

1.

Two springs of spring constants k and $3k$ are stretched separately by the same force. The ratio of potential energy stored in them respectively will be:

1. 3: 1
2. 9: 1
3. 1: 3
4. 1: 9

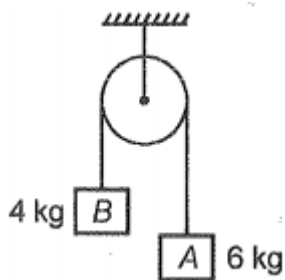
2.

A body of mass 0.5 kg thrown vertically upward with 20 m/s reaches a maximum height of 16 m. The amount of energy dissipated by the air drag acting on the ball during the ascent is:

1. 20 J
2. 10 J
3. 4 J
4. 8 J

3.

What is the work done by gravity on block A in 2 seconds after the blocks are released? (Pulley is light)



- (1) 240 J
- (2) 200 J
- (3) 120 J
- (4) 24 J

4.

A weight mg is suspended from a spring. If the energy stored in the spring is U . The elongation in the spring is:

1. $\frac{2U}{mg}$
2. $\frac{U}{mg}$
3. $\frac{\sqrt{2}U}{mg}$
4. $\frac{U}{\sqrt{2}mg}$

5.

The energy required to accelerate a car from rest to 30 m/s is E . The energy required to accelerate the car from 30 m/s to 60 m/s is

1. E
2. $2E$
3. $3E$
4. $4E$

6.

A block is carried slowly up an inclined plane. If W_f is work done by the friction, W_N is work done by the reaction force, W_g is work done by the gravitational force and W_{ex} is the work done by an external force, then choose the correct relation/s:

- (1) $W_N + W_f + W_g + W_{ex} = 0$
- (2) $W_N = 0$
- (3) $W_{ex} + W_f = -W_g$
- (4) All of these

7.

The position of a particle (x) varies with time (t) as $x = (t - 2)^2$, where x is in meters and t is in seconds. Calculate the work done during $t = 0$ to $t = 4$ s if the mass of the particle is 100 g.

- (1) 0.4 J
- (2) 0.2 J
- (3) 0.8 J
- (4) Zero

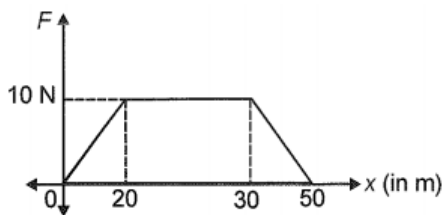
8.

A spring is attached to the ceiling of a room. A block of mass m is hooked to the spring and released. In static condition (when block stops after a long time) if U is the loss of potential energy of the block, then the elastic potential energy stored in the spring will be:

- (1) $-U$
- (2) U
- (3) $\frac{U}{2}$
- (4) $4U$

9.

An object of mass $m = 1.5$ kg is acted upon by the force as shown in the figure that varies with the position of the object as shown. If the object starts from rest at a point $x = 0$. What is its speed at $x = 50$ m?



1. 20 m/s
2. 25 m/s
3. 15 m/s
4. 17 m/s

10.

The work done by a person in carrying a box of mass 10 kg through a vertical height of 10 m is 4900 J. The mass of the person is:

- (1) 40 kg
- (2) 60 kg
- (3) 50 kg
- (4) 55 kg

11.

A particle is displaced from point $P(1, 1)$ m to $Q(4, 3)$ m by applying force $\vec{F} = (3\hat{i} + 4\hat{j})$ N. The work done by \vec{F} to move the particle from point A to B is:

- (1) 25 J
- (2) 20 J
- (3) 17 J
- (4) $5\sqrt{13}$ J

12.

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

1. $\frac{mv^2}{r\pi}$
2. $mr^2\pi$
3. Zero
4. $2mv^2\pi$

13.

A chord is used to vertically lower a block of mass m by a distance d at a constant downward acceleration of $\frac{g}{4}$. The work done by the chord on the block is

- (1) $\frac{3}{4}mgd$
- (2) $-\frac{3}{4}mgd$
- (3) $\frac{1}{4}mgd$
- (4) $-\frac{1}{4}mgd$

14.

Work done in increasing the length of a massless spring from natural length 15 cm to 15.1 cm is 20 J. Work done in increasing the length from 15.1 cm to 15.2 cm is

- (1) 20 J
- (2) 40 J
- (3) 60 J
- (4) 80 J

15.

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

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

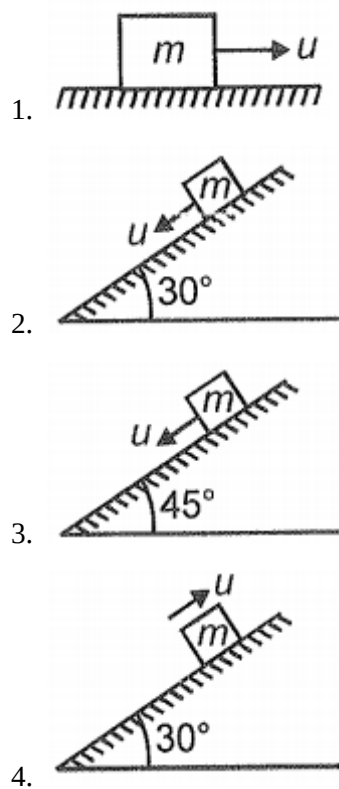
16.

The displacement x in the metre of a particle of mass 1 kg moving in one dimension under the action of a force is related to the time t in seconds by equation $t = \sqrt{x + 4}$. Work done by this force in the first 4 seconds is:

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

17.

Four situations are shown in following options. In each situation, planes are equally rough and block begins with the same speed and slides until the kinetic frictional force has stopped it. In which of the following cases increase in thermal energy due to sliding is least?



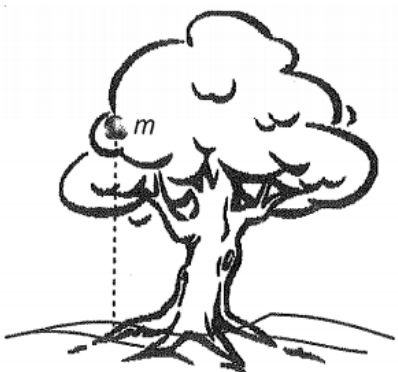
18.

A block of mass m is placed in an elevator moving down with an acceleration $\frac{g}{3}$. The work done by the normal reaction on the block as the elevator moves down through a height h is

1. $\frac{-2mgh}{3}$
2. $\frac{-mgh}{3}$
3. $\frac{2mgh}{3}$
4. $\frac{mgh}{3}$

19.

A fruit of mass m dropped from the height h of a tree. If it hits the ground with a speed of v m/s, then work done by the resistive force is:



1. $-mgh$
2. $-\frac{1}{2}mv^2$
3. $mv^2 + 2mgh$
4. $-\frac{m}{2}(2gh - v^2)$

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20.

A ball is released from the top of a tower. The ratio of work done by the force of gravity in the first, second and third seconds of the motion of the ball is:

- (1) 1: 2: 3
- (2) $1^2 : 2^2 : 3^2$
- (3) 1: 3: 5
- (4) 1: 5: 3