PHYSICS

BOOKS - DISHA PHYSICS (HINGLISH)

WORK, ENERGY AND POWER

Physics

1. A spring of spring constant $5 \times 10^3 N/m$ is stretched initially by 5 cm from the

unstretched position. The work required to further stretch the spring by another 5 cm is .

A. $12.50Nm$

B. $18.75Nm$

C. $25.00Nm$

D. $6.25Nm$

Answer:

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2. A paritcal of mass $10g$ moves along a circle of radius $6.4cm$ with a constant tangennitial acceleration. What is the magnitude of this acceleration . What is the magnitude of this acceleration if the kinetic energy of the partical becomes equal to $8 \times 10^{-4} J$ by the end of the second revolution after the beginning of the motion?

A. $0.1m/s^2$

B. $0.15m/s^2$

C. $1.8m/s^2$

D. $0.2m/s^2$

Answer:

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3. 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. $t^{3/4}$

B. $t^{3/2}$

C. $t^{1/4}$

D. $t^{1/2}$

Answer:

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4. 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. $28ms^{-1}$

C. $10ms^{-1}$

D. $14ms^{-1}$

Answer:

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5. A cord is used to lower vertically a block of mass M, a distance d at a constant downward acceleration of $\frac{g}{4}$, then the work done by the cord on the block is

A. $Mg.\ \frac{d}{4}$

B. $3Mg.\ \frac{d}{4}$

C. $-3Mg.\ \frac{d}{4}$

D. mgd

Answer:

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6. A rubber ball is dropped from a height of $5m$ on a plane, where the acceleration due to gravity is not shown. On bouncing it rises to $1.8m$. The ball loses its velocity on bouncing by a factor of

A. $\frac{16}{25}$

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

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

D. $\frac{9}{25}$

Answer:

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7. The first ball of mass m moving with the velocity v collides head on with the second ball of mass m at rest. If the coefficient of restitution is e, then the ratio of the velocities of the first and the second ball after the collision is

A. $\frac{1-e}{1+e}$

B. $\frac{e-1}{e+1}$s

C. $\frac{1+e}{e+1}$

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

Answer:

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8. 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. $\sqrt{mk} \quad t^{-1/2}$

B. $\sqrt{2mk} \quad t^{-1/2}$

C. $\frac{1}{2}\sqrt{mk} \quad t^{-1/2}$

D. $\sqrt{\frac{mk}{2}} \quad t^{-1/2}$

Answer:

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9. 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 .

A. $1.6 joule$

B. $16 joule$

C. $160 joule$

D. $1600 joule$

Answer:

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10. A sphere of mass $8m$ collides elastically (in one dimension) with a block of mass $2m$. If the initial energy of sphere is E. What is the final energy of sphere?

A. $0.8E$

B. $0.36E$

C. $0.08E$

D. $0.64E$

Answer:

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11. Two similar springs P and Q have spring constants K_P and $K_Q(K_P > K_Q)$. They are stretched first by the same amount (case a) ,then by the same force (case b). The work done by the spring W_P and W_Q are related as, in case (a) and case (b), respectively.

A. $W_P = W_Q, W_P = W_Q$

B. $W_P > W_Q, W_P > W_Q$

C. $W_P < W_Q, W_P < W_Q$

D. $W_P = W_Q, W_P > W_Q$

Answer:

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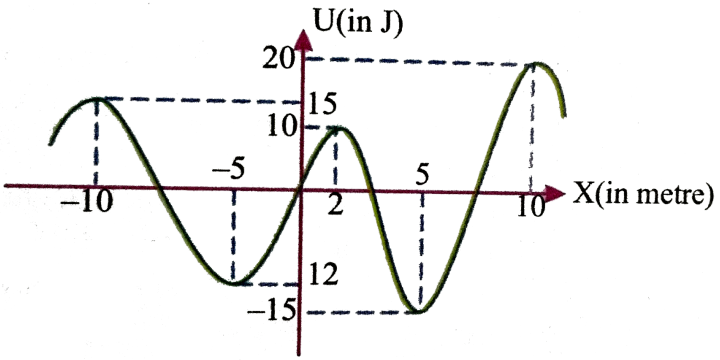
12. In the figure the variation of potential energy of a particle of mass $m = 2kg$ is represented w.r.t. its x-coordinate. The particle moves under the effect of this conservative force along the x-axis.



If the particle is released at the origin then

A. it will move towards positive x-axis

B. it will move towards negative x-axis

C. it will remain stationary at the origin

D. its subsequent motion cannot be decided due to lack of information

Answer:

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13. 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. 20

B. 10

C. 30

D. 40

Answer:

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14. A force applied by an engine of a train of mass 2.05×10^6kg changes its velocity from 5 m/s to 25 m/s in 5 minutes. The power of the engine is

A. $1.025MW$

B. $2.05MW$

C. $5MW$

D. $6MW$

Answer:

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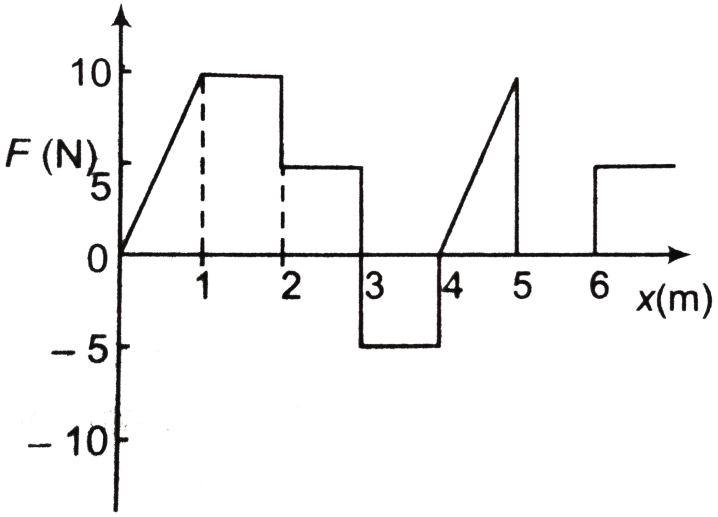
15. The relationship between the force F and position x of body is as shown in figure. The work done in displacing the body in displacing

the body from ($x = 1m$ to $x = 5m$) will be



A. $30J$

B. $15J$

C. $25J$

D. $20J$

Answer:

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16. A body is allowed to fall freely under gravity from a height of $10m$. If it looses $25\,\%$ of its energy due to impact with the ground, then the maximum height it rises after one impact is

A. $2.5m$

B. $5.0m$

C. $7.5m$

D. $8.2m$

Answer:

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17. Block C of mass M is moving with velocity V_0 and collides elastically with block A of mass M and connected to another block B of mass 2M through a spring of spring constant K. What is

K if X_0 is the compression of spring when velocity of A and B is same

A. $\frac{mv_0^2}{x_0^2}$

B. $\frac{mv_0^2}{2x_0^2}$

C. $\frac{3}{2}\frac{mv_0^2}{x_0^2}$

D. $\frac{2}{3}\frac{mv_0^2}{x_0^2}$

Answer:

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18. Two springs of force constants $300\frac{N}{m}$ (Spring A) and $400\frac{N}{m}$ (Spring B) are joined together in series. The combination is compressed by $8.75cm$. The ratio of energy stored in A and B is $\frac{E_A}{E_B}\text{Then}\frac{E_A}{E_B}$ is equal to:

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

B. $\frac{16}{9}$

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

D. $\frac{9}{16}$

Answer:

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19. 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. $\left(2t^2 + 3t^3\right)W$

B. $\left(2t^2 + 4t^4\right)W$

C. $\left(2t^3 + 3t^4\right)W$

D. $\left(2t^3 + 3t^5\right)W$

Answer:

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20. A bullet of mass $20g$ and moving with $600\frac{m}{s}$ collides with a block of mass $4kg$ hanging with the string. What is the velocity of bullet when it comes out of block, if block rises to height $0.2m$ after collision?

A. $200m/s$

B. $150m/s$

C. $400m/s$

D. $300m/s$

Answer:

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21. A body of mass m kg is ascending on a smooth inclined plane of inclination $\theta\left(\sin\theta = \frac{1}{x}\right)$ with constant acceleration of a m/s^2. The final velocity of the body is v

m/s^2. The work done by the body during this motion is (Initial velocity of the body = 0)

A. $\frac{1}{2}mv^2(g+xa)$

B. $\frac{mv^2}{2}\left(\frac{g}{2}+a\right)$

C. $\frac{2mv^2}{a}(a+gx)$

D. $\frac{mv^2}{2ax}(g+xa)$

Answer:

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22. A glass marble dropped from a certain height above the horizontal surface reaches the surface in time t and then continues to bounce up and down. The time in which the marble finally comes to rest is

A. $e^n t$

B. $e^2 t$

C. $t\left[\frac{1+e}{1-e}\right]$

D. $t\left[\frac{1-e}{1+e}\right]$

Answer:

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23. 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 mechainical energy of the particle is $2J$. Then , the maximum speed (in m//s) is

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

B. $(\sqrt{2})$

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

D. 2

Answer:

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24. 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:

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25. 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. $t^2 P_0$

B. $t^{1/2}$

C. $t^{-1/2}$

D. $\frac{t}{\sqrt{m}}$

Answer:

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26. When a $1.0kg$ mass hangs attached to a spring of length $50cm,$ the spring stretches by $2cm.$ The mass is pulled down until the length of the spring becomes $60cm.$ What is the amount of elastic energy stored in the spring in this condition. if $g = 10m/s^2.$

A. $1.5joule$

B. $2.0joule$

C. $2.5joule$

D. $3.0joule$

Answer:

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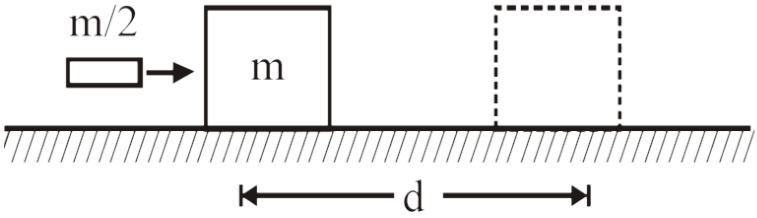
27. A block of mass m rests on a rough horizontal surface (Coefficient of friction isμ). When a bullet of mass $m/2$ strikes horizontally, and get embedded in it, the block moves a distance d before coming to rest. The initial velocity of the bullet is $k\sqrt{2\mu gd}$, then

the value of k is



A. 2

B. 3

C. 4

D. 5

Answer:

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28. A force act on a $30gm$ particle as a friction of the particle as a function as given by $x = 3t - 4t^2 + t^3$, where x is in metros and t is in seconds. The work done during the first 4 second is

A. $576mJ$

B. $450mJ$

C. $490mJ$

D. $530mJ$

Answer:

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29. A body of mass M_1 collides elastically with another mass M_2 at rest. There is maximum transfer of energy when :

A. $m_1 > > m_2$

B. $m_2 > > m_2$

C. $m_1 = m_2$

D. $m_1 = 2m_2$

Answer:

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30. A ball of mass 'm' moving with a horizontal velocity 'v' strikes the bob of mass 'm' of a pendulum at rest. During this collision, the ball sticks with the bob of the pendulum. The height to which the combined mass raises is (g = acceleration due to gravity).

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

B. $\frac{v^2}{4g}$

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

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

Answer:

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31. A 10 H.P. motor pumps out water from a well of depth 20 m and fills a water tank of volume 22380 litres at a height of 10 m from the ground. The running time of the motor to fill the empty water tank is ($g = 1 = ms^{-2}$)

A. 5 minutes

B. 10 minutes

C. 15 minutes

D. 15 minutes

Answer:

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32. 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. $E_1 < E_2$

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

D. $E_1 > E_2$

Answer:

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33. A bolck of mass $10kg$ is moving in x-direction with a constant speed of $10m/s$. it is subjected to a retardeng force $F = -0.1xJ/m$. During its travel from $x = 20m$ to $x = 30m$. Its final kinetic energy will be .

A. $450J$

B. $275J$

C. $250J$

D. $475J$

Answer:

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34. Identify the false statement from the following

A. Work-energy theorem is not independent of Newton's second law.

B. Work-energy theorem holds in all inertial frames.

C. Work done by friction over a closed path is zero.

D. No potential energy can be associated with friction.

Answer:

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35. A one-ton car moves with a constant velocity of $15ms^{-1}$ on a rough horizontal road. The total resistance to the motion of the

car is $12\ \%$ of the weight of the car. The power required to keep the car moving with the same constant velocity of $15ms^{-1}$ is [Take $g = 10ms^{-2}$]

A. $9kW$

B. $18kW$

C. $24kW$

D. $36kW$

Answer:

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

A. $1:2:3$

B. $1:4:9$

C. $1:3:5$

D. $1:5:3$

Answer:

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37. 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. $\theta = \tan^{-1}(1/2)$ " to the x-axis"

D. $\theta = \tan^{-1}(-1/2)$" to the x-axis"

Answer:

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38. A $2kg$ block slides on a horizontal floor with the a speed of $4m/s$ it strikes a uncompressed spring , and compresses it till the block is motionless . The kinetic friction force is compresses is $15N$ and spring constant is $10000N/m$. The spring by

A. $8.5cm$

B. $5.5cm$

C. $2.5cm$

D. $11.0cm$

Answer:

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39. A uniform chain of length $2m$ is kept on a table such that a length of $60cm$ hangas freely from the adge of the table . The table . The

total mass of the chain ia $4kg$ What is the work done in pulling the entire the chain the on the table ?

A. $12J$

B. $3.6J$

C. $7.2J$

D. $1200J$

Answer:

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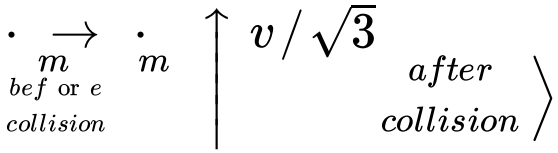
40. A mass 'm' moves with a velocity 'v' and collides inelastieally with another identical mass . After collision the 1^{st} mass moves with velocity $\frac{v}{\sqrt{3}}$ in a direction perpendicular to the initial direction of motion. Find the speed of the 2^{nd} mass after collision.



A. $\sqrt{3}v$

B. v

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

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

Answer:

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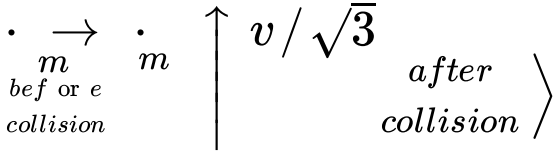
41. A mass 'm' moves with a velocity 'v' and collides inelastieally with another identical mass . After collision the 1^{st} mass moves with velocity $\frac{v}{\sqrt{3}}$ in a direction perpendicular to the initial direction of motion. Find the speed

of the 2^{nd} mass after collision.



A. $\sqrt{3v}$

B. v

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

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

Answer:

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42. A spherical ball of mass $20kg$ is stationary at the top of a hill of height $100m$, it rolls down a smooth surface to the ground , then climbs up another bill of height of $30m$ and final rolls down to a horizontal base at a height of $20m$ about the ground . The velocity attained by the ball is

A. $20m/s$

B. $40m/s$

C. $10\sqrt{30}m/s$

D. $10m/s$

Answer:

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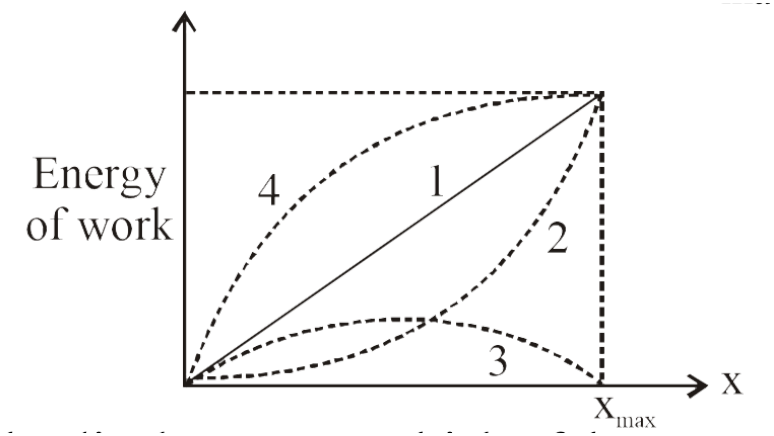
43. A block of mass M is kept on a platform which is accelerated upward with a constant acceleration 'a' during the time interval T. The work done by normal reaction between the

block and platform is



A. $-\frac{MgaT^2}{2}$

B. $\frac{1}{2}M(g+a)aT^2$

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

D. Zero

Answer:

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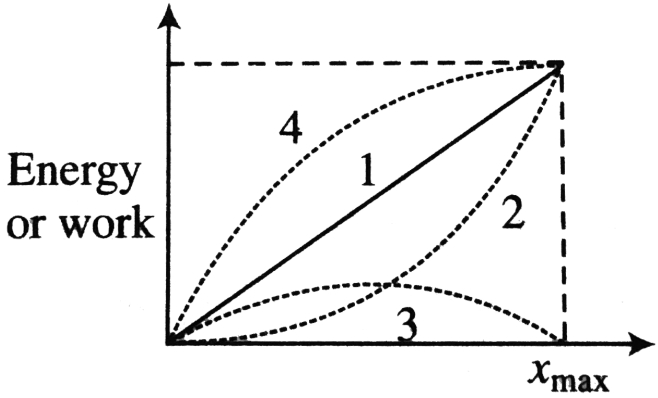
44. A srping lies along the x-axis attached to a wall at one end and a block at the other end. The block rests on a friction less surface at $x = 0$. A force of constant magnitude F is applied to the block that begins to compress the spring, until the block comes to a maximum displacement $x_{\max}$.



During the displacement, which of the curves shown in the graph best represents the kinetic energy of the block?

A. 1

B. 2

C. 3

D. 4

Answer:

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45. The $K.E.$ acquired by a mass m in travelling a certain distance d, starting from rest, under the action of a constant force is directly propotional to

A. m

B. $\sqrt{m}$

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

D. independent of m

Answer:

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46. 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. $mg(h+d)-\frac{1}{2}kd^2$

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:

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