$

C. $6.25m$

D. $5m$

Answer: (3)

Watch Video Solution

40. 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. 70 m

B. 130 m

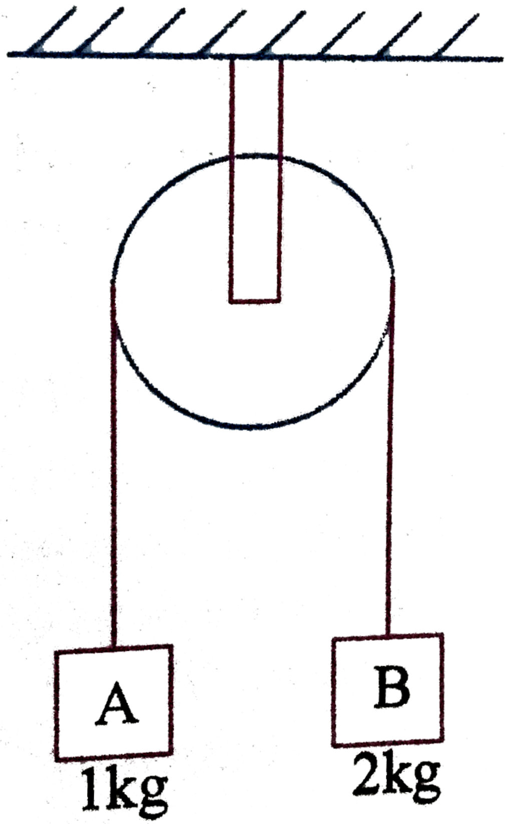
C. 180 m

D. 230 m

Answer: (2)

Watch Video Solution

41. In the arrangement shown in figure, string is light and inextensible and friction is absent every where. The speed of both blocks after the block $'A'$ has ascend a height of $1m$ will be $(g = 10m/s^2)$



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

B. $2.58\frac{m}{s}$

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

D. $3.58 \frac{m}{s}$

Answer: (2)

Watch Video Solution

42. The bob of a pendulum is released from a horizontal position. If the length of the pendulum is 1.5m, what is the speed with which the bob arrive at the lower most point, given that, it dissipated 5% of its initial energy against air resistance?

A. 3.14

B. 5.28

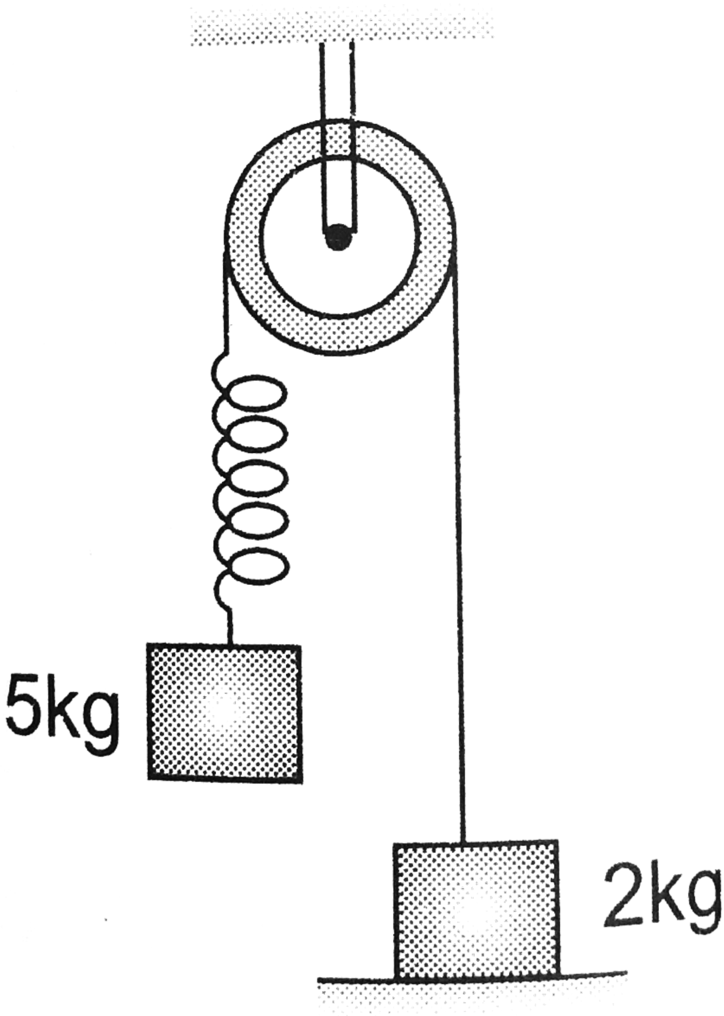
C. 1.54

D. 8.26

Answer: (2)

Watch Video Solution

43. System shown in figure is released from rest . Pulley and spring is mass less and friction is absent everywhere. The speed of $5kg$ block when $2kg$ block leaves the constant of with ground is (force constant of spring $k = 40N/m$ and $g = 10m/s^2$)



A. $\sqrt{2}\frac{m}{s}$

B. $2\sqrt{2}\frac{m}{s}$

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

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

Answer: (2)

Watch Video Solution

44. The potential energy of a particle of mass m is given by $U = \frac{1}{2}kx^2$ for $x < 0$ and $U = 0$ for $x \geq 0$. If total mechanical energy of the particle is E. Then its speed at $x = \sqrt{\frac{2E}{k}}$ is

A. zero

B. $\sqrt{2}\frac{E}{m}$

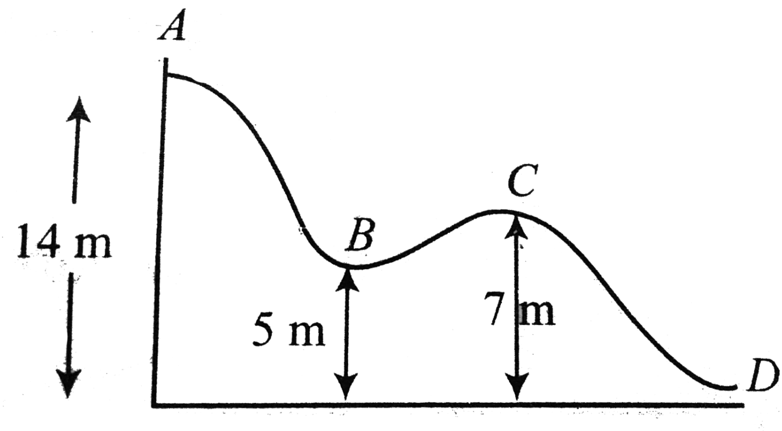
C. $\frac{\sqrt{E}}{m}$

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

Answer: (2)

Watch Video Solution

45. Figure shows the vertical section of a frictionless surface. A block of mass $2kg$ is released from rest from position A, its KE as it reaches position C is $(g = 10ms^{-2})$



A. $180J$

B. $140J$

C. $40J$

D. $280J$

Answer: (2)

Watch Video Solution

46. A body of mass m falls from a height h and collides with another body of same mass at rest. After collision, the two bodies combine and move through distance (d) till they come to rest. Find the work done against the resistive force.

A. $\frac{1}{2}mg(h+2d)$

B. $\frac{1}{2}mg(h+4d)$

C. $\frac{1}{2}mg(h-d)$

D. $\frac{1}{2}mg(h-2d)$

Answer: (2)

Watch Video Solution

47. Power supplied to a particle of mass 4 kg varies with time as $P = \frac{3t^2}{2}$ watt. Here t in second. If velocity of particle at t = 0 is v = 0, the velocity of particle at time t = 2s will be

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

B. $4\frac{m}{s}$

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

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

Answer: (3)

Watch Video Solution

48. A particle of mass m is moving in a circular path of constant radius r such that its centripetal acceleration a_c is varying with time t as $a_c = k^2rt^2$, where k is a constant. The power delivered to the particle by the forces acting on it is :

A. zero

B. $mk^2r^2t^2$

C. mk^2r^2t

D. mk^2rt

Answer: (3)

Watch Video Solution

49. A constant power P is applied to a particle of mass m. The distance traveled by the particle when its velocity increases from v_1 to v_2 is (neglect friction):

A. $3\frac{P}{m}\left(v_2^2 - v_1^2\right)$

B. $\frac{m}{3}P(v_2 - v_1)$

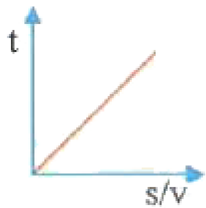
C. $\frac{m}{3}P\left(v_2^3 - v_1^3\right)$

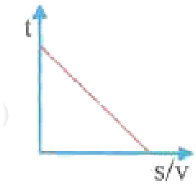
D. $\frac{m}{3}P\left(v_2^2 - v_1^2\right)$

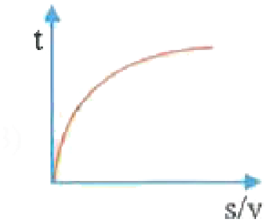
Answer: (3)

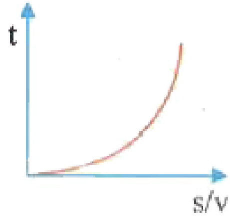
Watch Video Solution

50. A body is moved from rest along a straight line by a machine delivering constant power. The ratio of displacement and velocity (s/v) varies with time t as

A. 

B. 

C. 

D. 

Answer: (1)

Watch Video Solution

51. Power applied to a particle varices with time as $P = \left(3t^2 - 2t + 1\right)$ watt, where t is in second. Find the change in its kinetic energy between time $t = 2s$ and $t = 4s$.

A. 32J

B. 46J

C. 61J

D. 100J

Answer: (2)

Watch Video Solution

Watch Video Solution

52. A car of mass M accelerates starting from rest. Velocity of the car is given by $v = \left(\frac{2Pt}{M}\right)^{\frac{1}{2}}$ where P is the constant power supplied by the engine. The position of car as a function of time is given as

A. $\left(8\frac{P}{9}M\right)^{\frac{1}{2}} t^{\frac{3}{2}}$

B. $\left(9\frac{P}{8}M\right)^{\frac{1}{2}} t^{\frac{3}{2}}$

C. $\left(8\frac{P}{9}M\right)^{\frac{1}{2}} t^{\frac{2}{3}}$

D. $\left(9\frac{P}{8}M\right) t^{3}$

Answer: (1)

Watch Video Solution

53. Power supplied to a particle of mass 4 kg varies with time as $P = \frac{3t^2}{2}$ watt. Here t in second. If velocity of particle at t = 0 is v = 0, the velocity of particle at time t = 2s will be

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

B. $4\frac{m}{s}$

C. $1\frac{m}{s}$

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

Answer: (3)

Watch Video Solution

54. A particle is moving along x-axis under the action of a force F, which varies with its position $(x) as f \propto \frac{1}{\sqrt{x}}$. Find the variation of power due to this force with x.

A. $x^{\frac{1}{3}}$

B. $x^{\frac{1}{8}}$

C. $x^{\frac{1}{2}}$

D. $x^{\frac{1}{4}}$

Answer: (2)

Watch Video Solution

55. A body of mass m is projected with intial speed u at an angle θ with the horizontal. The change in momentum of body after time t is :-

A. $mgu\frac{\cos\theta}{\sqrt{2}}$

B. $mgu\frac{\sin\theta}{\sqrt{2}}$

C. $mgu\cos(90-\theta)\sqrt{2}$

D. both 2 and 3

Answer: (4)

Watch Video Solution

56. A stone is tied to a string of length l and is whirled in a vertical circle with the other end of the string as the centre. At a certain instant of time, the stone is at its lowest position and has a speed u. The magnitude of the change in velocity as it reaches a position where the string is horizontal (g being acceleration due to gravity) is

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

B. $\sqrt{2}gL$

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

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

Answer: (4)

Watch Video Solution

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

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

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: (4)

Watch Video Solution

58. A nail is fixed at a point P vertically below the point of suspension 'O' of simple pendulum of length $1m$. The bob is released when the string of pendulum makes an angle 30° with horiozontal. The bob reaches lowest point and then describes vertical circle whose centre coincides with P. The least distance of P from O is

A. $0.4m$

B. $0.5m$

C. $0.6m$

D. $0.8m$

Answer: (4)

Watch Video Solution

59. A simple pendulum with a bob of mass 'm' swings with angular amplitude of 60°. When its angular displacement is 30°, the tension in the strings would be

A. $3\sqrt{3}mg$

B. $m\frac{g}{2}(3\sqrt{3}-2)$

C. $\frac{1}{2}mg\left(\frac{3}{\sqrt{3}}+2\right)$

D. $\frac{1}{2}mg(3-\sqrt{2})$

Answer: (2)

Watch Video Solution

60. A stone of mass 1 kg tied to a light inextensible string of lenth $L = \frac{10}{3}m$, whirling in a circular path in a vertical plane. The ratio of maximum tension to the minimum tension in the string is 4. If g is taken to be $10ms^{-2}$, the speed of the stone at the highest point of the circle is

A. $20\frac{m}{s}$

B. $10\sqrt{3}\frac{m}{s}$

C. $5\sqrt{2}\frac{m}{s}$

D. $10\frac{m}{s}$

Answer: (4)

Watch Video Solution

61. A stationary body explodes into two fragments of masses m_1 and m_2. If momentum of one fragment is p, the energy of explosion is

A. $\frac{p^2}{2}(m_1 + m_2)$

B. $\frac{p^2}{2}\sqrt{m_1 m_2}$

C. $p^2 \frac{m_1 + m_2}{2} m_1 m_2$

D. $\frac{p^2}{2}(m_1 - m_2)$

Answer: (3)

Watch Video Solution

62. A mass of 1 kg is thrown up with a velocity of 100 m/s. After 5 seconds. It explodes into two parts. One parts of mass 400 g comes down with a velocity 25 m/s Calaculate the velocity of other parts:

A. $40\frac{m}{s} downwards$

B. $40\frac{m}{s} upwards$

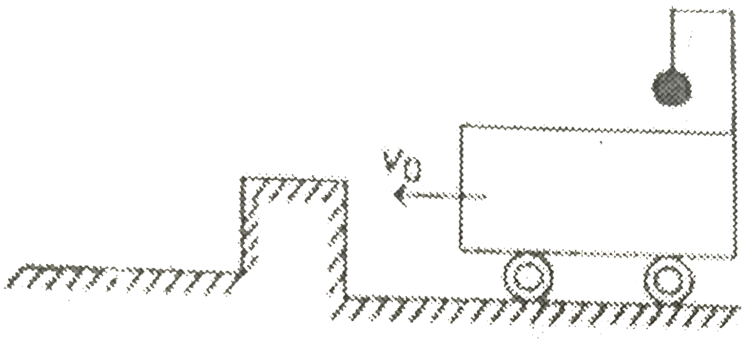
C. $100\frac{m}{s} upwards$

D. $60\frac{m}{s} upwards$

Answer: (3)

Watch Video Solution

63. A bob is suspended from a crane by a cable of length $l = 5m$. The crane and load are moving at a constant speed v_0. The crane is stopped by a bumper and the bob on the cable swings out an angle of 60°. The initial speed v_0 is $(g = 9.8m/s^2)$



A. $10\frac{m}{s}$

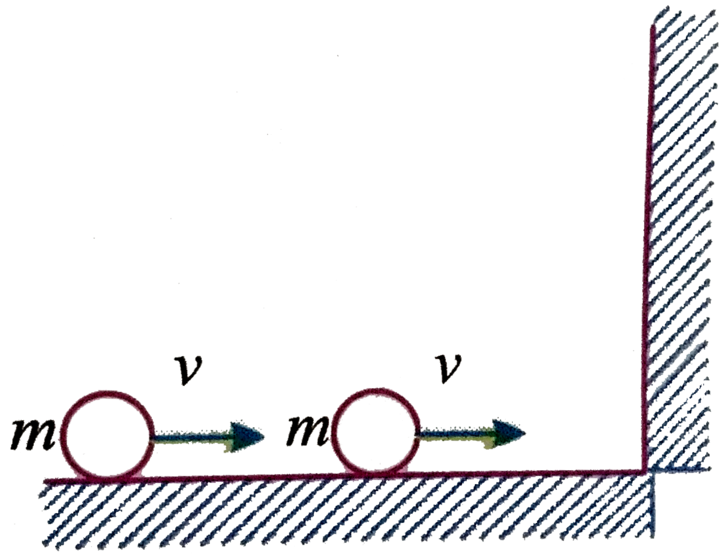
B. $7\frac{m}{s}$

C. $4\frac{m}{s}$

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

Answer: (2)

64. 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: (3)

Watch Video Solution

65. A block of wood of mass $3M$ is suspended by a string of length $\frac{10}{3}m$.

A bullet of mass M hits it with a certain velocity and gets embedded in it.

The block and the bullet swing to one side till the string makes 120° with the initial position. the velocity of the bullet is $\left(g=10ms^{-2}\right)$.

A. $\frac{40}{\sqrt{3}}ms^{-1}$

B. $20ms^{-1}$

C. $30ms^{-1}$

D. $40ms^{-1}$

Answer: (4)

Watch Video Solution

66. At high altitude , a body explodes at rest into two equal fragments with one fragment receiving horizontal velocity of $10m/s$. Time taken by the two radius vectors connecting of explosion to fragments to make 90° is

A. 10 s

B. 4 s

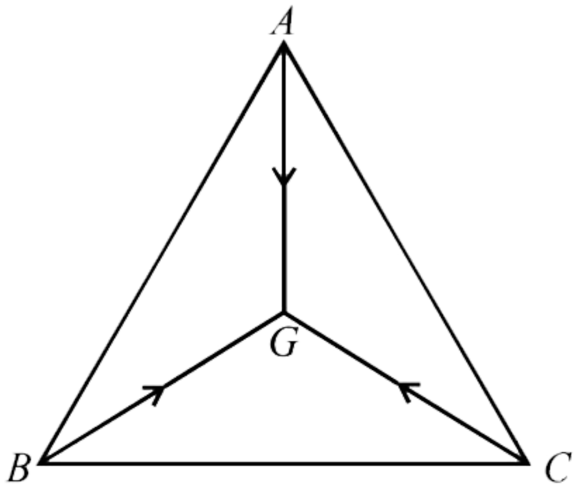
C. 2 s

D. 1 s

Answer: (4)

Watch Video Solution

67. Three particles A, B and C of equal mass move with equal speed V along the medians of an equilateral triangle as shown in hgure. They collide at the centroid G of the triangle. After the collision, A comes to test, B retraces its path with the speed V. What is the velocity of C ?



A. v along BG

B. $\frac{v}{2} along GB$

C. Zero

D. v along CG

Answer: (1)

Watch Video Solution

68. Two sphere A and B of equal masses lie on the smooth horizontal circular groove at opposite ends of diameter and at the end of time 't','A' impings on 'B' . If 'e' is the coefficient of restitution, the second impinge will occur after a time

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

B. $\frac{t}{e}$

C. $\pi\frac{t}{e}$

D. $2\pi\frac{t}{e}$

Answer: (1)

Watch Video Solution

69. A mass of $2.9kg$ is suspended from a string of length $50cm$ and is at rest . Another body of mass $100gm$ which is moving horizontal with a velocity of $150m/s$ strikes it . After striking the two bodies combine together . Tension in the string , when it is at an angle of 60° with the velocity is : $g = 10m/s^2$

A. $135.3N$

B. $165.5N$

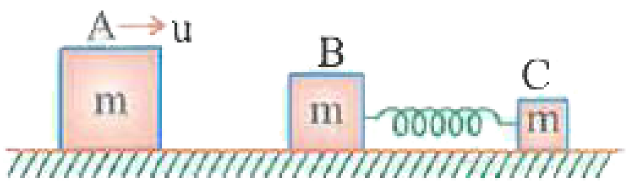
C. $142.4N$

D. $90N$

Answer: (1)

Watch Video Solution

70. A block 'A' of mass M moving with speed u collides elastically with block B of mass m which is connected to block C of mass m with a spring. When the compression in spring is maximum, the velocity of block C with respect to block A is (neglect friction) :-



A. zero

B. $\frac{M}{M}+mu$

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

D. $\frac{m}{M}u$

Answer: (3)

Watch Video Solution

71. A ball moving with velocity of 6 m/s strikes an identical stationary ball. After collision each ball moves at an angle of 30° with the original line of motion. What are the speeds of the balls after the collision ?

A. $\frac{\sqrt{3}}{2}\frac{m}{\sec}$

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

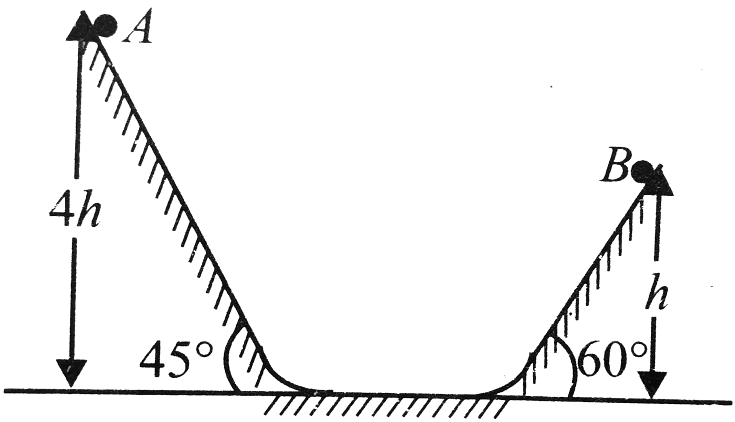
C. $2\sqrt{3}\frac{m}{\sec}$

D. $\sqrt{3}\frac{m}{\sec}$

Answer: (3)

Watch Video Solution

72. Two identical balls A and B are released from the position shown in Fig. They collide elastically with each other on the horizontal portion. The ratio of heights attained by A and B after collision is (neglect friction)



A. $1:4$

B. $2:1$

C. $4:13$

D. $2:5$

Answer: (3)

Watch Video Solution

73. A billiards player hits a stationary ball by an identical ball to pocket the target ball in a corner pocket that is at an angle of 35° with respect to the direction of motion of the first ball. Assuming the collision as elastic and that friction and rotational motion are not important, the angle made by the target ball with repect to the incoming ball is

A. 35°

B. 50°

C. 55°

D. 60°

Answer: (3)

View Text Solution

74. Statement -I : If collision occurs between two elastic bodies their kinetic energy decreases during the time of collision.

Statement -II : During collision intermolecular space decreases and hence elastic potential energy increases

A. Statement I & II are true

B. Statement I is true, Statement II is false

C. Statement I is false, Statement II is true

D. Statement I & II are false

Answer: (1)

Watch Video Solution

75. Assertion: A quick collision between two bodies is more violent that show collision , even when initial and final velocity are identical.

Reason: The rate of change of momentum determine that force is small or large.

A. Statement I & II are true

B. Statement I is true, Statement II is false

C. Statement I is false, Statement II is true

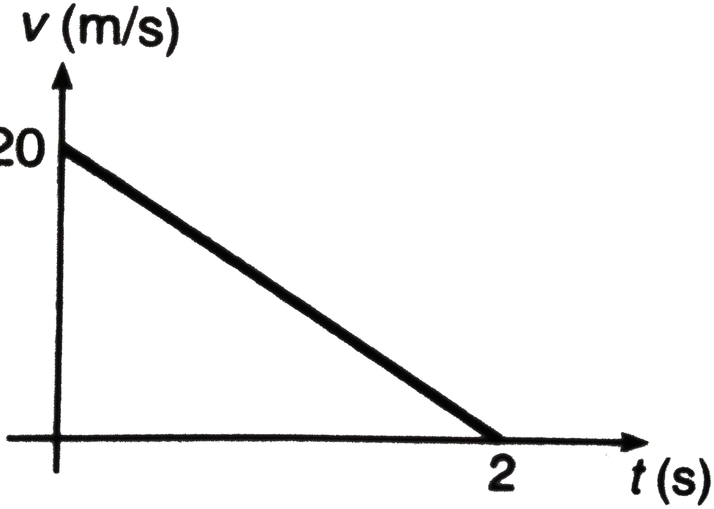
D. Statement I & II are false

Answer: (1)

Watch Video Solution

EXERCISE -II (H.W)

1. 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. 400 J

B. $-400J$

C. $-200J$

D. $200J$

Answer: (2)

Watch Video Solution

2. The displacement of a body of mass $2kg$ varies with time t as $S = t^2 + 2t$, where S is in seconds. The work done by all the forces acting on the body during the time interval $t = 2s$ to $t = 4s$ is

A. 63 J

B. 61 J

C. 62 J

D. 60 J

Answer: (4)

Watch Video Solution

3. Th ework done in moving a body of mass $4kg$ with uniform velocity of $5ms^{-1}$ for 10 second on a surface of $\mu = 0.4 is \left(take g = 9.8m/s^2\right)$

A. 584 J

B. 784 J

C. 684 J

D. 484 J

Answer: (2)

Watch Video Solution

4. A body is acted upon by a force which is inversely proportional to the distance covered. The work done will be proportional to

A. x

B. x^2

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

D. $\log_e x$

Answer: (4)

Watch Video Solution

5. A particle of mass $0.5kg$ is displaced from position $\vec{r}_1(2, 3, 1)$ to $\vec{r}_2(4, 3, 2)$ by applying a force of magnitude $30N$ which is acting along $\left(\hat{i} + \hat{j} + \hat{k}\right)$. The work done by the force is

A. $10\sqrt{3}J$

B. $30\sqrt{3}J$

C. $30J$

D. $40J$

Answer: (2)

Watch Video Solution

6. Kinetic energy of a particle moving in a straight line varies with time t as $K = 4t^2$. The force acting on the particle

A. is constant

B. is increasing

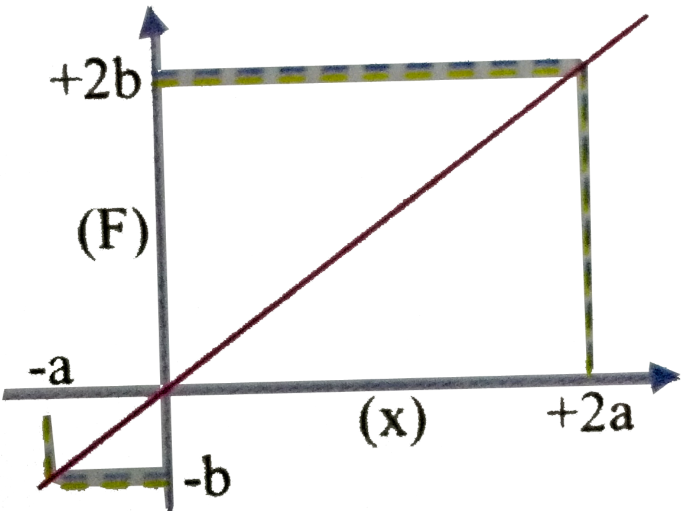
C. is decreasing

D. first increases and then decreases

Answer: (1)

Watch Video Solution

7. A force F acting on a particle varies with the position x as shown in the graph. Find the work done by the force in displacing the particle from $x = -a$ to $x = +2a$.



A. $3a\frac{b}{2}$

B. $4a\frac{b}{2}$

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

D. $\frac{2}{4}ab$

Answer: (1)

Watch Video Solution

8. A force $\vec{F} = \left(2\hat{i} + 3\hat{j} - 4\hat{k}\right)N$ acts on a particle moves $5\sqrt{2}m$, the work done by force in joule is

A. `25 sqrt2

B. $5\sqrt{58}$

C. 25

D. 10

Answer: (3)

Watch Video Solution

9. Two forces each of magnitude $10N$ act simultaneously on a body with their directions inclined to each other at an angle of 120° and displaces the body over $10m$ along the bisector of the angle between the two forces. Then the work done by force is

A. 5 J

B. 1 J

C. 50 J

D. 100 J

Answer: (3)

Watch Video Solution

10. A body is displaced from $(0, 0)$ to $(1m, 1m)$ along the path $x = y$ by a force $F = \left(x^2\hat{j} + y\hat{i}\right)N$. The work done by this force will be

A. $\frac{4}{3}J$

B. $\frac{5}{6}J$

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

D. $\frac{7}{5}J$

Answer: (2)

Watch Video Solution

11. A body of mass $5kg$ at rest under the action of a force which gives its velocity given by $v = 3 \times tm/s$, here 't' is time in seconds. The work done by the force in two seconds will be

A. 90 J

B. 45 J

C. 180 J

D. 30 J

Answer: (1)

Watch Video Solution

12. A particle is made to move from the origin in three spells of equal distances, first along the x -axis, second parallel to y-axis and third parallel to z -axis. One of the forces acting on it is has constant magnitude of 50 N and always acts along the direction of motion Work done by this force in the three spells of motion are equal and total work done in all the three spells is 300 J. The final coordinates of the particle will be :-

A. (2, 2, 2)m

B. (4, 4 ,4)m

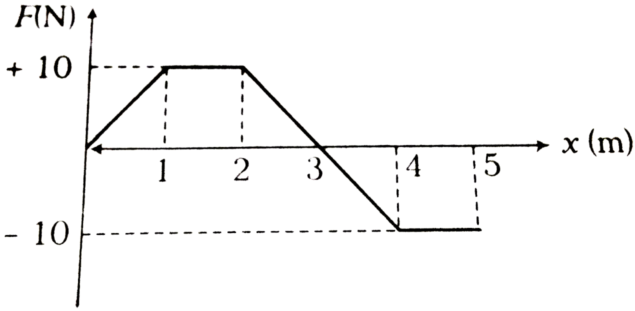
C. (6, 6,6)m

D. (10, 10, 10)m

Answer: (1)

Watch Video Solution

13. A position dependent force F ia acting on a particle and its force-position curve is shown in the figure. Work done on the particle, when its displacement is from 0 to 5 m is



A. 35 J

B. 25 J

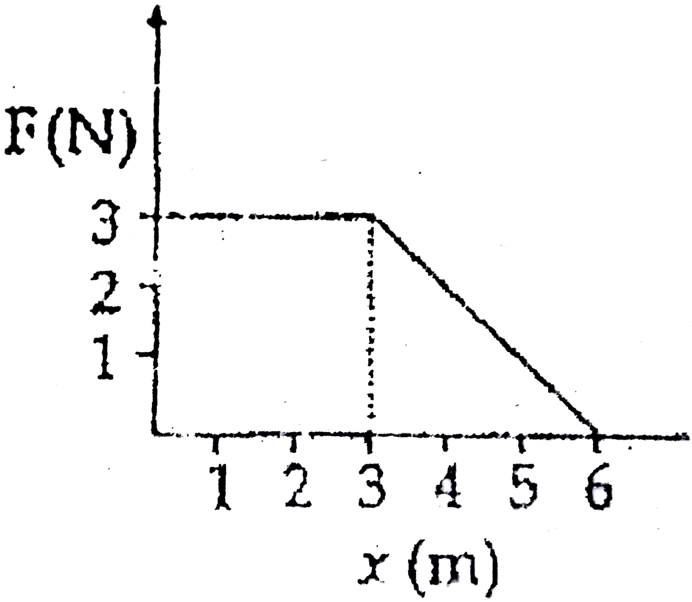
C. 15 J

D. 5 J

Answer: (4)

Watch Video Solution

14. A force F acting on an object varies which distance x as shown in the figure. The force is in N and x in m. The work done by the force in moving the object from x = 0 to x = 6 m is



A. 18.0 J

B. 13.5 J

C. 9.0 J

D. 4.5 J

Answer: (2)

Watch Video Solution

15. A body of mass m is allowed to fall with the help of string with downward acceleration g/6 to distance x. The work done by the string is

A. $mg\frac{x}{6}$

B. $-mg\frac{x}{6}$

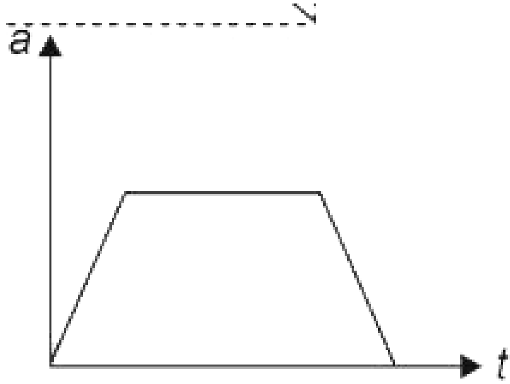
C. $5mg\frac{x}{6}$

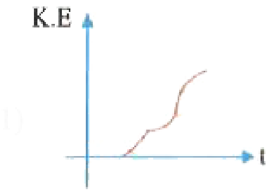
D. $-5mg\frac{x}{6}$

Answer: (4)

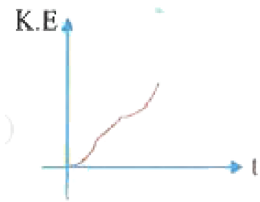
Watch Video Solution

16. Acceleration versus time graph of a particle moving in a straight line is as shown in adjoining figure. If initially particle was at rest. Then corresponding kinetic energy versus time graph will be :

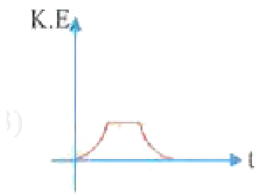




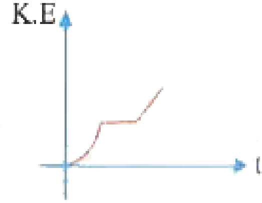
A.



B.



C.

D. 

Answer: (1)

Watch Video Solution

17. A rubber ball falling from a height of $5m$ rebounds from hard floor to a height of $3.5m$. The $\%$ loss of energy during the impact is

A. 20%

B. 30%

C. 43%

D. 50%

Answer: (2)

Watch Video Solution

18. An elastic spring is compressed between two blocks of masses $1kg$ and $2kg$ resting on a smooth horizontal table as shown. If the spring has $12J$ of energy and suddenly released, the velocity with which the larger block of $2kg$ moves will be

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

B. $4\frac{m}{s}$

C. $1\frac{m}{s}$

D. $8\frac{m}{s}$

Answer: (1)

Watch Video Solution

19. A block of mass $2kg$ is on a smooth horizontal surface. A light of force constant $800N/m$ has one end rigidly attached to a vertical wall and lying on that horizontal surface. Now the block is moved towards the wall compressing the spring over a distance f $5cm$ and then suddenly released. By the time the spring regains its natural length and looses contact with the block, the velocity acquired by the block will be

A. $200\frac{m}{s}$

B. $100\frac{m}{s}$

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

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

Answer: (4)

Watch Video Solution

20. n' identical cubes each of mass 'm' and edge 'L' are on a floor. If the cubes are to be arranged one over the other in a vertical stack, the work to be done is

A. $Lmn\frac{g(n-1)}{2}$

B. $L\frac{g(n-1)}{m}n$

C. $\frac{n-1}{L}mng$

D. $Lmn\frac{g}{2}(n-1)$

Answer: (1)

Watch Video Solution

21. A vertically projected body attains the maximum height in $6s$. The ratio of kinetic energy at the end of 3^{rd} second to decrease in kinetic energy in the next three seconds is

A. $1:1$

B. $1:3$

C. $3:1$

D. $9 : 1$

Answer: (1)

Watch Video Solution

22. The kinetic energy K of a particle moving along a circle of radius R depends upon the distance s as $K = as^2$. The force acting on the particle is

A. $2a\frac{s^2}{R}$

B. $2as\left(1 + \frac{s^2}{R^2}\right)^{\frac{1}{2}}$

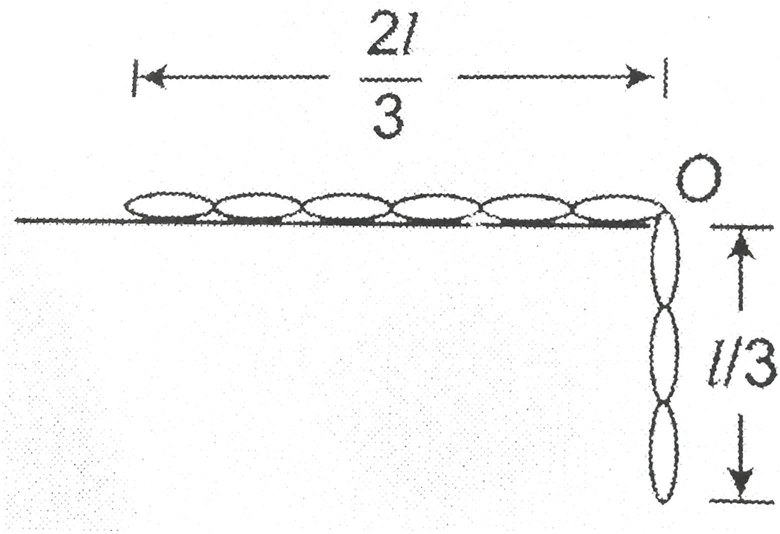
C. $2as$

D. $2a$

Answer: (2)

Watch Video Solution

23. A uniform chain of mass m and length l is placed on a smooth table so that one – third length hanges freely as shown in the figure. Now the chain is released, with what velocity chain slips off the table?



A. $V = \sqrt{g}L$

B. $V = \frac{\sqrt{3gl}}{4}$

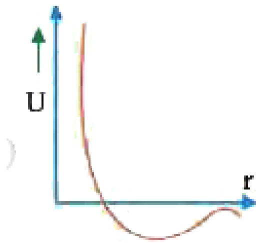
C. $V = \frac{1}{2}\sqrt{5gL}$

D. $V = \frac{1}{2}\sqrt{g}L$

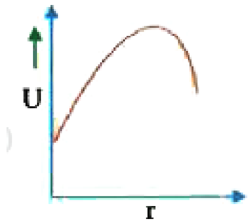
Answer: (2)

Watch Video Solution

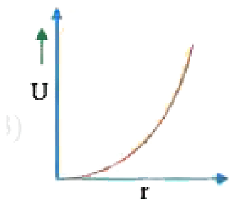
24. These diagrams represent the potential energy U of a diatomic molecule as a function of the inter-atomic distance r. The diagram corresponds to stable molecule found in nature is.



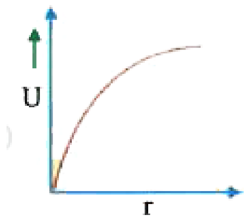
A.



B.



C.



D.

Answer: (1)

Watch Video Solution

25. The potential energy of a particle of mass 5 kg moving in the $x - y$ plane is given by $U = (- 7x + 24y) J$, where x and y are given in metre. If the particle starts from rest, from the origin, then the speed of the particle at $t = 2$s is

A. $5 \frac{m}{s}$

B. $14 \frac{m}{s}$

C. $17.5 \frac{m}{s}$

D. $10 \frac{m}{s}$

Answer: (4)

Watch Video Solution

26. A particle of mass m1 is moving with a velocity v_1 and another particle of mass m_2 is moving with a velocity v2. Both of them have the same momentum but their different kinetic energies are E1 and E2 respectively. If $m_1 > m_2$ then

A. $E_1 < E_2$

B. $\frac{E_1}{E_2} = \frac{m_1}{m_2}$

C. $E_1 > E_2$

D. $E_1 = E_2$

Answer: (1)

Watch Video Solution

27. The potential energy of a certain spring when stretched through a distance 'S' is 10 joule. The amount of work (in joule) that must be done on this spring to stretch it through an additional distance 'S' will be

A. 30

B. 40

C. 10

D. 20

Answer: (1)

Watch Video Solution

28. Match the following

Column I	Column II
(A)Work	(p)Slope of (momentum- time)P-t graph
(B) Power	(q) Slope of W - t graph
(C)Force	(r) Area under F-s graph
(D)Impulse	(iv) Area under F- t graph

A. A -q, B - p, C -s, D - r

B. A-r, B-q,C-p, D-s

C. A-s, B-q,C-p, D-r

D. A-q, B-r,C-s, D-p

Answer: (2)

Watch Video Solution

29. When a bullet is fired a target, its velocity dwecreases by half after penetrating 30 cm into it. The additional thickness it will penetrate before coming to rest is

A. 10 cm

B. 30 cm

C. 40 cm

D. 60 cm

Answer: (1)

Watch Video Solution

30. A bullet of mass $10gm$ is fired horizontally with a velocity $1000ms^{-1}$ from a riffle situated at a height $50m$ above the ground. If the bullet reached the ground with a velocity $500ms^{-1}$, the work done against air resistance in the trajectory of the bullet is (in joule) $(g = 10ms^{-2})$.

A. 5005

B. 3755

C. 3750

D. 17.5

Answer: (2)

Watch Video Solution

31. A block of mass $5kg$ is initially at rest on a rough horizontal surface. A force of $45N$ acts over a distance of $2m$. The force of friction acting on the block is $25N$. The final kinetic energy of the block is

A. $40J$

B. $90J$

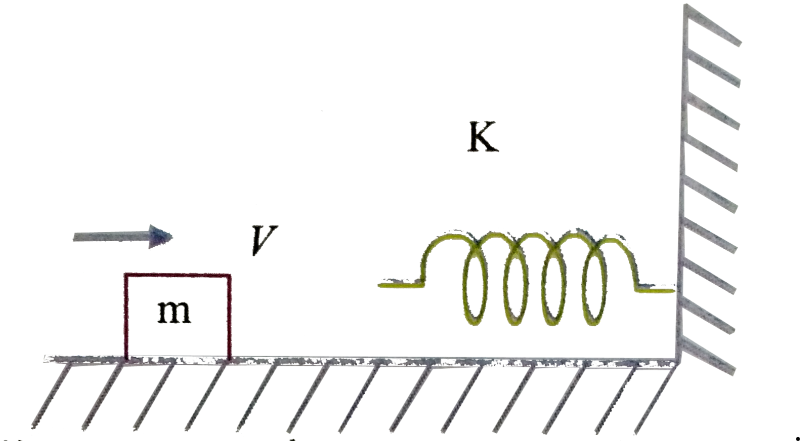
C. $50J$

D. $140J$

Answer: (1)

Watch Video Solution

32. A block of mass $m = 25kg$ on a smooth horizontal surface with a velocity $\vec{v} = 3ms^{-1}$ meets the spring of spring constant $k = 100N/m$ fixed at one end as shown in figure. The maximum compression of the spring and velocity of block as it returns to the original position respectively are.



A. $1.5m, \ - ms^{-1}$

B. $1.5m, 0ms^{-1}$

C. $1.0m, 3ms^{-1}$

D. $0.5m, 2ms^{-1}$

Answer: (1)

Watch Video Solution

33. A body freely falls from a certain height onto the ground in a time 't'. During the first one third of the interval it gains a kinetic energy ΔK_1

and during the last one third of the interval, it gains a kinetic energy ΔK_2. The ratio $\Delta K_1 : \Delta K_2$ is

A. $1:1$

B. $1:3$

C. $1:4$

D. $1:5$

Answer: (4)

Watch Video Solution

34. The potential energy function for the force between two atoms in a diatomic molecule is approximate given by $U(r) = \frac{a}{r^{12}} - \frac{b}{r^6}$, where a and b are constants and r is the distance between the atoms. If the dissociation energy of the molecule is $D = [U(r = \infty) - U_{\text{at equilibrium}}]$, D is

A. $\frac{b^2}{6}a$

B. $\frac{b^2}{2}a$

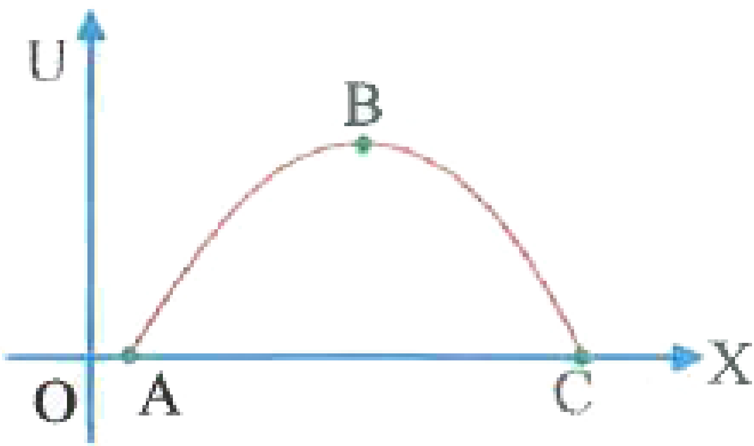
C. $\frac{b^2}{12}a$

D. $\frac{b^2}{4}a$

Answer: (4)

Watch Video Solution

35. The variation of potential energy U of a body moving along x - axis varies with its position (x) as shown in figure



The body is in equilibrium state at

A. A

B. B

C. C

D. Both A & C

Answer: (2)

Watch Video Solution

36. The PE of a 2 kg particle, free to move along x-axis is given by $V(x) = \left(\frac{x^3}{3} - \frac{x^2}{2}\right)J$. The total mechanical energy of the particle is 4 J. Maximum speed (in ms^{-1}) is

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

B. $\sqrt{2}$

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

D. $\frac{5}{\sqrt{6}}$

Answer: (4)

Watch Video Solution

37. Figure given below shows the variation of potential energy function U(x), corresponding to one dimensional force field. The point on the graph representing the position of most stable equilibrium is :

` (##NAR_NEET_PHY_XI_P2_C06_E09_112_Q01.png" width="80%">

A. A

B. B

C. C

D. D

Answer: (4)

View Text Solution

38. A ball is projected vertically down with an initial velocity from a height of $20m$ onto a horizontal floor. During the impact it loses 50% of its energy and rebounds to the same height. The initial velocity of its projection is

A. $20ms^{-1}$

B. $15ms^{-1}$

C. $10ms^{-1}$

D. $5ms^{-1}$

Answer: (1)

Watch Video Solution

39. A freely falling body takes $4s$ to reach the ground. One second after release, the percentage of its potential energy, that is still retained is

A. 6.25%

B. $25\ \%$

C. $37.5\ \%$

D. $93.75\ \%$

Answer: (4)

Watch Video Solution

40. Two identical blocks A and B , each of mass m resting on smooth floor are connected by a light spring of natural length L and spring constant k, with the spring at its natural length. A third identical block C (mass m) moving with a speed v along the line joining A and B collides with A. The maximum compression in the spring is

A. $v\sqrt{\frac{m}{2}k}$

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

C. $\sqrt{m\frac{v}{2}k}$

D. $m\frac{v}{2}k$

Answer: (1)

Watch Video Solution

41. A body is thrown vertically up with certain initial velocity, the potential and kinetic energies of the body are equal is thrown with double the velocity upwards, the ratio of potential and kinetic energies upwards, the ratio of potential and kinetic energies of the body when it crosses the same point, is

A. $1:1$

B. $1:4$

C. $1:7$

D. $1:8$

Answer: (3)

Watch Video Solution

42. A body is thrown vertically upward from a point A 125 m above the ground. It goes up to a maximum height of 250 m above the ground and passes through A on its downward journey. The velocity of the body when it is at a height of 70 m above the ground is $\left(g = 10m/s^2\right)$

A. $50ms^{-1}$

B. $60ms^{-1}$

C. $80ms^{-1}$

D. $20ms^{-1}$

Answer: (2)

Watch Video Solution

43. A body of mass 10 kg dropped from a height 20 m, acquires a velocity of 10m/s after a falling through a distance of 20m. What is the work done by the air resistance on the body?

A. 1500 J

B. 1800J

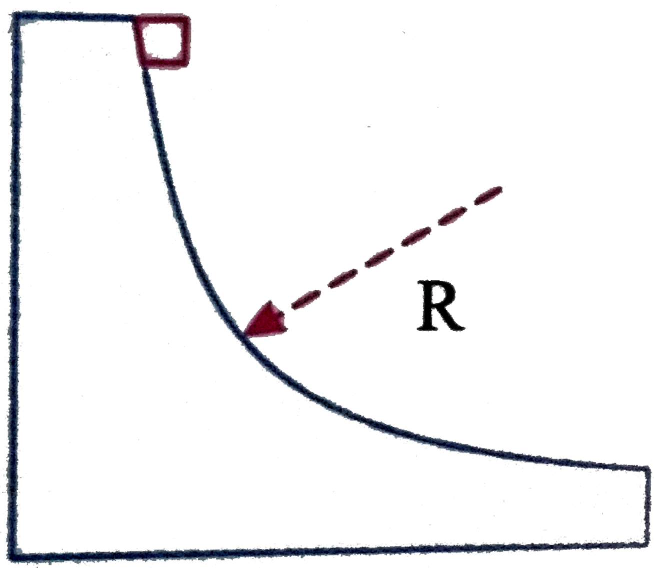
C. $-1500J$

D. $-1800J$

Answer: (3)

Watch Video Solution

44. 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. $\sqrt{5}gR$

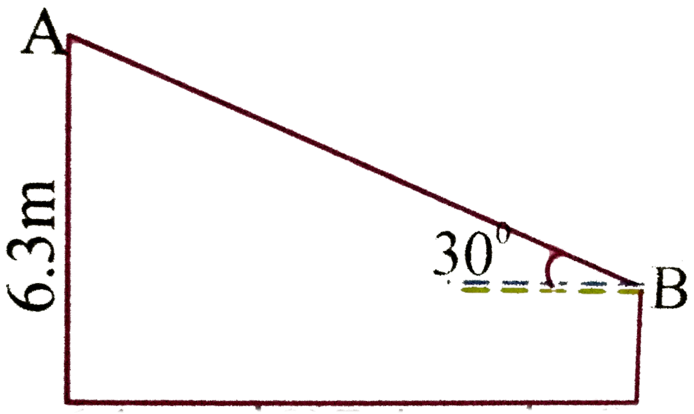
C. $\sqrt{2}gR$

D. $\sqrt{g}R$

Answer: (3)

Watch Video Solution

45. AB is a frictionless inclined surface making an angle of 30° with horizontal. A is $6.3m$ above the ground while B is $3.8m$ above the ground. A block slides down form A, initially starting from rest. Its velocity on reaching B is



A. $7ms^{-1}$

B. $14ms^{-1}$

C. $7.4ms^{-1}$

D. $4.9ms^{-1}$

Answer: (1)

Watch Video Solution

46. A ball of mass $2kg$ and another of mass $4kg$ are dropped together from a 60 feet tall building . After a fall of 30 feet each towards earth , their respective kinetic energies will be the ratio of

A. $\sqrt{2}:1$

B. $1:4$

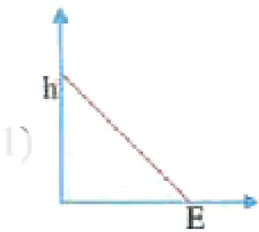
C. $1:2$

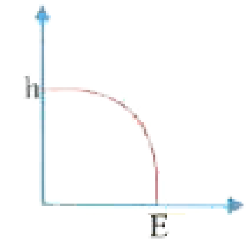
D. $1:\sqrt{2}$

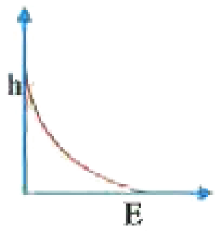
Answer: (3)

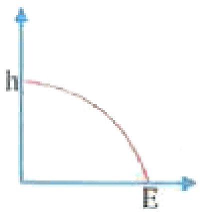
Watch Video Solution

47. Which of the following graphs depicts the variation of KE of a ball bouncing on a horizontal floor with height ? (Neglect air resistances)

A. 

B. 

C. 

D. 

Answer: (1)

Watch Video Solution

48. A man M_1 of mass $80kg$ runs up a staircase in $15s$. Another man M_2 also of mass $80kg$ runs up the same staircase in $20s$. The ratio of the power development by then will be:

A. 1

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

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

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

Answer: (2)

Watch Video Solution

49. A train of weight $10^7 N$ is running on a travel track with uniform speed of $36 km h^{-1}$. The frictional force is 0.5 kg f per quintal. If $g = 10 m s^{-2}$, power of engine is

A. $0.5 kW$

B. $5 kW$

C. $50 kW$

D. $500 kW$

Answer: (4)

Watch Video Solution

50. The velocity 'v' reached by a car of mass 'm' on moving a certain distance from the starting point when driven by a motor with constant power 'P' is such that

A. $v \propto 3\frac{P}{m}$

B. $v^2 \propto 3\frac{P}{m}$

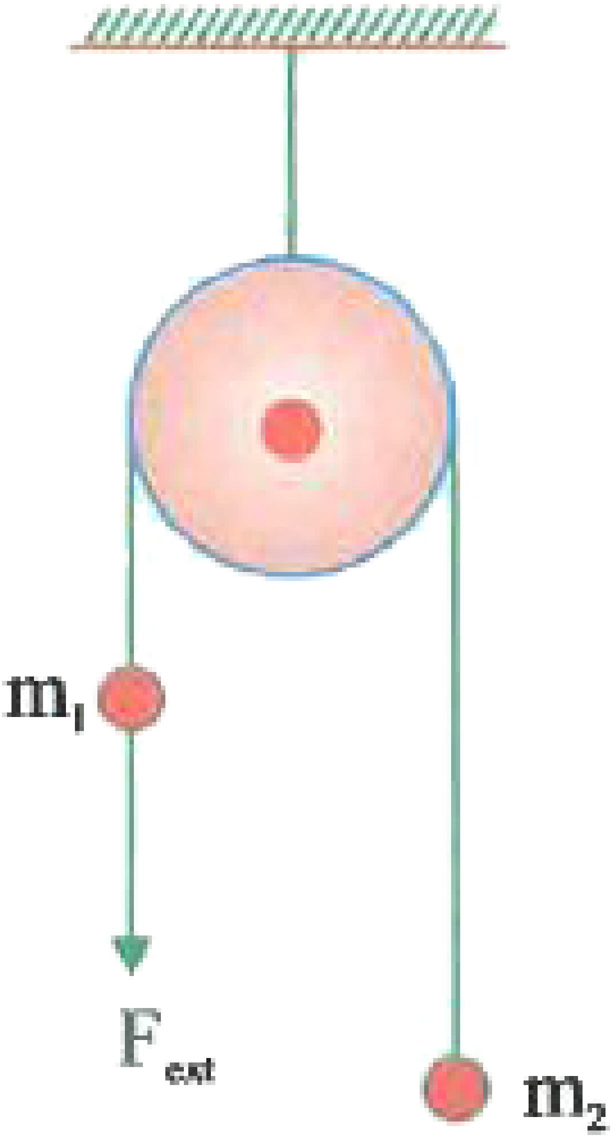
C. $v^3 \propto 3\frac{P}{m}$

D. $v \propto \left(3\frac{P}{m}\right)^2$

Answer: (3)

Watch Video Solution

51. Two bodies of masses m_1 and $m_2 (m_2 > m_1)$ are connected by a light inextensible string which passes through a smooth fixed pulley. The instantaneous power delivered by an external agent to pull m_1 with constant velocity v is :



A. $(m_2 - m_1)\frac{g}{v}$

B. $(m_2 - m_1)\frac{v}{g}$

C. $(m_2 - m_1)gv$

D. $(m_1 - m_2)gv$

Answer: (3)

Watch Video Solution

52. An engine pumps water through a hose pipe. Water passes through the pipe and leaves it with a velocity of $2ms^1$. The mass per unit length of water in the pipe is $100kgm^{-1}$. What is the power of the engine?

A. $100W$

B. $400W$

C. $200W$

D. $800W$

Answer: (1)

Watch Video Solution

53. An elevator that can carry a maximum load of 1500 kg (elvator+ passengers) is moving up with a constant speed of 2 ms^{-1}. The frictional force opposing the motion is 3000 N. Find the minmum power delvered by the motor to the elevator in watts as well as in horse power $(g = 10ms^{-2})$

A. $36.2hp$

B. $26.1hp$

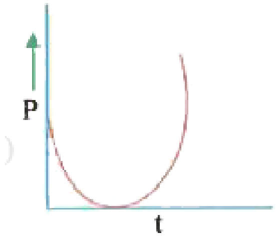
C. $48.3hp$

D. $12.3hp$

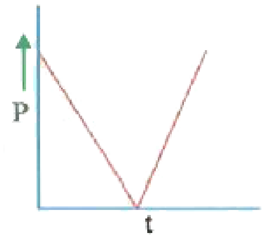
Answer: (3)

Watch Video Solution

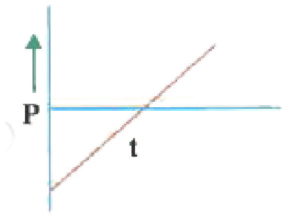
54. A particle is projected at $t = 0$ from a point on the ground with certain velocity at an angle with the horizontal. The power gravitational force is plotted against time. Which of the following is the best representation ?



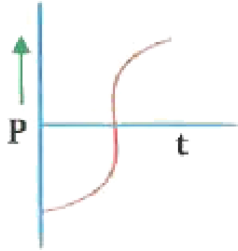
A.



B.



C.

D. 

Answer: (3)

Watch Video Solution

55. The input power to an electric 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: (2)

Watch Video Solution

56. 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: (1)

Watch Video Solution

57. A point size mass $100gm$ is rotated in a vertical circle using a cord of length $20cm$. When the string makes an angle 60° with the vertical, the

speed of the mass is $1.5m/s$. The tangential acceleration of the mass in that position is (in ms^{-2}).

A. 4.9

B. $4.9\sqrt{2}$

C. $49\sqrt{3}$

D. 9.8

Answer: (3)

Watch Video Solution

58. A vehicle is travelling along concave road then along convex road of same radius of curvatures at uniform speed. If the normal reactions on the vehicle as it crosses the lowest point of concave surface, highest point of convex surface are $1.5 \times 10^4 N$, $3 \times 10^3 N$ respectively, then the mass of vehicle is $\left(g = 10m/s^{-2}\right)$.

A. $400kg$

B. $450kg$

C. $800kg$

D. $900kg$

Answer: (4)

Watch Video Solution

59. The length of a simple pendulum is $1m$. The bob is given a velocity $7ms^{-1}$ in horizontal direction from mean position. During upward motion of bob, if the string breaks when the bob is horizontal, then the maximum vertical height of ascent of bob from rest position is

A. $2.5m$

B. $2m$

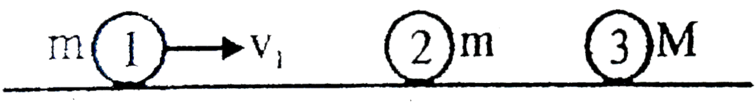
C. $3m$

D. $3.5m$

Answer: (1)

Watch Video Solution

60. Two balls marked 1 and 2 of the same mass m and a third ball marked 3 of mass M are arranged over a smooth horizontal surface as shown in the figure. Ball 1 moves with a velocity v_1 towards ball 2. All collisions are assumed to be elastic. If $M < m$, the number of collisions between the balls will be.



A. 1

B. 2

C. 3

D. 4

Answer: (2)

Watch Video Solution

61. A particle of mass m moving eastward with a velocity V collides with another particle of same mass moving northwards with the same speed V. The two particles coalesce and the new particle moves in NE direction. Calculate magnitude and direction of velocity of new particle.

A. $\sqrt{2}v$

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

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

D. $2v$

Answer: (2)

Watch Video Solution

62. A 10 gm bullet is fired from a rifle horizontally into a 5 kg block of wood suspended by a string and the bullet gets embedded in the block.

The impact causes the block to swing to a height of $2.5cm$ above its initial level. The velocity of the bullet is

A. $286.8\frac{m}{\sec}$

B. $350.7\frac{m}{\sec}$

C. $1000\frac{m}{\sec}$

D. $523\frac{m}{\sec}$

Answer: (2)

Watch Video Solution

63. Three identical particles with velocities $v_0\hat{i}$, $-3v_0\hat{j}$ and $5v_0\hat{k}$ collide successively with each other in such a way that they form a single particle. The velocity vector of resultant particle is

A. $v_0\left(\hat{i}-3\hat{j}+5\hat{k}\right)$

B. $\frac{v_0}{3}\left(\hat{i}-3\hat{j}+5\hat{k}\right)$

C. $\frac{v_0}{2}\left(\hat{i}-3\hat{j}+5\hat{k}\right)$

D. $\frac{v_0}{3}\left(\hat{i}+3\hat{j}+5\hat{k}\right)$

Answer: (2)

Watch Video Solution

64. From the top of a tower of height $100m$ a $10gm$ block is dropped freely and a $6gm$ bullet is fired vertically upwards from the foot of the tower with velocity $100ms^{-1}$ simultaneously. They collide and stick together. The common velocity after collision is $\left(g=10ms^{-2}\right)$.

A. $27.5ms^{-1}$

B. $150ms^{-1}$

C. $40ms^{-1}$

D. $100ms^{-1}$

Answer: (1)

Watch Video Solution

65. A steel ball of radius $2cm$ is initially at rest. It is struck head on by another steel ball of radius $4cm$ travelling with a velocity of $81cm/s$. If the collision is elastic their respective final velocities are

A. $63c\frac{m}{s}, 144c\frac{m}{s}$

B. $144c\frac{m}{s}, 63c\frac{m}{s}$

C. $19c\frac{m}{s}, 100c\frac{m}{s}$

D. $100c\frac{m}{s}, 19c\frac{m}{s}$

Answer: (2)

Watch Video Solution

66. A canon shell fired breaks into two equal parts at its highest point. One part retraches the path to the canon with kinetic enegry E_1 and the kinetic energy of the second part is E_2. Relation between E_1 and E_2 is

A. $E_2 = E_1$

B. $E_2 = 4E_1$

C. $E_2 = 9E_1$

D. $E_2 = 15E_1$

Answer: (3)

Watch Video Solution

67. A mass of 2.9 kg is suspended from a string of length 50 cm and is at rest. Another body of mass 100 g, which is moving horizontally with a velocity of $150 m/s$ strikes and sticks to it. Subsequently when the string makes an angle of 60° with the vertical, the tension in the string is (g = $10 m/s^2$)

A. 140 N

B. 135 N

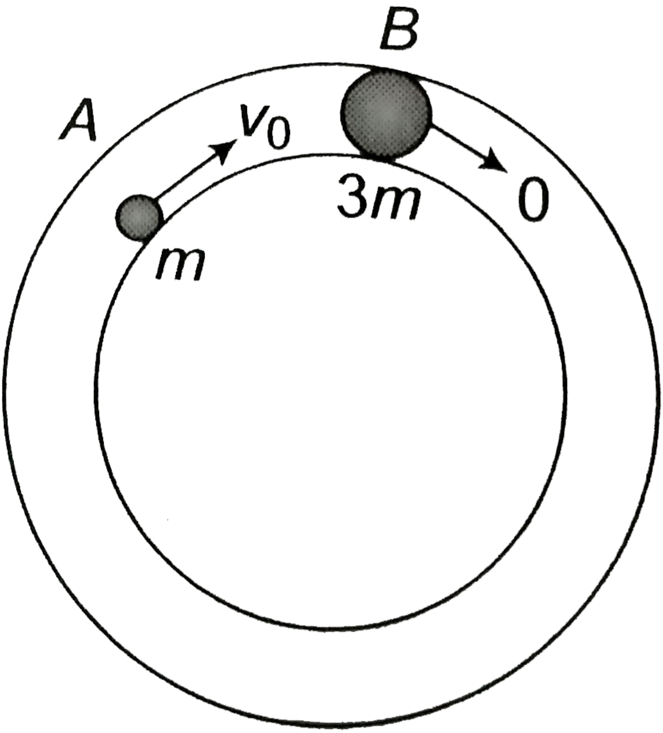
C. 125 N

D. 90 N

Answer: (2)

Watch Video Solution

68. In a smooth circular tube of radius R , a particle of mass m moving with speed V_0 hits another particle of mass $3m$ at rest as shown. The time after which the next collision takes place (assume elastic collision)



A. $\pi \frac{R}{v_0}$

B. $2\pi \frac{R}{v_0}$

C. $\pi \frac{R}{2} v_0$

D. $\pi \frac{R}{4} v_0$

Answer: (2)

Watch Video Solution

69. A mass 'm' moves with a velocity 'v' and collides inelastically with another identical mass at rest. After collision the 1st mass moves with velocity $\frac{v}{\sqrt{3}}$ in a direction perpendicular to the initial direction of motion. Find the speed of the 2^{nd} mass after collision :

A. v along BG

B. $\sqrt{3}v$

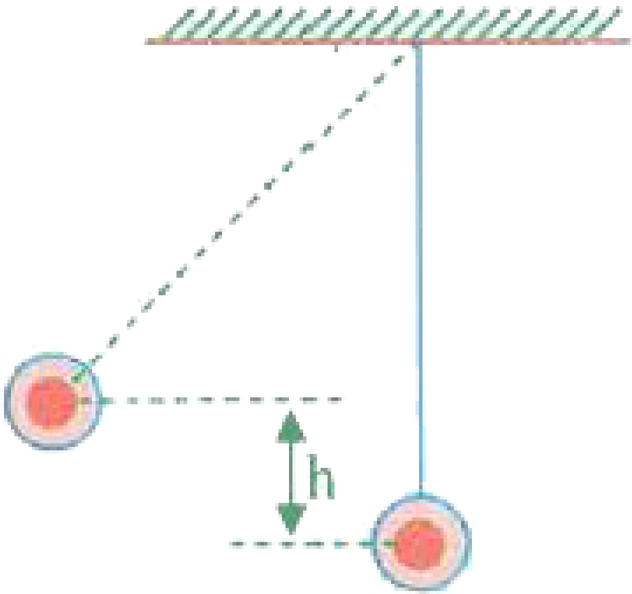
C. $\frac{2}{\sqrt{3}}v$

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

Answer: (3)

Watch Video Solution

70. In the figure, pendulum bob on left side is pulled a side to a height h from its initial position. After it is released it collides with the right pendulum bob at rest, which is of the same mass. After the collision the two bobs stick together and raise to a height :-



A. $3\frac{h}{4}$

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

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

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

Answer: (4)

Watch Video Solution

71. A body oa mass M at rest explodes into three pieces, two of which of mass (M/4) each are thrown- off in perpendicular directions with velocities of $6ms^{-1}$ and $8ms^{-1}$ respectively. The third piece will be thrown-off with a velocity of `

A. $1.5ms^{-1}$

B. $2ms^{-1}$

C. $5ms^{-1}$

D. $3ms^{-1}$

Answer: (3)

Watch Video Solution

72. A mass m moving horizontal (along the x-axis) with velocity v collides and stricks to mass of $3m$ moving vertically upward (along the y-axis) with velocity $2v$. The final velocity of the combination is

A. $\frac{3}{2}v\hat{i} + \frac{1}{4}v\hat{j}$

B. $\frac{1}{4}v\hat{i} + \frac{3}{4}v\hat{j}$

C. $\frac{1}{3}v\hat{i} + \frac{2}{3}v\hat{j}$

D. $\frac{2}{3}v\hat{i} + \frac{1}{3}v\hat{j}$

Answer: (2)

Watch Video Solution

73. During "elastic collision"

a) there is no loss of kinetic energy

b) the bodies are perfectly elastic

c) temporarily some of the kinetic energy is used to deform the bodies

d) after collision the bodies regain the original shape keeping the total energy constant

A. only "a" is true

B. a,b,c,d are true

C. b,c,d are true

D. a,b,c are true

Answer: (2)

Watch Video Solution

74. Identify the correct statements from the following

a) the collisions between the nuclei and fundamental particles are considered as elastic collisions

b) Emission of an alpha particle by a heavy nucleus is an "elastic collision"

c) The collision between two ivory balls is considered as "elastic collision"

d) A running man jumps into a train. It is an "elastic collision"

A. only a & b are true

B. onlyb & c are true

C. a, b & c are true

D. b, c & d are true

Answer: (3)

View Text Solution

75. A ball hits a floor and rebounds after an inelastic collision. In this case

A. a, b, d

B. a, b, c

C. a, b

D. a,b,c,d

Answer: (3)

Watch Video Solution

EXERCISE -III

1. 300J of work is done in slinding a 2 kg block up an inclined plane of height 10m. Taking g =$10m / s^2$, work done against friction is

A. 1000 J

B. 200 J

C. 100 J

D. Zero

Answer: (3)

Watch Video Solution

2. The potential energy of a spring when stretched by $2cmisU$ if the spring is stretched by $8cm$ the potential energy in it is

A. $\frac{U}{4}$

B. $4U$

C. $8U$

D. $16U$

Answer: (4)

Watch Video Solution

3. A body of mass $3kg$ is under a constant force which causes a displacement s metre in it, given by the relation $s = \frac{1}{3}t^2$, where t is in seconds. Work done by the force in 2 seconds is

A. $\frac{19}{5}J$

B. $\frac{5}{19}J$

C. $\frac{3}{8}J$

D. $\frac{8}{3}J$

Answer: (4)

Watch Video Solution

4. A ball is dropped from a height h on to a floor . If the cofficient of restitution is e, calculate the height the ball first rebounds ?

A. e^2h

B. $e\sqrt{h}$

C. eh

D. $\sqrt{e}h$

Answer: (1)

Watch Video Solution

5. 300J of work is done in slinding a 2 kg block up an inclined plane of height 10m. Taking g =$10m/s^2$, work done against friction is

A. $200J$

B. $100J$

C. zero

D. $1000J$

Answer: (2)

Watch Video Solution

6. Kinetic energy of particles of mass 10 g and 40 g is same, the ratio of their linear momentum is

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

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

C. $\frac{1}{\sqrt{2}}$

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

Answer: (2)

Watch Video Solution

7. A vertical spring with force constant k is fixed on a table. A ball of mass m at a height h above the free upper end of the spring falls vertically on the spring , so that the spring is compressed by a distance d. The net work done in the process is

A. $mh(h-d)+\frac{1}{2}Kd^2$

B. $mg(h+d)+\frac{1}{2}Kd^2$

C. $mg(h+d)-\frac{1}{2}Kd^2$

D. $mg(h-d)-\frac{1}{2}Kd^2$

Answer: (2)

Watch Video Solution

8. A body of mass 10 kg initially at rest acquires velocity $10ms^{-1}$. What is the work done ?

A. $-500J$

B. $500J$

C. $50J$

D. $-50J$

Answer: (2)

Watch Video Solution

9. A ball moves on a frictionless inclined table without slipping. The work done by the surface on the ball is :

A. positive

B. negative

C. zero

D. none of these

Answer: (3)

Watch Video Solution

10. Two identical balls A and B collide head on elastically. If velocities of A and B, before the collision are $+0.5\frac{m}{s}$ and $-0.3\frac{m}{s}$ respectively, then their velocities, after the collision, are respectively

A. $-0.5\frac{m}{s}$ and $+0.3\frac{m}{s}$

B. $+0.5\frac{m}{s}$ and $+0.3\frac{m}{s}$

C. $+0.3\frac{m}{s}$ and $-0.5\frac{m}{s}$

D. $-0.3\frac{m}{s}$ and $+0.5\frac{m}{s}$

Answer: (4)

Watch Video Solution

11. Water falls from a height of $60m$ at the rate $15kg/s$ to operate a turbine. The losses due to frictional forces are 10% of energy . How much power is generated to by the turbine? (g=10 m//s^(2))`.

A. $8.1kW$

B. $10.2kW$

C. $12.3kW$

D. $7.0kW$

Answer: (1)

Watch Video Solution

12. A shell of mass $200g$ is ejected from a gun of mass $4kg$ by an explosion that generate $1.05kJ$ of energy. The initial velocity of the shell is

A. $40ms^{-1}$

B. $120ms^{-1}$

C. $100ms^{-1}$

D. $80ms^{-1}$

Answer: (3)

Watch Video Solution

13. Two bodies of masses m and $4m$ are moving with equal linear momenta. The ratio of their kinetic energies is :

A. $1:2$

B. $1:4$

C. $4:1$

D. $1:1$

Answer: (1)

Watch Video Solution

14. A body of mass 1 kg is thrown upwards with a velocity $20ms^{-1}$. It momentarily comes to rest after attaining a height of 18 m. How much energy is lost due to air friction ? (Take $g = 10ms^{-2}$)

A. $30J$

B. $40J$

C. $10J$

D. $20J$

Answer: (4)

Watch Video Solution

15. An explosion blows a rock into three parts. Two parts go off at right angles to each other . These two are $1kg$ first part moving with a velocity of $12ms^{-1}$ and $2kg$ second part moving with a velocity of $8ms^{-1}$. If the third part flies off with a velocity of $4ms^{-1}$. Its mass would be

A. 5 kg

B. 7 kg

C. 17 kg

D. 3 kg

Answer: (1)

Watch Video Solution

16. A body of mass $1kg$ is thrown upwards with a velocity $20ms^{-1}$. It momentarily comes to rest after attaining a height of $18m$. How much energy is lost due to air friction? $\left(g = 10ms^{-2}\right)$

A. $20J$

B. $30J$

C. $40J$

D. $10J$

Answer: (1)

Watch Video Solution

17. An engine pumps water continously through a hose. Water leave the hose with a velocity v and m is the mass per unit length of the Water jet. What is the rate at Which kinetic energy is imparted to water?

A. $\frac{1}{2}mv^3$

B. mv^3

C. $\frac{1}{2}mv^2$

D. $\frac{1}{2}m^2v^2$

Answer: (1)

Watch Video Solution

18. A block of mass m attached in the lower and vertical spring The spring is hung from a calling and force constant value k The mass is released from rest with the spring initially unstreched The maximum value of extension produced in the length of the spring will be

A. $M\frac{g}{k}$

B. $2M\frac{g}{k}$

C. $4M\frac{g}{k}$

D. $M\frac{g}{2}k$

Answer: (2)

Watch Video Solution

19. A rain drop with radus 1.5 mm falls from a cloud at a height 1200 m from ground . The density of water is 1000 kg/m^3 and density of air is $1.2kg/m^3$. Assume the drop was spherical throughout the fall and there is no air drag. The impact speed of the drop will be :

A. $27k\frac{m}{h}$

B. $550k\frac{m}{h}$

C. Zero

D. $129k\frac{m}{h}$

Answer: (2)

Watch Video Solution

20. A ball moves on a frictionless inclined table without slipping. The work done by the surface on the ball is :

A. positive

B. negative

C. zero

D. none of these

Answer: (3)

Watch Video Solution

21. A cord is used to lower vertically a block of mass M through a distance d at a constant acceleration $g/4$. Find the work done by the cord on the block.

A. $Mg\frac{d}{4}$

B. $3Mg\frac{d}{4}$

C. $-3Mg\frac{d}{4}$

D. Mgd

Answer: (3)

Watch Video Solution

22. A child's spring gun when fired vertically sends the ball to a height h, starting with a launch velocity. The same gun is used on the moon and the ball starts with a velocity v' and used to height h'. Then

A. $h > h', v' > v$

B. $h' > h, v' > v$

C. $h' = h, v' < v$

D. $h' = h', v' > v$

Answer: (2)

Watch Video Solution

23. A ball of 1 kg drops vetically on to the floor with a speed of $25ms^{-1}$. It rebounds with an initial velocity of $10ms^{-1}$. (a) What impulse acts on the ball during contact ? (b) If the ball is in contact for 0.02 s , what is the average force exerted on the floor ?

A. $0.1, 55kg\frac{m}{s}, 1550N$

B. $0.2, 45kg\frac{m}{s}, 1650N$

C. $0.3, 30kg\frac{m}{s}, 1550N$

D. $0.4, 35kg\frac{m}{s}, 1750N$

Answer: (4)

Watch Video Solution

24. Consider the following statement. When jumping from some height, you should bend your knees as you come to rest instead of keeping your legs stiff. Which of the following relations can be useful in explaining the statement?

A. $\Delta \bar{p}_1 = -\Delta \bar{p}_2$

B. $\Delta E = \Delta (PE + KE) = 0$

C. $\overrightarrow{F} \Delta t = m \Delta \overrightarrow{v}$

D. $\Delta x \infty \Delta F$

Answer: (2)

Watch Video Solution

25. A body of mass M at rest explodes into three pieces, two of which of mass M//4 each are thrown off in prependicular directions eith velocities of $3/s$ and $4m/s$ respectively. The third piece willl be thrown off with a velocity of

A. $3\frac{m}{s}$

B. $2.5\frac{m}{s}$

C. $4.5\frac{m}{s}$

D. $9\frac{m}{s}$

Answer: (2)

Watch Video Solution

26. The potential energy of a particle in a certain field has the form $U = a/r^2 - b/r$, where a and b are positive constants, r is the distance from the centre of the field. Find:

(a) the value of r_0 corresponding to the equilibrium position of the particle, examine where this position is steady,

(b) the maximum magnitude of the attraction force, draw the plots $U(r)$ and $F_r(r)$ (the projections of the force on the radius vector r).

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

B. $2\frac{a}{b}$

C. $-\frac{a}{b}$

D. $\frac{a}{b}$

Answer: (1)

Watch Video Solution

27. A ball moving with velocity $2ms^{-1}$ collides head on with another stationary ball of double the mass. If the coefficient of restitution is 0.5, then their velocities (in ms^{-1}) after collision will be

A. $0, 1$

B. $1, 1$

C. $1, 0.5$

D. $0, 2$

Answer: (4)

Watch Video Solution

28. An engine pumps water through a hose pipe. Water passes through the pipe and leaves it with a velocity of $2ms^{1}$. The mass per unit length of water in the pipe is $100kgm^{-1}$. What is the power of the engine?

A. 400 W

B. 200 W

C. 100 W

D. 800 W

Answer: (4)

Watch Video Solution

29. A particle of mass M starting from rest undergoes uniform acceleration. If the speed acquired in time T is V, the power delivered to the particle is -

A. $M\frac{V^2}{T}$

B. $\frac{1}{2}M\frac{V^2}{T^2}$

C. $M\frac{V^2}{T^2}$

D. $\frac{1}{2}M\frac{V^2}{T}$

Answer: (4)

Watch Video Solution

30. Two sphere A and B of masses m_1 and m_2 respectivelly colides. A is at rest initally and B is moving with velocity v along x-axis. After collision B has a velocity $\frac{v}{2}$ in a direction perpendicular to the original direction. The mass A moves after collision in the direction.

A. opposite to that of B

B. $\theta = \tan^{-1}\left(\frac{1}{2}\right) \rightarrow x - a\xi s$

C. $\theta = \tan^{-1}\left(-\frac{1}{2}\right) \rightarrow x - a\xi s$

D. same as that of B

Answer: (3)

Watch Video Solution

31. When the KE of a particle is increased by 300%, the momentum of the body si increased by :

A. $300\ \%$

B. $200\ \%$

C. $100\ \%$

D. $50\ \%$

Answer: (3)

Watch Video Solution

32. The potential energy of a system increased if work is done

A. upon the system by a nonconservative force

B. by the system against a conservative force

C. by the system against a nonconservative force

D. upon the system by a conservative force

Answer: (2)

Watch Video Solution

33. A body projected vertically from the earth reaches a height equal to earth's radius before returning to the earth. The power exerted by the gravitational force is greatest.

A. at the highest position of the body

B. at the instant just before the body hits the earth

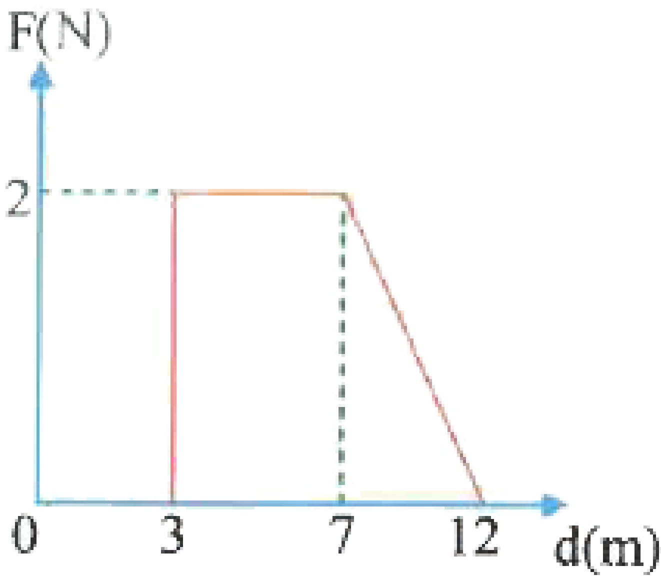
C. it remains constant all through

D. at the instant just after the body is projected

Answer: (2)

Watch Video Solution

34. Force F on a particle moving in a straight line varies with distance d as shown in figure



The work done on the particle during its displacement of 12 m is

A. $18J$

B. $21J$

C. $26J$

D. $13J$

Answer: (4)

Watch Video Solution

35. A mass m moving horizontal (along the x-axis) with velocity v collides and stricks to mass of $3m$ moving vertically upward (along the y-axis) with velocity $2v$. The final velocity of the combination is

A. $\frac{3}{2}v\hat{i} + \frac{1}{4}v\hat{j}$

B. $\frac{1}{4}v\hat{i} + \frac{3}{2}v\hat{j}$

C. $\frac{1}{3}v\hat{i} + \frac{2}{3}v\hat{j}$

D. $\frac{2}{3}v\hat{i} + \frac{1}{3}v\hat{j}$

Answer: (2)

Watch Video Solution

36. A car of mass m starta from rest and accelerates so that the instyantaneous power delivered to the car has a constant magnitude P_0. The instaneous velocity of this car is proportional to

A. $t^2 P_\circ$

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

C. $t^{-\frac{1}{2}}$

D. $\dfrac{t}{\sqrt{m}}$

Answer: (2)

Watch Video Solution

37. The potential energy of a particle in a force field is:

$U = \frac{A}{r^2} - \frac{B}{r}$,. Where A and B are positive constants and r is the distance of particle from the centre of the field. For stable equilibrium the distance of the particle is

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

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

C. $\frac{A}{B}$

D. $\frac{B}{A}$

Answer: (2)

Watch Video Solution

38. A solid cylinder of mass $3kg$ is rolling on a horizontal surface with velocity $4ms^{-1}$. It collides with a horizontal spring of force constant $200Nm^{-1}$. The maximum compression produced in the spring will be :

A. $0.5m$

B. $0.6m$

C. $0.7m$

D. $0.2m$

Answer: (2)

Watch Video Solution

39. Two sphere A and B of masses m_1 and m_2 respectivelly colides. A is at rest initally and B is moving with velocity v along x-axis. After collision B has a velocity $\frac{v}{2}$ in a direction perpendicular to the original direction. The mass A moves after collision in the direction.

A. same as that of B

B. opposite to that of B

C. $\theta = \tan^{-1}\left(\frac{1}{2}\right) \to x - a\xi s$

D. $\theta = \tan^{-1}\left(-\frac{1}{2}\right) \to thex - a\xi s$

Answer: (4)

Watch Video Solution

40. A uniform force of $\left(3\hat{i}+\hat{j}\right)$ newton acts on a particle of mass $2kg$. Hence the particle is displaced from position $\left(2\hat{i}+\hat{k}\right)$ meter to position $\left(4\hat{i}+3\hat{j}-\hat{k}\right)$ meter. The work done by the force on the particle is :

A. $6J$

B. $13J$

C. $15J$

D. $9J$

Answer: (4)

Watch Video Solution

41. A body of mass (4m) is laying in xy-plane at rest. It suddenly explodes into three pieces. Two pieces each mass (m) move perpedicular to each other with equal speeds (v). Total kinetic energy generated due to explosion is

A. mv^2

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

C. $2mv^2$

D. $4mv^2$

Answer: (2)

Watch Video Solution

42. The heart of a man pumps 5 liters of blood through the arteries per minute at a pressure of 150 mm of mercury. If the density of mercury be $13.6 \times 10^3 kg/m^3$ and $g = 10m/s^2$ then the power of heat in watt is :

A. $3.0W$

B. $1.50W$

C. $1.70W$

D. $2.35W$

Answer: (3)

Watch Video Solution

43. A ball is thrown vertically downwards from a height of 20m with an intial velocity v_0. It collides with the ground, loses 50% of its energy in collision and rebounds to the same height. The intial velocity v_0 is (Take, g =10 ms^{-2})

A. $28ms^{-1}$

B. $10ms^{-1}$

C. $14ms^{-1}$

D. $20ms^{-1}$

Answer: (4)

Watch Video Solution

44. On a friction surface a block a mass M moving at speed v collides elastic with another block of same mass M which is initially at rest . After collision the first block moves at an angle θ to its initial direction and has a speed $\frac{v}{3}$. The second block's speed after the collision is

A. $3\sqrt{2}v$

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

C. $2\frac{\sqrt{2}}{3}v$

D. $\frac{3}{4}v$

Answer: (3)

Watch Video Solution

45. A partical of mass m is driven by a machine that deleveres a constant power k watts. If the partical starts from rest the force on the partical at time t is

A. $\sqrt{2}mkt^{-\frac{1}{2}}$

B. $\frac{1}{2}\sqrt{m}kt^{-\frac{1}{2}}$

C. $\sqrt{m\frac{k}{2}}t^{-\frac{1}{2}}$

D. $\sqrt{m}kt^{-\frac{1}{2}}$

Answer: (3)

Watch Video Solution

46. A block of mass 10 kg, moving in x-direction with a constant speed of $10ms^{-1}$, is subjected to a retarding force $F = 0.1 \times J/m$ during its travel from x=20 m to 30 m. Its final KE will be

A. $275J$

B. $250J$

C. $475J$

D. $450J$

Answer: (3)

Watch Video Solution

47. Two particles of masses m_1, m_2 move with initial velocities u_1 and u_2. On collision, one of the particles get excited to higher level, after absording enegry. If final velocities of particles be v_1 and v_2 then we must have

A. $\frac{1}{2}m_1u_1^2 + \frac{1}{2}m_2u_2^2 - \varepsilon = \frac{1}{2}m_1v_1^2 + \frac{1}{2}m_2v_2^2$

B. $\frac{1}{2}m_1^2u_1^2 + \frac{1}{2}m_2^2u_2^2 + \varepsilon = \frac{1}{2}m_1^2v_1^2 + \frac{1}{2}m_2^2v_2^2$

C. $m_1^2u_1 + m_2^2u_2 - \varepsilon = m_1^2v_1 + m_2^2v_2$

D. $\frac{1}{2}m_1u_1^2 + \frac{1}{2}m_2u_2^2 = \frac{1}{2}m_1v_1^2 + \frac{1}{2}m_2v_2^2 - \varepsilon$

Answer: (1)

Watch Video Solution

48. Two similar springs P and Q have spring constant K_P and K_Q such that $K_P > K_Q$. They are stretched, first by the same amount (case a), then the same force (case b). The work done by the spring W_P and W_Q are related as, in case (b), respectively

A. $W_P > W_Q, W_Q > W_P$

B. $W_P < W_Q, W_Q < W_P$

C. $W_P = W_Q, W_P > W_Q$

D. $W_P = W_Q, W_P = W_Q$

Answer: (1)

Watch Video Solution

49. What is the minimum velocity with which a body of mass m must enter a vertical loop of radius R so that it can complete the loop?

A. $\sqrt{5gR}$

B. $\sqrt{gR}$

C. $\sqrt{2gR}$

D. $\sqrt{3gR}$

Answer: (1)

Watch Video Solution

50. A particle of mass 10 g moves along a circle of radius 64 cm with a constant tangential acceleration. What is the magnitude of this acceleration if the kinetic energy of the particle becomes equal to $8 \times 10^{-4} J$ by the end of the second revolution after the beginning of the motion ?

A. $0.2\frac{m}{s^2}$

B. $0.1\frac{m}{s^2}$

C. $0.15\frac{m}{s^2}$

D. $0.18\frac{m}{s^2}$

Answer: (2)

Watch Video Solution

51. A body of mass $1kg$ begins to move under the action of a time dependent force $\overrightarrow{F} = \left(2t\hat{I} + 3t^2\hat{j}\right)N$, where $\hat{i}$ and $\hat{j}$ are unit vectors along x-and y-axes. What power will be developed by the force at the time t ?

A. $\left(2t^3 + 3t^5\right)W$

B. $\left(2t^2 + 3t^3\right)W$

C. $\left(2t^2 + 4t^4\right)W$

D. $\left(2t^3 + 3t^4\right)W$

Answer: (1)

Watch Video Solution

52. A bullet of mass 10 g moving horizontally with a velocity of $400ms^{-1}$ strikes a wooden block of mass 2kg which is suspended by a light inextensible string of length 5 m. As a result, the centre of gravity of the block is found to rise a vertical distance of 10 cm. The speed of the bullet after it emerges out horizontally from the block will be

A. $120ms^{-1}$

B. $160ms^{-1}$

C. $100ms^{-1}$

D. $80ms^{-1}$

Answer: (1)

Watch Video Solution

53. Two identical balls A and B having velocity of $0.5m/s$ and $-0.3m/s$ respectively collide elastically in one dimension. The velocities of B and A after the collision respectively will be

A. $-0.3\frac{m}{s}$ and $0.5\frac{m}{s}$

B. $0.3\frac{m}{s}$ and $0.5\frac{m}{s}$

C. $-0.5\frac{m}{s}$ and $0.3\frac{m}{s}$

D. $0.5\frac{m}{s}$ and $-0.3\frac{m}{s}$

Answer: (4)

Watch Video Solution

54. A paricle moves from a point $\left(-2\hat{i}+5\hat{j}\right)$ to $\left(4\hat{j}+3\hat{k}\right)$ when a foce of $\left(4\hat{i}+3\hat{j}\right)N$ is applied. How much work has been done by the force?

A. $5J$

B. $2J$

C. $8J$

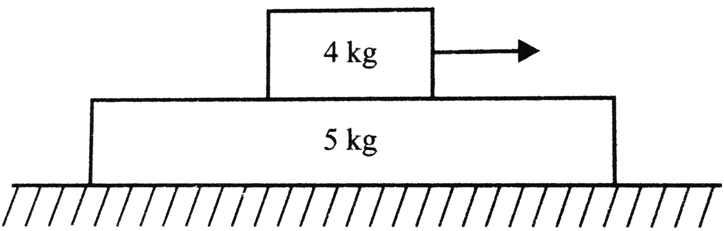
D. $11J$

Answer: (1)

Watch Video Solution

EXERCISE IV

1. A large slab of mass $5kg$ lies on a smooth horizontal surface, with a block of mass $4kg$ lying on the top of it. The coefficient of friction between the block and the slab is 0.25. If the block is pulled horizontally by a force of F $= 6N$, the work done by the force of friction on the slab, between the instants $t = 2s$ and $t = 3s$, is $\left(g = 10ms^{-2}\right)$



A. $2.4J$

B. $5.55J$

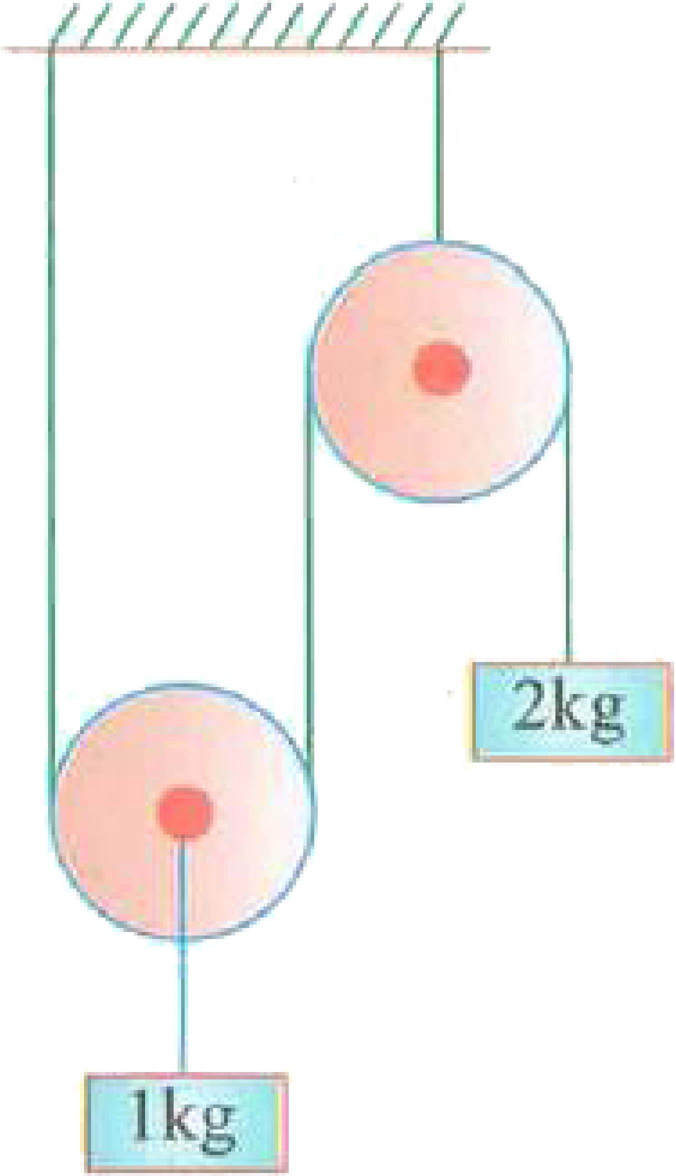
C. $4.444J$

D. $10J$

Answer: (2)

Watch Video Solution

2. In the pulley - block system shown in figure, strings are light. Pulleys are massless and smooth. System is released from rest. In 0.3 seconds



a) work done on 2 kg blocks by gravity is $6J$

b) work done on 2 kg block by string is $-2J$

c) work done on 1 kg block by gravity is $-1.5J$

d) work done on 1 kg block by string is 2 J

A. only a, d are correct

B. only b , d are correct

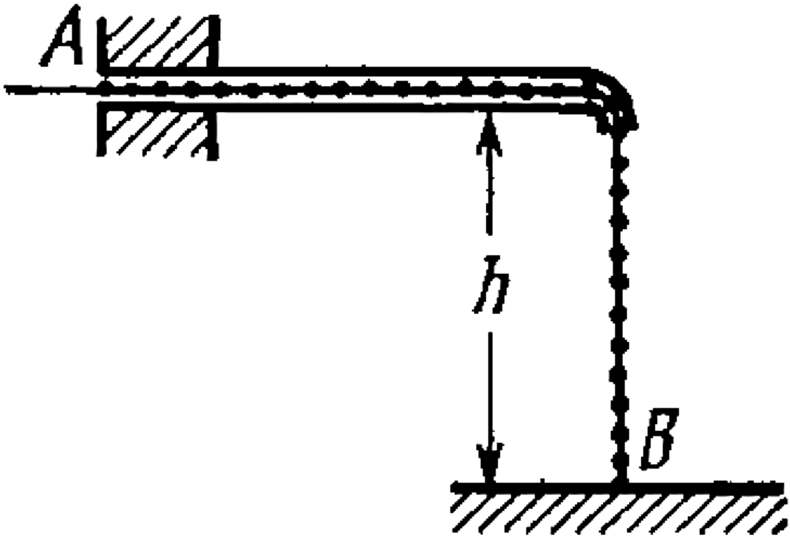
C. only a,b,c are correct

D. All are correct

Answer: (4)

Watch Video Solution

3. A chain AB of length l is located in a smooth horizontal tube so that its fraction of length h hangs freely and touches the surface of the table with its end B(figure). At a certain moment the end A of the chain is set free. With what velocity will this end of the chain slip out of the tube?



A. $h\sqrt{2\frac{g}{L}h}$

B. $\sqrt{2gh\log_e\left(\frac{L}{h}\right)}$

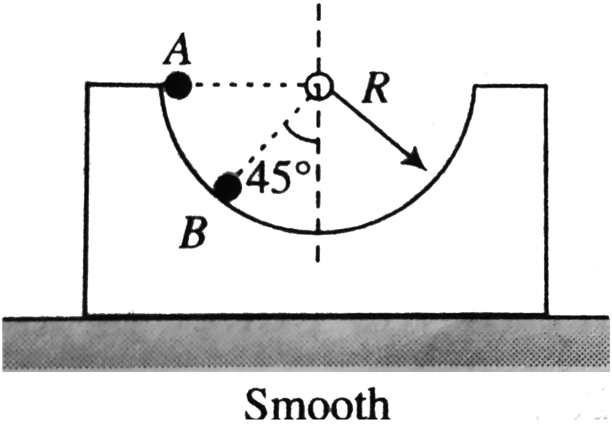
C. $\sqrt{2gl\log_e\left(\frac{L}{h}\right)}$

D. $\frac{1}{h}L\sqrt{2g}$

Answer: (2)

Watch Video Solution

4. A ball of mass m is released from A inside a smooth wedge of mass m as shown in figure. What is the speed of the wedge when the ball reaches point B?



A. $\left(g\frac{R}{3}\sqrt{2}\right)^{\frac{1}{2}}$

B. $\sqrt{2}gR$

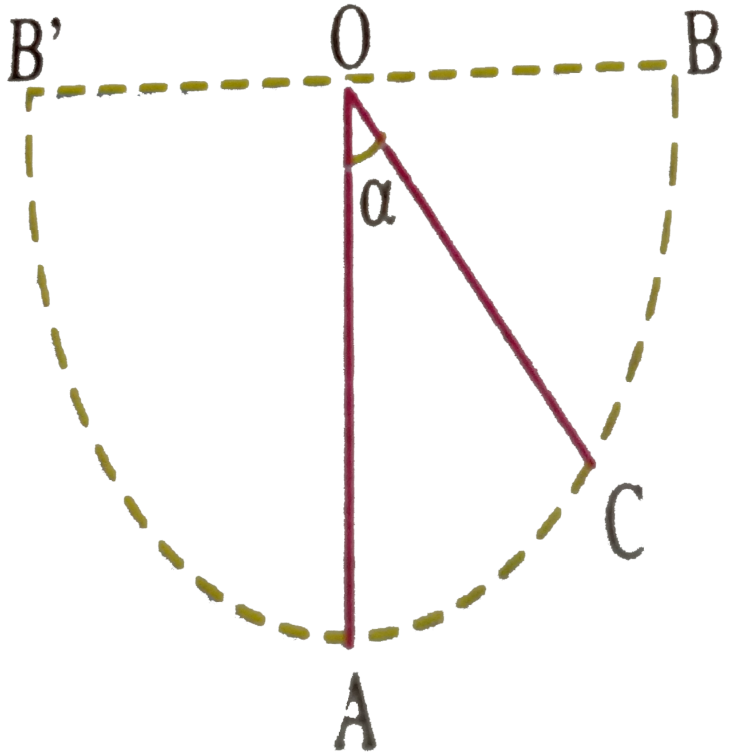
C. $\left(5g\frac{R}{2}\sqrt{3}\right)^{\frac{1}{2}}$

D. $\frac{\sqrt{3}}{2}gR$

Answer: (1)

Watch Video Solution

5. A bob of mas M is suspended by a massless string of length L. The horizontal velocity v at position A is just sufficient to make it reach the point B. The angle θ at which the speed of the bob is half of that at A, satisfies.



A. $\theta = \frac{\pi}{4}$

B. $\frac{\pi}{4} < \theta < \frac{\pi}{2}$

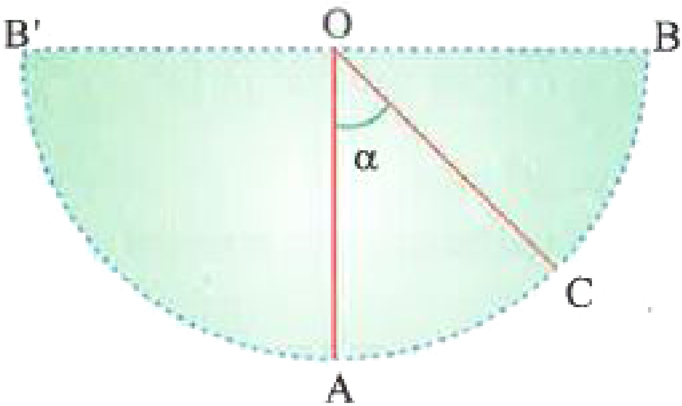
C. $\frac{\pi}{2} < \theta < 3\frac{\pi}{4}$

D. $3\frac{\pi}{4} < \theta\pi$

Answer: (4)

Watch Video Solution

6. A simple pendulum is vibrating with an angular amplitude of 90° as shown in the figure. For what value of a is the acceleration directed



i) vertically upwards

ii) horizontally

iii) vertically downward

A. $0^{\circ}, \cos^{-1}\left(\frac{1}{\sqrt{3}}\right), 90^{\circ}$

B. $90^{\circ}, \cos^{-1}\left(\frac{1}{\sqrt{3}}\right), 0^{\circ}$

C. $\cos^{-1}\left(\frac{1}{\sqrt{3}}\right), 0^{\circ}, 90^{\circ}$

D. $\cos^{-1}\left(\frac{1}{\sqrt{3}}\right), 90^{\circ}, 0^{\circ}$

Answer: (1)

View Text Solution

7. A projectile is fixed on a horizontal ground. Coefficient of restitution between the projectile and the ground is 'e'. If a, b and c be the ration of time of flight $\left[\frac{T_1}{T_2}\right]$, maximum height $\left[\frac{H_1}{H_2}\right]$ and horizontal range $\left[\frac{R_1}{R_2}\right]$ in first two collisions with the ground, then

A. $a = \frac{1}{e}$

B. $b = \frac{1}{e^2}$

C. $c = \frac{1}{e}$

D. $1, 2\&3$

Answer: (4)

Watch Video Solution

8. A ball A of mass $3m$ is placed at a distance d from the wall on a smooth horizontal surface Another ball B of mass m moving with velocity u collides with ball A. The coefficient of restitution between the balls and the wall and between the balls is e

(a) the velocity of ball B after collision is $\frac{u(3e-1)}{4}$.

(b) the velocity of ball B after collision is $\frac{u(2e-1)}{4}$.

(c) after collision, ball A will have away by distance $\frac{d(2e-1)}{(2e-1)}$ during the time ball B returns back to wall.

(d) after collision, ball A will move away by distance $\frac{d(e-1)}{(3e-1)}$ during the time ball B returns back to wall.

A. a,d

B. a, c

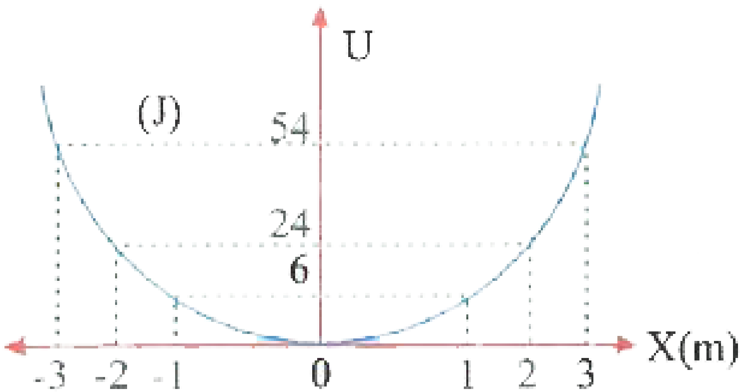
C. b,d

D. c,d

Answer: (1)

Watch Video Solution

9. Figure given below shows the variation of potential energy function U(x), corresponding to a particle lying in a one dimensional force field. The force acting on the particle at x = 2 m is:



A. $-12N$

B. $-24N$

C. $-16N$

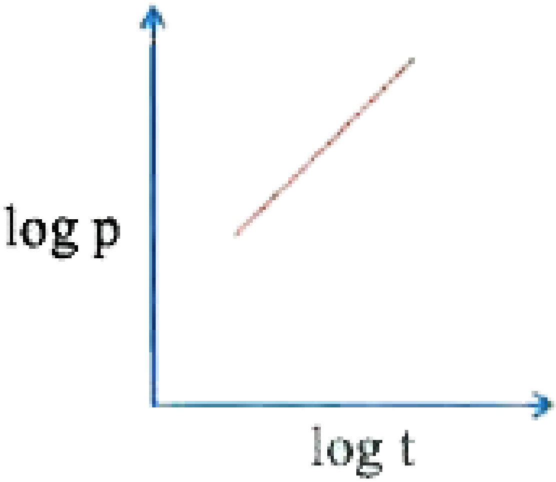
D. $-8N$

Answer: (2)

Watch Video Solution

10. A particles moves along a circle of a fixed radius with a variable acceleration given by $a_n = kt^n$, where k is a constant and t time. If the power 'P' delivered by all forces acting on it be plotted against time 't' on a log-log scale, the slope of the straight line obtained is 2 as shown in

Figure below. The value of n is:



A. 1

B. 2

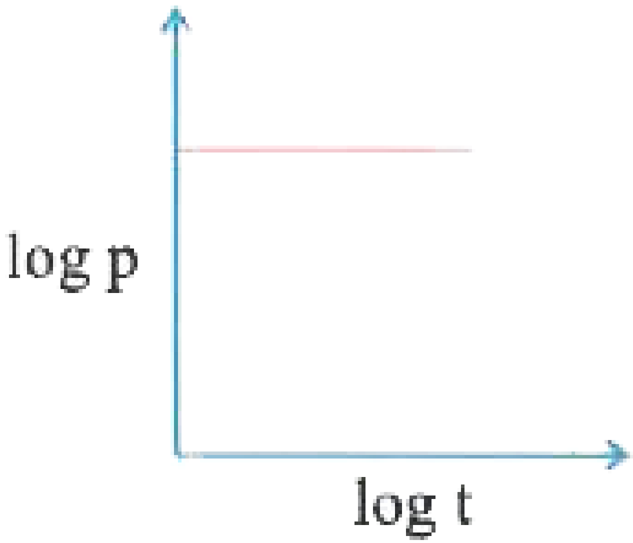
C. 3

D. -1

Answer: (3)

Watch Video Solution

11. A particle is moving along a circle of fixed radius such thta the power 'P' delivered by all the forces acting on it varies with time t as shown in figure. The angular acceleration $\alpha$of the particle varies as:



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

B. $t^{-\frac{1}{2}}$

C. t

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

Answer: (2)

Watch Video Solution

12. Two blocks having masses 8 kg and 16 kg are connected to the two ends of a light spring. The system is placed on a smooth horizontal floor. An inextensible string also connects B with ceiling as shown in figure at the initial moment. Initially the spring has its natural length.A constant horizontal force F is applied to the heavier block as shown. What is the maximum possible value of F so that lighter block doesn't loose contact with ground.

` (##NAR_NEET_PHY_XI_P2_C06_E11_012_Q01.png" width="80%">

A. 10 N

B. 20 N

C. 30 N

D. 40 N

Answer: (3)

View Text Solution

13. Figure shows a spring fixed at the bottom end of an incline of inclination 37^0. A small block of mass 2 kg starts slipping down the incline from a point 4.8 m away from the spring. The block compresses the spring by 20 cm, stops momentarily and then rebounds through a distance of 1 m up the incline. Find a. the frictioin coefficient between the plane and the block and b. the spring constant of the spring. Take $g = 10\frac{m}{s^2}$.

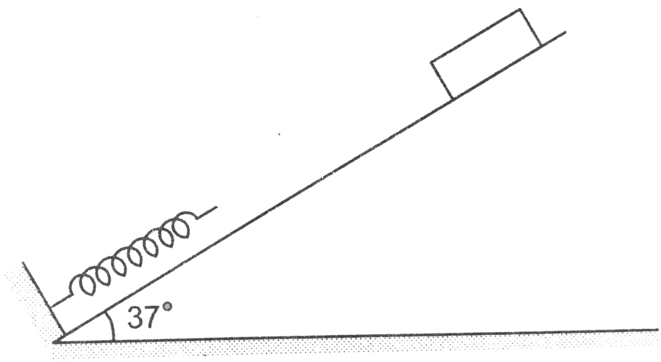


Figure 8-E7

A. $0.5,\ 1000\frac{N}{m}$

B. $0.5,\ 500\frac{N}{m}$

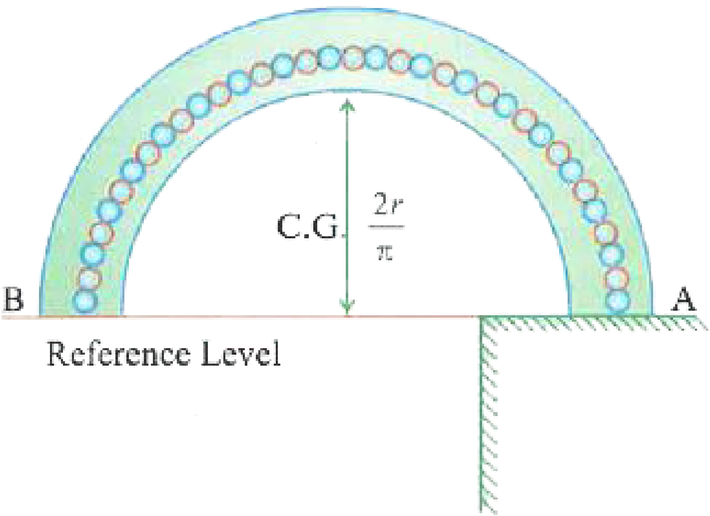
C. $0.2,\ 500\frac{N}{m}$

D. $0.2,\ 1000\frac{N}{m}$

Answer: (1)

Watch Video Solution

14. A heavy flexible uniform chain of length πr and mass $\lambda \pi r$ lies in a smooth semicircular tube AB of radius 'r'. Assuming a slight disturbane to start the chain in motion, find the velocity v with which it will emerge from the end of the tube?



A. $\sqrt{\frac{2}{\pi} + \frac{\pi}{2}}$

B. $\sqrt{2rg\left(\frac{2}{\pi} + \frac{\pi}{2}\right)}$

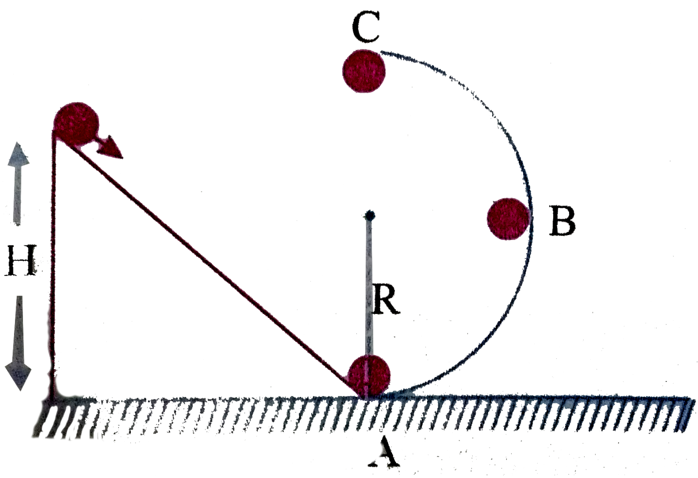
C. $\sqrt{2rg}\left(\frac{1}{\pi}+\pi\right)$

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

Answer: (3)

Watch Video Solution

15. A body slides without friction from a height $H = 60cm$ and then loops the loop of radius $R = 20cm$ at the bottom of an incline. Find the ratio of forces exerted on the body by the track at the positions A, B and $C(g = 10ms^{-2})$.



A. $7:3:1$

B. $5:3:1$

C. $7:4:1$

D. $1:4:7$

Answer: (3)

Watch Video Solution

16. A heavy particle hanging from a fixed point by a light inextensible string of length l is projected horizonally with speed $\sqrt{gl}$. Find the speed of the particle and the inclination of the string to the vertical at the instant of the motion when the tension in the string is equal to the weight of the particle.

A. $\sqrt{g}l$

B. $\sqrt{2}gl$

C. $\sqrt{3}gl$

D. $\sqrt{g}\frac{l}{3}$

Answer: (4)

Watch Video Solution

17. A cricket ball of mass 150 g moving with a speed of 123 km/h hits at the middle of the bat, held firmly at its position by the batsman.The ball moves straight back to the bowler after hitting the bat.Assuming that collision between ball and bat is completely elastic and the two remain in contact for $0.001s$, the force that the batsman had to apply to hold the bat firmly at its place would be

A. $10.5N$

B. $21N$

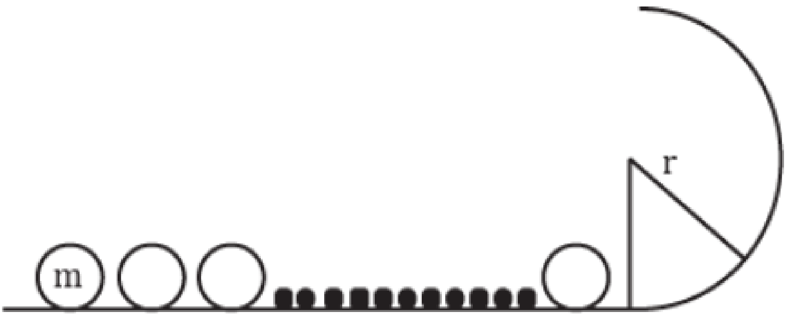
C. $1.05 \times 10^4 N$

D. $2.1 \times 10^4 N$

Answer: (3)

Watch Video Solution

18. n elastic balls are placed at rest on a smooth horizontal plane which is circular at the ends with radius r as shown in the figure. The masses of the balls are $m, \frac{m}{2}, \frac{m}{2^2}, \ldots\ldots\ldots\ldots \frac{m}{2^{n-1}}$ respectively. What is the minimum velocity which should be imparted to the first ball of mass m such that $n^t h$ ball completes the vertical circle



A. $\sqrt{5gr}$

B. $\left(\frac{3}{4}\right)^{n-1}\sqrt{5gr}$

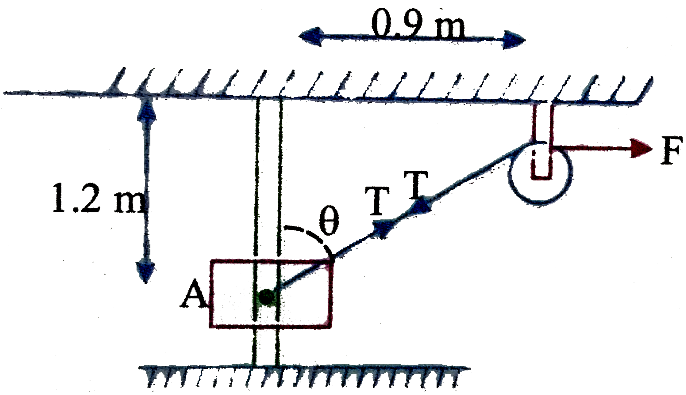
C. $\left(\frac{3}{4}\right)^{n}\sqrt{gr}$

D. $\left(\frac{4}{3}\right)6(n)\sqrt{5gr}$

Answer: (2)

Watch Video Solution

19. The $50N$ collar starts from rest at A and is lifted with a constant speed of $0.6m/s$ along the smooth rod. Determine the power developed by the force F at the instant shown.



A. $20W$

B. $30W$

C. $10W$

D. $40W$

Answer: (2)

Watch Video Solution

20. A hose pipe has a diameter of $2.5cm$ and is required to direct a jet of water to a height of atleast $40cm$. Find the minimum power of the pump needed for this hose.

A. $21.5J$

B. $21.5KJ$

C. $10.5KJ$

D. $10.5J$

Answer: (2)

Watch Video Solution

21. A body of mass m accelerates uniformly from rest to velocity v_0 in time t_0. What is the instantaneous power delivered to the body when its velocity is $\frac{v_0}{2}$?

A. $m\frac{v_0^2}{t_0}$

B. $m\frac{v_0}{2}t_0$

C. $m\frac{v_0^2}{2}t_0$

D. $m\frac{v_0}{3}t_0$

Answer: (3)

Watch Video Solution

22. A particle of mass $2kg$ starts moving in a straight line with an initial velocity of $2m/s$ at a constant acceleration of $2m/s^2$. Then rate of change of kinetic energy.

A. is four times the velocity at any moment

B. is two times the displacement at any moment.

C. is four times the rate of change of velocity at any moment.

D. is constant throughout

Answer: (1)

Watch Video Solution

23. A lifting machine, having an efficiency of 80% uses $2500J$ of energy in lifting a $10kg$ load over a certain height. If the load is now allowed to fall through that height freely, its velocity at the end of the fall will be $(g = 10m/s^2)$

A. $10ms^{-1}$

B. $15ms^{-1}$

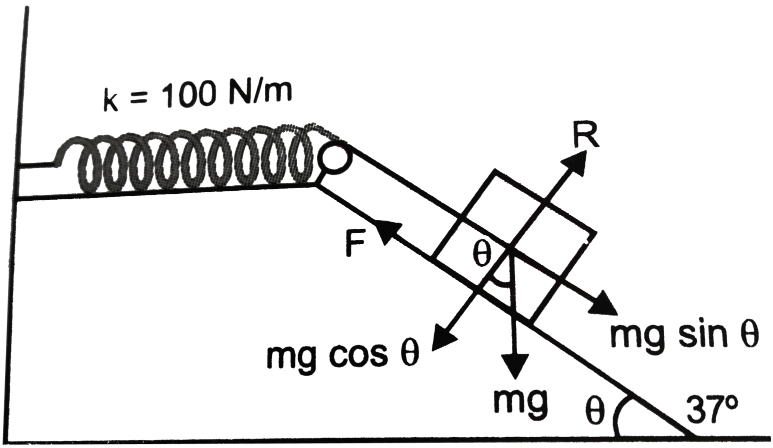
C. $20ms^{-1}$

D. $25ms^{-1}$

Answer: (3)

Watch Video Solution

24. A 1kg block situated on a rough incline is connected to a spring of spring constant $100Nm^{-1}$ as shown in figure,. The block is released from rest with the spring in the unstretched position. The block moves 10cm down the incline before coming to rest. Find the coefficient of friction between the block and the incline. Assume that the spring has negligible mass and the pulley is frictionless.



A. 0.125

B. 1.25

C. 5.2

D. 4.5

Answer: (1)

Watch Video Solution

25. A light spring of force constant 'K' is held between two blocks of masses 'm' and '2m'. The two blocks and the spring system rests on a smooth horizontal floor. Now th blocks are moved towards each other compressing the springs by 'x' and suddenly released. The relative velocity between the blocks when the spring attains its natural length will be

A. $\left(\frac{\sqrt{3K}}{2m}\right)x$

B. $\left(\frac{\sqrt{2K}}{3m}\right)x$

C. $\left(\frac{\sqrt{K}}{3m}\right)x$

D. $\left(\frac{\sqrt{K}}{2m}\right)x$

Answer: (1)

Watch Video Solution

26. During gas of negligible mass is sealed in a test tube of mass $50gm$ with the helo of a stopper of mass $3.5gm$. The test tube is suspended from a fixed point with help of massless string such that the test tube is horizontal and distance between point of suspension and centre of mass of test tube is $25cm$. The test tube is heated to a temperature due to which stopper is ejected out horizontally while test tube completes a vertical circle of radius $25cm$. The minimum velocity with which stopper should be ejected out is

A. 72 kmph

B. 90 kmph

C. 180 kmph

D. 360 kmph

Answer: (3)

Watch Video Solution

27. A block is freely sliding down from a vertical height $4m$ on smooth inclined plane. The block reaches bottom of inclined plane and then it decribes vertical circle of radius $1m$ along smooth track. The ratio of normal reactions on the block while it crossing lowest point and highest point of vertical circle is

A. $6:1$

B. $5:1$

C. $3:1$

D. $5:2$

Answer: (3)

Watch Video Solution

28. The length of a ballistic pendulum is $1m$ and mass of its block is $1.9kg$. A bullet of mass $0.1kg$ strikes the block in horizontal direction with a velocity $100ms^{-1}$ and got embedded in the block. After collision the combined mass swings away from lowest point. The tension in the strings when it makes an angle 60° with vertical is $\left(g = 10ms^{-2}\right)$.

A. 20 N

B. 30 N

C. 40 N

D. 50 N

Answer: (3)

Watch Video Solution

29. A stone attached to a string is rotated in a vertical circle such that when it is at the top of the circle its speed is V and there is neither tension nor slacking in the string. The speed of stone when its angular displacement is 120° from the lowest point is

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

B. $\sqrt{2}V$

C. $\sqrt{3}V$

D. $\frac{\sqrt{3}}{2}V$

Answer: (2)

Watch Video Solution

30. Mass of the bob of a simple pendulum of length L is m. If the bob is projected horizontally from its mean position with velocity $\sqrt{4gL}$, then the tension in the string becomes zero after a vertical displacement of

A. $\frac{L}{3}$

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

C. $4\frac{L}{3}$

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

Answer: (4)

Watch Video Solution

31. A wooden block of mass $10gm$ is dropped from the top of a cliff $100m$ high. Simultaneously a bullet of same mass is fired from the foot of the cliff vertically upwards with a velocity of $100ms^{-1}$. If the bullet after collision gets embedded in the block, the common velocity of the bullet and the block immediately after collision is $\left(g = 10ms^{-2}\right)$.

A. $40ms^{-1} downward$

B. $40ms^{-1} upward$

C. $80ms^{-1} upward$

D. zero

Answer: (2)

Watch Video Solution

32. A test tube of mass $20gm$ is filled with a gas and fitted with a stopper of $2gm$. It is suspended horizontally by means of a thread of $1m$ length and heated. When the stopper kicks out, the tube just completes a circle in vertical plane. The velocity with which the stopper kicked out is

A. $7ms^{-1}$

B. $10ms^{-1}$

C. $70ms^{-1}$

D. $0.1ms^{-1}$

Answer: (3)

Watch Video Solution

33. Two bodies move towards each other and collide inelastically. The velocity of the first body is $2m/s$ and that of the seconf is $4m/\sec$ before impact. The common velocity after collision is $1m/s$ in the direction of the first body. The number of times did the KE of the first body exceed that of the second body before collision.

A. 4.25

B. 3.25

C. 2.25

D. 1.25

Answer: (4)

Watch Video Solution

34. A body A moves towards a wall with velocity V. The wall also moves towards the body A with velocity V_0. After collision the body moves in opposite direction with velocity V^1 which is $\left(1+\frac{2V_0}{V}\right)$ times the velocity V. The coefficient of restitution is

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

B. $\frac{1}{3}$

C. 1

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

Answer: (3)

Watch Video Solution

35. A sphere A of mass m moving with a velocity hits another stationary sphere B of same mass. If the ratio of the velocity of the sphere after collision is $\frac{v_A}{v_B} = \frac{1-e}{1+e}$ where e is the coefficient of restitution, what is the initial

velocity of sphere A with which it strikes?

A. $V_A + V_B$

B. $V_A - V_B$

C. $V_B - V_A$

D. $\frac{V_B + V_A}{2}$

Answer: (1)

Watch Video Solution

36. An electron and a proton are moving under the influence of mutual forces. In calculating the change in the kinetic energy of the system during motion, one ignores the magnetic force of one on another. This is because,

A. the two magnetic forces are equal and opposite, so they produce no net effect.

B. the magnetic forces do not work on each particle

C. the magnetic forces do equal and opposite(but non-zero) work on each particle

D. the magnetic forces are necessarily negligible

Answer: (2)

Watch Video Solution

37. A proton is kept at rest. A positively charged particle is released from rest at a distance d in its field. Consider two experiments, one ini which the charged particle is also a proton and in another, a position. In the same time t, the work done on the two moving charged particles is

A. same as the same force law is involved in the two experiments

B. less for the case of positron, as the positron moves away more rapidly and the force on it weakens

C. more for the case of a positron, as the positron moves away a larger distance

D. same as the work done by charged particle on the stationary proton

Answer: (3)

Watch Video Solution

38. A man squatting on the ground gets straight up and stand. The force of reaction of ground on the man during the process is.

A. constant and equal to mg in magnitude

B. constant and greater than mg in magnitude

C. variable but always greater than mg

D. at first greater than mg and later becomes equal to mg

Answer: (4)

Watch Video Solution

39. A cyclist comes to a skidding stop in $10m$. During this process, the force on the cycle due to the road is $200N$ and is directly opposite to the motion.

a. How much work does the road do on the cycle?

b. How much work does the cycle do on the road?

A. $+2000J$

B. $-200J$

C. zero

D. $-20,000J$

Answer: (3)

Watch Video Solution

40. A body is falling freely under the action of gravity alone in vacuum. Which of the following quantities remain constant during the fall ?

A. Kinetic energy

B. Potential energy

C. Total mechanical energy

D. Total linear momentum

Answer: (3)

Watch Video Solution

41. During inelastic collision between two bodies, which of the following quantities always remain conserved ?

A. Total kinetic energy

B. Total mechanical energy

C. Total linear momentum

D. Speed of each body

Answer: (3)

Watch Video Solution

42. A mass of $5kg$ is moving along a circular path or radius $1m$. If the mass moves with 300 revolutions per minute, its kinetic energy would be

A. $250\pi^2 J$

B. $100\pi^2 J$

C. $5\pi^2 J$

D. $0J$

Answer: (1)

Watch Video Solution

43. In a shotput event an athlete throws the shotput of mass $10kg$with an initial speed of $1ms^{-1}$ at 45° from a height $1.5m$ above ground. Assuming air resistance to be negligible and acceleration due to gravity to be $10ms^{-2}$, the kinetic energy of the shotput when it just reaches the ground will be

A. $2.5J$

B. $5.0J$

C. $52.5J$

D. $155.0J$

Answer: (4)

Watch Video Solution