PHYSICS

NEET

CRASH COURSE

CIRCULAR MOTION
WORK, ENERGY & POWER

SMART ACHIEVERS

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CIRCULAR MOTION, WORK, ENERGY & POWER

Q.1 A body which is constrained for move along Y–direction is acted upon by a force $\vec{F} = (-2\hat{i} + 15\hat{j} + 6\hat{k})N$. The work done by this force in displacing the body by 10m along Y–axis is-

(1) 105 (2) 150 (3) 250 (4) 100

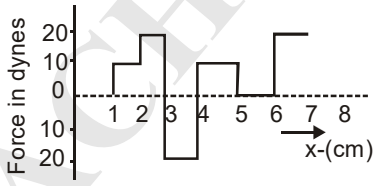
Q.2 Find the workdone in moving a 50 kg. block through a horizontal distance of 10 m. by applying a force of 100 N which makes an angle of 60° with the horizontal-

(1) 50 Joule (2) 50 ergs (3) 500 Joule (4) 500 ergs

Q.3 A position dependent force $F = 7 - 2x + 3x^2$ newton acts on a small body of mass 2 kg and displaces it from x = 0 to x = 5m. The work done in joules is

(1) 70 (2) 270 (3) 35 (4) 135

Q.4 The relationship between force and position is shown in the figure given (in one dimensional case). The work done by the force in displacing a body from x = 1 cm to x = 5 cm is -



(1) 20 ergs (2) 60 ergs (3) 70 ergs (4) 700 ergs

Q.5 Given that the displacement of the body in metre is a function of time as follows : $x = 2t^4 + 5$. The mass of the body is 2 kg. What is the increase in its kinetic energy one second after the start of motion-

(1) 8 J (2) 16 J (3) 32 J (4) 64 J

Q.6 The negative of the work done by the conservative internal forces on a system equals the change in

(1) total energy (2) kinetic energy (3) potential energy (4) none of these

Q.7 Two springs of spring constants 1500 N/m and 3000 N/m respectively are stretched with the same force. They will have potential energy in the ratio-

(1) 4 : 1 (2) 1 : 4 (3) 2 : 1 (4) 1 : 2

Q.8 When a body of mass m is suspended from a spiral spring of natural length L, the spring gets stretched through a distance h. The potential energy of the stretched spring is-

(1) $\frac{mgh^2}{2}$ (2) mgh (3) $\frac{1}{2}$mgh (4) $\frac{1}{2}$mg (L + h)

Q.9 If a spring extends by x on loading, then the energy stored by the spring is- (T is the tension in the spring and K is force constant)

(1) $\frac{2x}{T^2}$ (2) $\frac{T^2}{2K}$ (3) $\frac{2K}{T^2}$ (4) $\frac{T^2}{2x}$

Q.10 An ideal massless spring S can be compressed 2 metre by a force of 200 N. This spring is placed at the bottom of the frictionless inclined plane with makes an angle $\theta = 30°$ with the horizontal. A 20 kg mass is released from rest at the top of the inclined plane and is brought to rest momentarily after compressing the spring 4 metre. Through what distance does the mass slide before coming to rest- ($g = 10\ m/s^2$)

(1) 2.2 m (2) 4 m (3) 8 m (4) 1.9 m

Q.11 A weight lifter lifts a weight 300 kg. from ground to a height of 2 m. in 3 sec. Average power developed by him-

(1) 2210 watt (2) 8820 watt (3) zero watt (4) 1960 watt

Q.12 An engine is capable of providing 10 kW power, the time taken by it in raising a lift of mass 200 kg to a height of 40m is- ($g = 10 m/sec^2$)

(1) 4 sec (2) 5 sec (3) 8 sec (4) 10 sec

Q.13 If a force F is applied on a body and it moves with a velocity v the power will be-

(1) Fv (2) F/v (3) F/v^2 (4) Fv^2

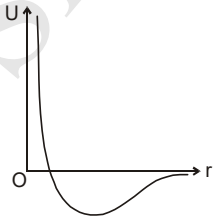
Q.14 A train weighing 10^7 N is running on a level track with uniform speed of 36 km/h. the frictional force is 0.5 kg f per quintal. What is the power of the engine- ($g = 10\ m/sec^2$)

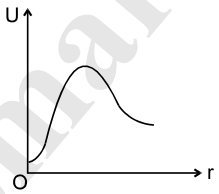
(1) 0.5 kw (2) 5 kw (3) 50 kw (4) 500 kw

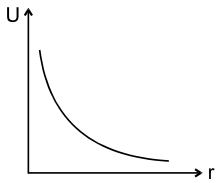
Q.15 The potential energy of a particle in a field is $U = \frac{a}{r^2} - \frac{b}{r}$, where a and b are constant. The value of r in terms of a and b where force on the particle is zero will be :

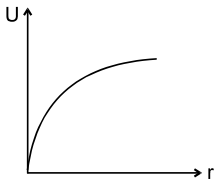
(1) $\frac{a}{b}$ (2) $\frac{b}{a}$ (3) $\frac{2a}{b}$ (4) $\frac{2b}{a}$

Q.16 The diagrams represent the potential energy U of a function of the inter-atomic distance r. Which diagram corresponds to stable molecules found in nature.

(1) 

(2) 

(3) 

(4) 

Q.17 The potential energy for a force field $\vec{F}$ is given by $U(x, y) = \sin(x + y)$. Magnitude of the force acting on the particle of mass m at $\left(0, \frac{\pi}{4}\right)$ is

(1) 1 (2) $\sqrt{2}$ (3) $\frac{1}{\sqrt{2}}$ (4) 0

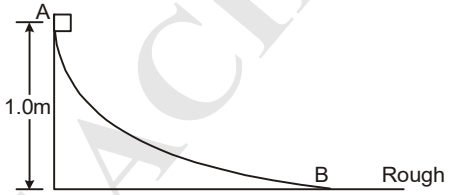
Q.18 A particle is moving in a potential region given by $U = K(x^2 + y^2 + z^2)$. The force acting on the particle is given by-

(1) $-2k(x\hat{i} + y\hat{j} + z\hat{k})$ (2) $k(x\hat{i} + y\hat{j} + z\hat{k})$ (3) $\frac{k}{2}(x\hat{i} + y\hat{j} + z\hat{k})$ (4) $k(x^2\hat{i} + y^2\hat{j} + z^2\hat{k})$

Q.19 There are two massless springs A and B of spring constant K_A and K_B respectively and $K_A > K_B$. If W_A and W_B be denoted as work done on A and work done on B respectively, then

(1) If they are compressed to same distance, $W_A > W_B$
(2) If they are compressed by same force (upto equilibrium state) $W_A = W_B$
(3) If they are compressed by same distance, $W_A = W_B$
(4) If they are compressed by same force (upto equilibrium state) $W_A > W_B$

Q.20 A block weighing 10 N travles down a smooth curved track AB joined to a rough horizontal surface (figure). The rough surface has a friction coefficient of 0.20 with the block. If the block starts slipping on the track from a point 1.0 m above the horizontal surface, the distance it will move on the rough surface is :



(1) 5.0 m (2) 10.0 m (3) 15.0 m (4) 20.0 m

Q.21 The potential energy of a particle varies with x according to the relation $U(x) = x^2 - 4x$. The point x = 2 is a point of :

(1) stable equilibrium (2) unstable equilibrium (3) neutral equilibrium (4) none of above

Q.22 The potential energy function associated with the force $\vec{F} = 4xy\,\hat{i} + 2x^2\hat{j}$ is :

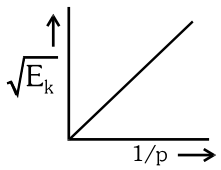
(1) $U = -2x^2y$ (2) $U = -2x^2y +$ constant
(3) $U = 2x^2y +$ constant (4) not defined

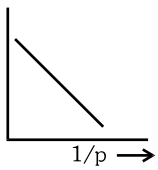
Q.23 The relation between conservative force and potential energy U is given by :–

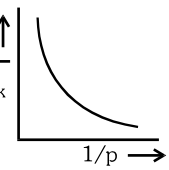
(1) $\vec{F} = \frac{dU}{dx}$ (2) $\vec{F} = \int U\,dx$ (3) $\vec{F} = -\frac{dU}{dx}$ (4) $\vec{F} = \frac{dU}{dx}$

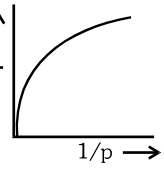
Q.24 The graph between $\sqrt{E_k}$ and $\frac{1}{p}$ is

(E_K = kinetic energy and p = momentum) –

(1) 

(2) 

(3) 

(4) 

Q.25 The mass of a bucket full of water is 15 kg. It is being pulled up from a 15m deep well. Due to a hole in the bucket 6 kg water flows out of the bucket. The work done in drawing the bucket out of the well will be –

(1) 900 Joule (2) 1500 Joule (3) 1800 Joule (4) 2100 Joule

Q.26 A stone is projected vertically up to reach maximum height 'h'. The ratio of its kinetic energy to potential energy, at a height $\frac{4h}{5}$ will be :-

(1) 5 : 4 (2) 4 : 5 (3) 1 : 4 (4) 4 : 1

Q.27 The ratio of angular speeds of minutes hand and hour hand of a watch is -

(1) 1 : 12 (2) 6 : 1 (3) 12 : 1 (4) 1:6

Q.28 In uniform circular motion-

(1) both velocity and acceleration are constant
(2) acceleration and speed are constant but velocity changes
(3) both acceleration and velocity change
(4) both acceleration and speed are constant

Q.29 What happens to the centripetal acceleration of a revolving body if you double the orbital speed v and halve the angular velocity ω ?

(1) the centripetal acceleration remains unchanged
(2) the centripetal acceleration is halved
(3) the centripetal acceleration is doubled
(4) the centripetal acceleration is quadrupled

Q.30 The breaking tension of a string is 10 N. A particle of mass 0.1 kg tied to it is rotated along a horizontal circle of radius 0.5 metre. The maximum speed with which the particle can be rotated without breaking the string is-

(1) $\sqrt{5}$ m/sec (2) $\sqrt{(50)}$ m/sec (3) $\sqrt{(500)}$ m/sec (4) $\sqrt{(1000)}$ m/sec

Q.31 A car of mass m is taking a circular turn of radius 'r' on a frictional level road with a speed v. In order that the car does not skid-

(1) $\frac{mv^2}{r} \geq \mu mg$ (2) $\frac{mv^2}{r} \leq \mu mg$ (3) $\frac{mv^2}{r} = \mu mg$ (4) $\frac{v}{r} = \mu mg$

Where 'μ' is coefficient of friction

Q.32 A body is revolving with a uniform speed V in a circle of radius r. The angular acceleration of the body is -

(1) $\frac{V}{r}$ (2) Zero

(3) $\frac{V^2}{r}$ along the radius and towards the centre (4) $\frac{V^2}{r}$ along the radius and away from the centre

Q.33 A car is travelling with linear velocity v on a circular road of radius r. If it is increasing it speed at the rate of 'a' metre/sec^2, then the resultant acceleration will be-

(1) $\sqrt{\left(\frac{v^2}{r^2}-a^2\right)}$ (2) $\sqrt{\left(\frac{v^4}{r^2}+a^2\right)}$ (3) $\sqrt{\left(\frac{v^4}{r^2}-a^2\right)}$ (4) $\sqrt{\left(\frac{v^2}{r^2}+a^2\right)}$

Q.34 A body of mass 2 kg is tied at one end of a string 1 m long. The other end is fixed and the body revolves in a horizontal circle. The maximum tension which the string can withstand is 2000 N. Calculate the maximum number of revolutions per minute the body will make and its linear velocity when the string just breaks-

(1) 203 rpm, 13.6 m/sec (2) 32 rpm, 16.3 m/sec
(3) 302 rpm, 61.3 m/sec (4) 302 rpm, 31.6 m/sec

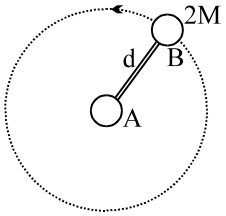
Q.35 A particle rests on the top of a hemisphere of radius R. Find the smallest horizontal velocity that must be imparted to the particle if it is to leave the hemisphere without sliding down it-

(1) $\sqrt{gR}$ (2) $\sqrt{2gR}$ (3) $\sqrt{3gR}$ (4) $\sqrt{5gR}$

Q.36 A particle is moving in a circle :

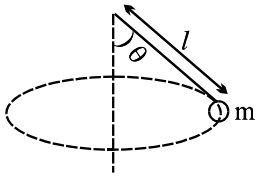
(1) The resultant force on the particle must be towards the centre.
(2) The cross product of the tangential acceleration and the angular velocity will be zero.
(3) The direction of the angular acceleration and the angular velocity must be the same.
(4) The resultant force may be towards the centre.

Q.37 The dumbell is placed on a frictionless horizontal table. Sphere A is attached to a frictionless pivot so that B can be made to rotate about A with constant angular velocity. If B makes one revolution in period P, the tension in the rod is



(1) $\frac{4\pi^2Md}{P^2}$ (2) $\frac{8\pi^2Md}{P^2}$ (3) $\frac{4\pi^2Md}{P}$ (4) $\frac{2Md}{P}$

Q.38 A conical pendulum is moving in a circle with angular velocity ω as shown. If tension in the string is T, which of following equations are correct ?



(1) $T = m\omega^2 l$ (2) $T\sin\theta = m\omega^2 l$
(3) $T = mg\cos\theta$ (4) $T = m\omega^2 l\sin\theta$

Q.39 If a setellite moves above Earth's atmosphere in a circular orbit with constant speed, then :

(1) its acceleration and velocity are always in the same direction
(2) the net force on it is zero
(3) its velocity is constant
(4) its acceleration is toward the Earth

Q.40 A car rounds a 75-m radius curve at a constant speed of 18 m/s. A ball is suspended by a string from the ceiling the car and moves with the car. The angle between the string and the vertical is :

(1) 0 (2) 1.4° (3) 24° (4) 90°

Q.41 Circular freeway entrance and exit ramps are commonly banked to handle a car moving at 13 m/s. To design a similar ramp for 26 m/s one should :

(1) increase radius by factor of 2 (2) decrease radius by factor of 2

(3) decrease radius by factor of 4 (4) decrease radius by factor of 4

Q.42 A car is moving with a speed V on a road inclined at an angle θ in a circular arc of radius r, the minimum coefficient of friction so that the car does not slip away-

(1) $\frac{V^2}{rg} = \mu \tan\theta$ (2) $\mu = V^2/rg$ (3) $\frac{V^2\cos\theta - rg\sin\theta}{rg\cos\theta + V^2\sin\theta}$ (4) $\frac{V^2\cos\theta - rg\sin\theta}{rg\cos\theta - V^2\sin\theta}$

Q.43 Three small balls each of mass 100 gm are attached at distance of 1 m, 2 m and 3 m from end D of a 3 m length of string. The string is rotated with uniform angular velocity in a horizontal plane about D. If the outside ball is moving at a speed of 6 m/s, the ratio of tension in the three parts of the string from inside-

(1) 6 : 5 : 4 (2) 3 : 2 :1 (3) 3 : 5 : 6 (4) 6 : 5 : 3

Q.44 A force $\vec{F} = 2\hat{i} - 3\hat{j} + 7\hat{k}$ (N) acts on a particle which undergoes a displacement $\vec{r} = 7\hat{i} + 3\hat{j} - 2\hat{k}$ (M). Calculate the work done by the force

(1) 37 J (2) –9 J (3) 49 J (4) 14 J

Q.45 If a man increases his speed by 2 m/sec, his K.E. is doubled. The original speed of the man is-

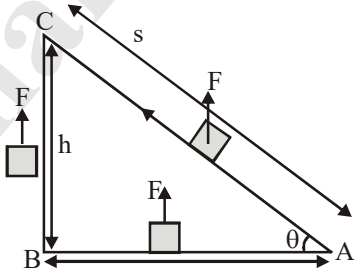
(1) $(2+\sqrt{2})$ m/s (2) $(2+2\sqrt{2})$ m/s (3) 4 m/s (4) $(1+\sqrt{2})$ m/s

Q.46 The principle of conservation of energy implies that-

(1) the total mechanical energy is conserved. (2) the total kinetic energy is conserved

(3) the total potential energy is conserved. (4) sum of all types of energies is conserved.

Q.47 If we shift a body in equilibrium from A to C in a gravitational field via path AC or ABC :



(1) the work done by the force $\vec{F}$ for both paths will be same

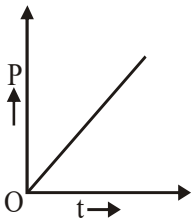
(2) $W_{AC} > W_{ABC}$

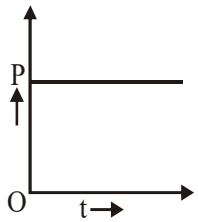
(3) $W_{AC} < W_{ABC}$

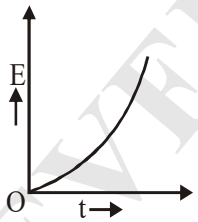
(4) none of the above

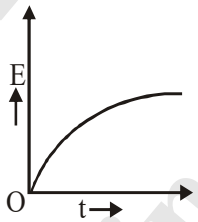
Q.48 The elastic potential energy of a spring
(1) increases only when it is stretched (2) decreases only when it is stretched
(3) decreases only when it is compressed (4) increases whether stretched or compressed

Q.49 A vehicle is driven along a straight horizontal track by a motor which exerts a constant driving force. The vehicle starts from rest at t = 0 and the effects of friction and air resistance are negligible. If KE of vehicle at time t is E and power developed by the motor is P, which of the given graphs is/are correct?

(1) 

(2) 

(3) 

(4) 

Q.50 A position dependent force $F = 7 - 2x + 3x^2$ newton acts on a small body of mass 2 kg and displaces it from x = 0 to x = 5 m. The work done in joule is :-
(1) 70 (2) 270 (3) 35 (4) 135

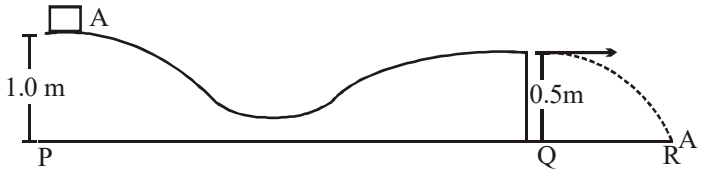
Q.51 An engine pumps out 40 kg of water in one second. Thg water comes out vertically upwards with a velocity of 3 ms^{-1}. What is the power of engine in kilowatt ?
(1) 1.2 (2) 12 (3) 120 (4) 1200

Q.52 A ball is allowed to fall from a height of 10 m. If there is 40% loss of energy due to impact, then after one impact ball will go upto :-
(1) 10 m (2) 8 m (3) 4 m (4) 6 m

Q.53 A small block of mass m is kept on a rough inclined surface of inclination θ fixed in an elevator. The elevator goes up with a uniform velocity v and the block does not slide on the wedge. The work done by the force of friction on the block in time t will be :-
(1) zero (2) $mgvt\cos^2\theta$ (3) $mgvt\sin^2\theta$ (4) $mgvt\sin 2\theta$

Q.54 A projectile is fired from the top of a 43.2 m high cliff with an initial speed of 50 m/s at an unknown angle. Its speed when it hits the ground is ($g = 10\ m/s^2$):-
(1) 58 m/s (2) 48 m/s (3) 65 m/s (4) cannot be determined

Q.55 Figure shows a particle sliding on a frictionless track which terminates in a straight horizontal section. If the particle starts slipping from the point A, how far away from the point Q will the particle hit the ground ?



(1) 1m (2) 0.5 m (3) 1.5 m (4) 0.75 m

Q.56 In which of the following is work is done by any force
(1) A man carrying a bucket of water, walking on a level road with a uniform velocity
(2) A drop of rain falling vertically with a constant velocity
(3) A man whirling a stone tied to a string in a circle with a constant speed
(4) A man walking up on a staircase

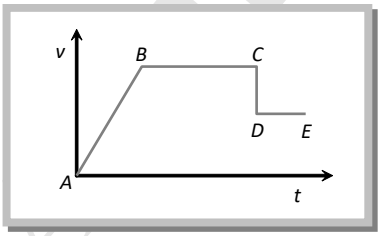
Q.57 If the linear momentum is increased by 50%, the kinetic energy will increase by
(1) 50% (2) 100 % (3) 125% (4) 25%

Q.58 The potential energy of a 1 kg 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 2 J. Then, the maximum speed (in m/s) is –
(1) $1/\sqrt{2}$ (2) 2 (3) $3/\sqrt{2}$ (4) $\sqrt{2}$

Q.59 The adjoining diagram shows the velocity versus time plot for, a particle. The work done by the force on the particle is positive from



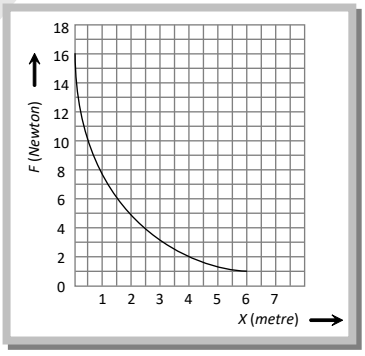
(1) A to B (2) B to C (3) C to D (4) D to E

Q.60 The force on a particle varies as $F = \frac{9}{x^2}$. The work done in displacing the particle from $x = 1$ to $x = 3$ is
(1) 4 J (2) 3 J (3) 5 J (4) 6 J

Q.61 A force acts on a 3.0 g particle in such a way that the position of the particle as a function of time is given by $x = 3t - 4t^2 + t^3$, where x is in metres and t is in seconds. The work done during the first is

(1) 576 mJ (2) 450 mJ (3) 490 mJ (4) 530 mJ

Q.62 The relation between the displacement X of an object produced by the application of the variable force F is represented by a graph shown in the figure. If the object undergoes a displacement from $X = 0.5\,m$ to $X = 2.5\,m$ the work done will be approximately equal to



(1) 16 J (2) 32 J (3) 1.6 J (4) 8 J

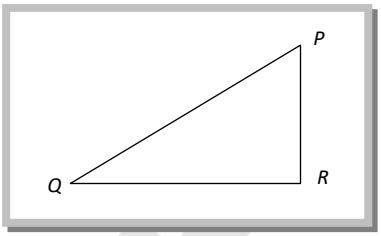
Q.63 For the path PQR in a conservative force field. The amounts work done in carrying a body from P to Q and from Q to R are 5 Joule and 2 Joule respectively. The work done in carrying the body from P to R will be

(1) 7 J

(2) 3 J

(3) $\sqrt{21}$ J

(4) Zero



Q.64 A spring of force constant 800 N/m has an extension of 5 cm. The work done in extending it from 5 cm to 15 cm is

(1) 16 J (2) 8 J (3) 32 J (4) 24 J

Q.65 Two springs have their force constants K_1 and K_2. Both are stretched till their elastic energies are equal. If the stretching forces are F_1 and F_2 then $F_1 : F_2$ is equal to

(1) $K_1 : K_2$ (2) $K_2 : K_1$

(3) $\sqrt{K_1} : \sqrt{K_2}$ (4) $K_1^2 = K_2^2$

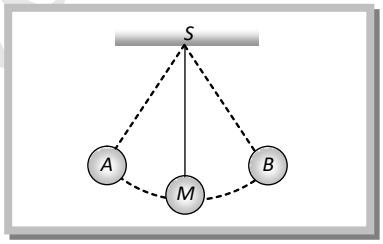
Q.66 What is the velocity of the bob of a simple pendulum at its mean position, if it is able to rise to vertical height of 10cm (Take $g = 9.8\,m/s^{-1}$)

(1) 0.6 m/s

(2) 1.4 m/s

(3) 1.8 m/s

(4) 2.2 m/s



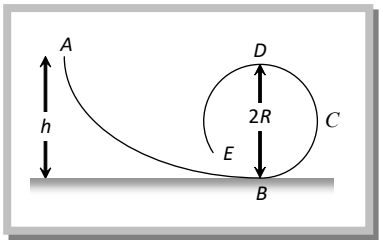
Q.67 A frictionless track ABCDE ends in a circular loop of radius R. A body slides down the track from point A which is at a height $h = 5$ cm. Maximum value of R for the body to successfully complete the loop is

(1) 5 cm

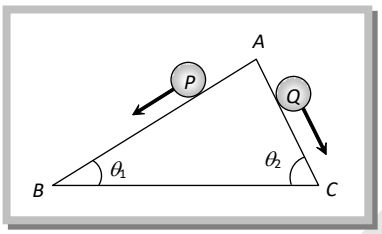
(2) $\frac{15}{4}$cm

(3) $\frac{10}{3}$cm

(4) 2 cm

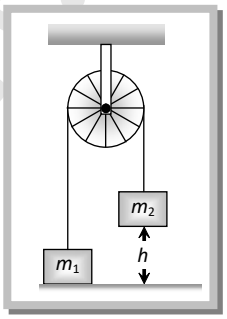


Q.68 Two inclined frictionless tracks of different inclinations ($\theta_1 < \theta_2$) meet at A from where two blocks P and Q of different masses are allowed to slide down from rest at the same time, one on each track as shown in fig.



(1) Both blocks will reach the bottom at the same time
(2) Block Q will reach the bottom earlier than block P
(3) Both blocks reach the bottom with the same speed
(4) Block Q will each the bottom with a higher speed that block P

Q.69 Two masses m_1 and m_2 ($m_2 > m_1$) are positioned as, shown in figure, m_1 being on the ground and at a height h above the ground. When m_2 is released, the speed at which it hits the ground will be :



(1) $\sqrt{\frac{2ghm_1}{m_2}}$

(2) $\sqrt{\frac{2gh(m_1-m_2)}{(m_1+m_2)}}$

(3) $\sqrt{\frac{2gh(m_1+m_2)}{(m_1-m_2)}}$

(4) $\sqrt{\frac{2gh(m_2-m_1)}{(m_1+m_2)}}$

Q.70 A spring of spring constant 5×10^3 N/m is stretched initially by 5 cm from the unstretched position. Then the work required to stretch it further by another 5 cm is –
(1) 18.75 N-m (2) 25.00 N-m (3) 6.25 N-m (4) 12.50 N-m

Q.71 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 of the chain is 4 kg. What is the work done in pulling the entire chain on the table–
(1) 7.2 J (2) 3.6 J (3) 120 J (4) 1200 J

Q.72 An athlete in the olympic games covers a distance of 100 m in 10 s. His kinetic energy can be estimated to be in the range
(1) 2×10^5 J – 3×10^5 J (2) 20,000 J – 50,000 J
(3) 2,000 J – 5,000 J (4) 200 J – 500 J

Direction for following questions :

Q.73 Statement-1 : The work done on a particle by the resultant force is equal to the change in its kinetic energy.

Statement-2 : $W = \int \vec{F}.d\vec{r} = \int \frac{d\vec{p}}{dt}.d\vec{r} = \int m\,v\,dv = \int dK = K_2 - K_1$ where $K = \frac{1}{2}mv^2$

(1) Statement-1 is True, Statement-2 is True; Statement-2 is a correct explanation for Statement-1.
(2) Statement-1 is True, Statement-2 is True; Statement-2 is NOT a correct explanation for Statement-1
(3) Statement-1 is True, Statement-2 is False
(4) Statement-1 is False, Statement-2 is False

Q.74 Statement-1 : The instantaneous power of an agent is measured as the dot product of instantaneous velocity and the force (only one force applied by agent) acting on it at that instant.
Statement-2 : The unit of instantaneous power is watt.
(1) Statement-1 is True, Statement-2 is True; Statement-2 is a correct explanation for Statement-1.
(2) Statement-1 is True, Statement-2 is True; Statement-2 is NOT a correct explanation for Statement-1
(3) Statement-1 is True, Statement-2 is False
(4) Statement-1 is False, Statement-2 is False

Q.75 Statement-1 : A light body and heavy body have same momentum. Then also they have same kinetic energy.
Statement-2 : Kinetic energy does not depend on mass of the body.
(1) Statement-1 is True, Statement-2 is True; Statement-2 is a correct explanation for Statement-1.
(2) Statement-1 is True, Statement-2 is True; Statement-2 is NOT a correct explanation for Statement-1
(3) Statement-1 is False, Statement-2 is True
(4) Statement-1 is False, Statement-2 is False

Q.76 Statement-1 : A spring has potential energy, both when it is compressed or stretched.
Statement-2 : In compressing or stretching, work is done on the spring against the restoring force.
(1) Statement-1 is True, Statement-2 is True; Statement-2 is a correct explanation for Statement-1.
(2) Statement-1 is True, Statement-2 is True; Statement-2 is NOT a correct explanation for Statement-1
(3) Statement-1 is True, Statement-2 is False
(4) Statement-1 is False, Statement-2 is False

Q.77 Statement-1 : A kinetic energy of a body is quadrupled, when its velocity is doubled.
Statement-2 : Kinetic energy is proportional to square of velocity.
(1) Statement-1 is True, Statement-2 is True; Statement-2 is a correct explanation for Statement-1.
(2) Statement-1 is True, Statement-2 is True; Statement-2 is NOT a correct explanation for Statement-1
(3) Statement-1 is True, Statement-2 is False
(4) Statement-1 is False, Statement-2 is False

ANSWER KEY

Q.1	2	Q.2	3	Q.3	4	Q.4	1	Q.5	4
Q.6	3	Q.7	3	Q.8	3	Q.9	2	Q.10	3
Q.11	4	Q.12	3	Q.13	1	Q.14	4	Q.15	3
Q.16	1	Q.17	1	Q.18	1	Q.19	1	Q.20	1
Q.21	1	Q.22	2	Q.23	3	Q.24	3	Q.25	3
Q.26	3	Q.27	3	Q.28	3	Q.29	1	Q.30	2
Q.31	2	Q.32	2	Q.33	2	Q.34	4	Q.35	1
Q.36	4	Q.37	2	Q.38	2	Q.39	4	Q.40	3
Q.41	3	Q.42	3	Q.43	4	Q.44	2	Q.45	2
Q.46	4	Q.47	1	Q.48	4	Q.49	1	Q.50	4
Q.51	1	Q.52	4	Q.53	3	Q.54	1	Q.55	1
Q.56	4	Q.57	3	Q.58	3	Q.59	1	Q.60	4
Q.61	1	Q.62	1	Q.63	1	Q.64	2	Q.65	3
Q.66	2	Q.67	4	Q.68	4	Q.69	4	Q.70	1
Q.71	2	Q.72	3	Q.73	1	Q.74	2	Q.75	4
Q.76	1	Q.77	1						