1.

A spring 40 mm long is stretched by the application of a force. If 10 N force required to stretch the spring through 1 mm, then work done in stretching the spring through 40 mm is

(a) 84J

(b) 68J

(c) 23J

(d) 8J

2.

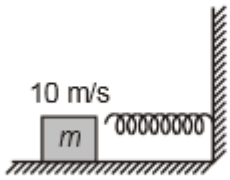
Two springs with spring constants k_1 = 1500 N/m and k_2 = 3000 N/m are stretched by the same force. The ratio of potential energy stored in the springs will be

(1) 2 : 1 (2) 1 : 2

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

3.

A block of mass 2 kg moving with velocity of 10 m/s on a smooth surface hits a spring of force constant 80 × 10^3 N/m as shown. The maximum compression in the spring is



(1) 5 cm (2) 10 cm

(3) 15 cm (4) 20 cm

4.

Relation between velocity (v) and time (t) is $v\alpha\sqrt{t}$, then which one of the following quantity is constant:

1. Force 2. Power
3. Momentum 4. Kinetic Energy

5.

A force F is applied on a body which moves with a velocity v in the direction of the force, then the power will be

1. Fv^2
2. Fv
3. F/v^2
4. F/v

6.

Three different objects of masses m_1, m_2 and m_3 are allowed to fall from rest and from the same point '*O*' along three different frictionless paths. The speeds of the three objects, on reaching the ground, will be in the ratio of

(1) $m_1 : m_2 : m_3$

(2) $m_1 : 2m_2 : 3m_3$

(3) 1 : 1 : 1

(4) $\frac{1}{m_1} : \frac{1}{m_2} : \frac{1}{m_3}$

7.

A body of mass *m* is moving in a circle of radius *r* with a constant speed *v*. The force on the body is $\frac{mv^2}{r}$ and is directed towards the centre. What is the work done by this force in moving the body over half the circumference of the circle

(1) $\frac{mv^2}{r} \times \pi r$

(2) Zero

(3) $\frac{mv^2}{r^2}$

(4) $\frac{\pi r^2}{mv^2}$

8.

A ball is suspended by a thread of length *l*. What minimum horizontal velocity has to be imparted to the ball for it to reach the height of the suspension:

(1) *gl*

(2) 2 *gl*

(3) $\sqrt{gl}$

(4) $\sqrt{2gl}$

9.

A body of mass *m* hangs at one end of a string of length *l*, the other end of which is fixed. It is given a horizontal velocity so that the string would just reach where it makes an angle of 60° with the vertical. The tension in the string at mean position is

(1) 2 *mg*

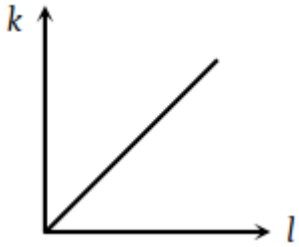
(2) *mg*

(3) 3 *mg*

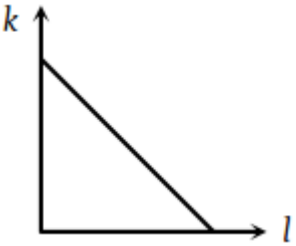
(4) $\sqrt{3}mg$

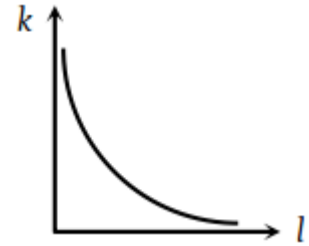
10.

Which of the following graph depicts spring constant *k* versus length *l* of the spring correctly

(1) 

(2) 

(3) 

(4) 

11.

Work done by a frictional force is

(1) Negative

(2) Positive

(3) Zero

(4) All of the above

12.

A block of mass 50 *kg* slides over a horizontal distance of 1 *m*. If the coefficient of friction between their surfaces is 0.2, then work done against friction is

(1) 98 *J*

(2) 72*J*

(3) 56 *J*

(4) 34 *J*

13.

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

(1) Negative work

(2) Positive but not maximum work

(3) No work at all

(4) Maximum work

14.

A body moves a distance of 10 *m* along a straight line under the action of a force of 5 *N*. If the work done is 25 *joules*, the angle which the force makes with the direction of motion of the body is

(1) 0°

(2) 30°

(3) 60°

(4) 90°

15.

A force $F = \left(5\hat{i} + 3\hat{j}\right)$ *newton* is applied over a particle which displaces it from its origin to the point $r = \left(2\hat{i} - 1\hat{j}\right)$ *metres*. The work done on the particle is

(1) – 7 *joules*

(2) + 13 *joules*

(3) + 7 *joules*

(4) + 11 *joules*

16.

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

(1) 7.2 *J*

(2) 3.6 *J*

(3) 120 *J*

(4) 1200 *J*

17.

A particle is acted upon by a force of constant magnitude which is always perpendicular to the velocity of the particle, the motion of the particle takes place in a plane. It follows that

(1) Its velocity is constant

(2) Its acceleration is constant

(3) Its kinetic energy is constant

(4) It moves in a straight line

18.

It is easier to draw up a wooden block along an inclined plane than to haul it vertically, principally because

(1) The friction is reduced

(2) The mass becomes smaller

(3) Only a part of the weight has to be overcome

(4) 'g' becomes smaller

19.

A particle moves under the effect of a force $F = Cx$ from $x = 0$ to $x = x_1$. The work done in the process is

(1) Cx_1^2

(2) $\frac{1}{2}Cx_1^2$

(3) Cx_1

(4) Zero

20.

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

(1) $Mg\frac{d}{4}$

(2) $3Mg\frac{d}{4}$

(3) $-3Mg\frac{d}{4}$

(4) Mgd

21.

Two springs have their force constant as k_1 and $k_2(k_1 > k_2)$. When they are stretched by the same force

(1) No work is done in case of both the springs

(2) Equal work is done in case of both the springs

(3) More work is done in case of second spring

(4) More work is done in case of first spring

22.

If a long spring is stretched by 0.02 m, its potential energy is U. If the spring is stretched by 0.1 m, then its potential energy will be

(1) $\frac{U}{5}$

(2) U

(3) $5U$

(4) $25U$

23.

Which one of the following is not a conservative force

(1) Gravitational force

(2) Electrostatic force between two charges

(3) Magnetic force between two magnetic dipoles

(4) Frictional force

24.

Work done in raising a box depends on

(1) How fast it is raised

(2) The strength of the man

(3) The height by which it is raised

(4) None of the above

25.

If the increase in the kinetic energy of a body is 22%, then the increase in the momentum will be

(1) 22%

(2) 44%

(3) 10%

(4) 300%

26.

If a body of mass 200 g falls from a height 200 m and its total P.E. is converted into K.E. at the point of contact of the body with earth surface, then what is the decrease in P.E. of the body at the contact (g = 10 m/s^2)

(1) 200 J

(2) 400 J

(3) 600 J

(4) 900 J

27.

The kinetic energy of a body of mass 2 *kg* and momentum of 2 *Ns* is

(1) 1 *J*

(2) 2 *J*

(3) 3 *J*

(4) 4 *J*

28.

A particle of mass m at rest is acted upon by a force *F* for a time *t*. Its Kinetic energy after an interval *t* is

(1) $\frac{F^2t^2}{m}$

(2) $\frac{F^2t^2}{2m}$

(3) $\frac{F^2t^2}{3m}$

(4) $\frac{Ft}{2m}$

29.

If a man increase his speed by 2 *m/s* , his K.E. is doubled, the original speed of the man is

(1) $\left(1+2\sqrt{2}\right)m/s$

(2) 4 *m/s*

(3) $\left(2+2\sqrt{2}\right)m/s$

(4) $\left(2+\sqrt{2}\right)m/s$

30.

Two equal masses $m_1\,and\,m_2$ moving along the same straight line with velocities + 3 ms^{-1} and -5 ms^{-1} respectively collide elastically. Their velocities after a collision will be respectively

(1) +4 ms^{-1} for both

(2) -3 ms^{-1} and + 5ms^{-1}

(3) -4 ms^{-1} and +4 ms^{-1}

(4) -5 ms^{-1} and +3 ms^{-1}

31.

An engine exerts a force $\overrightarrow{F}=\left(20\hat{i}-3\hat{j}-5\hat{k}\right)$ N and moves with velocity $\overrightarrow{v}=\left(6\hat{i}+20\hat{j}-3\hat{k}\right)ms^{-1}$. The power of the engine (in watt) is

(1) 45

(2) 75

(3) 20

(4) 10

32.

A stone is thrown at an angle of 45° to the horizontal with kinetic energy K. The kinetic energy at the highest point is

(1) $\frac{K}{2}$

(2) $\frac{K}{\sqrt{2}}$

(3) K

(4) zero

33.

Two springs A and B have force constants $k_A\,and\,k_B$ such that $k_B\;=\;2\,k_A$. Both springs are deformed by the same force. If energy stored in spring A is E, then energy stored in spring B is

(1) $\frac{E}{2}$

(2) 2E

(3) E

(4) 4E

34.

A stationary particle explodes into two particles of masses $m_1\,and\,m_2$ which move in opposite directions with velocities $v_1\,and\,v_2$. The ratio of their kinetic energies E_1/E_2 is

(1) $\frac{m_2}{m_1}$

(2) $\frac{m_1}{m_2}$

(3) 1

(4) $\frac{m_1v_2}{m_2v_1}$

35.

A particle of mass m_1 is moving with a velocity v_1 and another particle of mass m_2 is moving with a velocity v_2. Both of them have the same momentum but their different kinetic energies are $E_1\,and\,E_2$, respectively. If $m_1>m_2$ then

(1) $\frac{E_1}{E_2}=\frac{m_1}{m_2}$

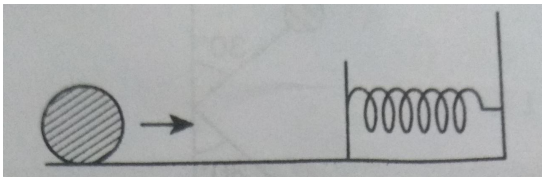
(2) $E_1>E_2$

(3) $E_1=E_2$

(4) $E_1<E_2$

36.

A mass of 0.5 kg moving with a speed of 1.5 ms^{-1} on a horizontal smooth surface, collides with a nearly weightless spring of force constant k = 50 Nm^{-1}. The maximum compression of the spring would be



(1) 0.12 m

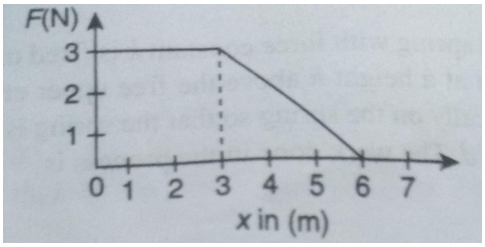
(2) 1.5 m

(3) 0.5 m

(4) 0.15 m

37.

A force F acting on an object varies with distance x as shown here



The force is in Newton and x in meters. The work done by the force in moving the object from x = 0 to x = 6 m is

(1) 18.0 J

(2) 13.5 J

(3) 4.5 J

(4) 9.0 J

38.

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

(1) $\frac{5}{19}\ J$

(2) $\frac{3}{8}\ J$

(3) $\frac{8}{3}\ J$

(4) $\frac{19}{5}\ J$

39.

The potential energy of a long spring when stretched by 2 cm is U. If the spring is stretched by 8 cm the potential energy stored in it is

(1) 4 U

(2) 8 U

(3) 16 U

(4) $\frac{U}{4}$

40.

A body of mass 1 kg is thrown upwards with a velocity 20 ms^{-1}. It momentarily comes to rest after attaining a height of 18 m. How much energy is lost due to air friction? (g = 10 ms^{-1})

(1) 30 J

(2) 40 J

(3) 10 J

(4) 20 J

41.

The potential energy of a system increases, if work is done

(1) upon the system by a conservative force.

(2) upon the system by a non-conservative force.

(3) by the system against a conservative force.

(4) by the system against a non-conservative force.

42.

A uniform force of $\left(3\hat{i}+\hat{j}\right)$ newton acts on a particle of mass 2 kg. Hence the particle is displaced from position $\left(2\hat{i}+\hat{k}\right)$ m to position $\left(4\hat{i}+3\hat{j}-\hat{k}\right)$ m. The work done by the force on the particle is

(1) 9 J

(2) 6 J

(3) 13 J

(4) 15 J

43.

A block of mass 10 kg, moving in x direction with a constant speed of 10 ms^{-1}, is subjected ot a retarding force, F = 0.1 x Jm^{-1} during its travel from x = 20 to 30 m. Its final K.E. will be

(1) 450 J

(2) 275 J

(3) 250 J

(4) 475 J

44.

Consider a drop of rain water having mass 1 g falling from a height of 1 km. It hits the ground with a speed of 50 m/s, Take g constant with a value 10 m/s^2. The work done by the (i) gravitational force and the (ii) resistive force of air is

(1) (i) 1.25 J (ii) -8.25 J

(2) (i) 100 J (ii) 8.75 J

(3) (i) 10 J (ii) -8.75 J

(4) (i) -10 J (ii) -8.25 J

45.

A moving block having mass m, collides with another stationary block having mass 4 m. The lighter block comes to rest after collision. When the initial velocity of the lighter block is v, then the value of the coefficient of restitution (e) will be

(1) 0.8

(2) 0.25

(3) 0.5

(4) 0.4

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