V PLUS U

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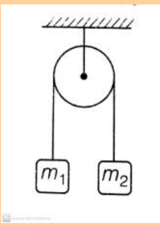
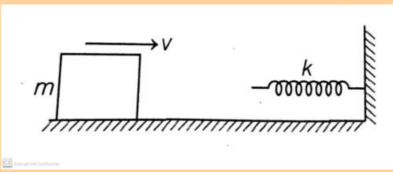
DPP-2

SUBJECT : PHYSICS **TOPIC: WORK** **TIME:** **DATE:**

1. **The masses m_1 and m_2 ($m_2 > m_1$) are released from rest. Using work-energy theorem, find out velocity of the blocks when they move a distance x.**



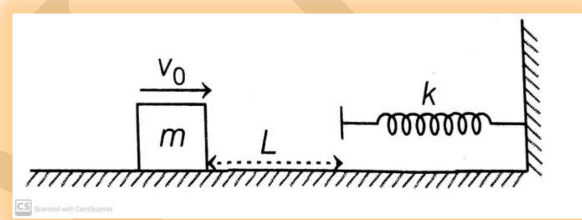
2. **A block of mass m sliding on a smooth horizontal surface with a velocity *v* meets a long horizontal spring fixed at one end and having spring constant k as shown in figure. Find the maximum compression of the spring. Will the velocity of the block be the same as when it comes back to the original position shown?**



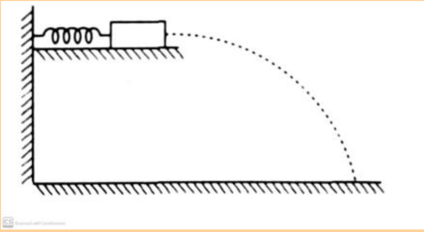
3. **Coefficient of friction between block and ground is μ. Initially, spring is in its natural length.**

(a) Find minimum speed v_0 required to given to the block which is initially at a distance L from the spring, so that the maximum compression in the spring is L.

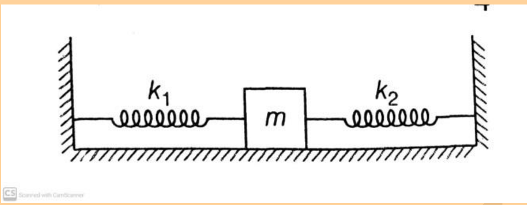
(b) Also find speed of the block when it gets separated from the spring.



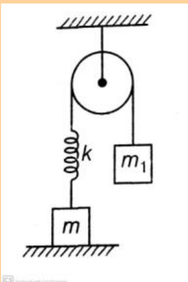
4. **As shown in figure, there is a spring block system. Block of mass 500 g is pressed against a horizontal spring fixed at one end to compress the spring through 5.0 cm. The spring constant is 500 N/m. When released, the block moves horizontally till it leaves the spring. Calculate the distance, where it will hit the ground 4 m below the spring?**



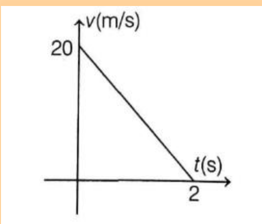
5. A block of mass m is attached to two undetached springs of spring constants k_1 and k_2 as shown in the figure. The block is displaced towards right through a distance x and is released.
Find the speed of the block as it passes through a distance $\frac{x}{4}$ from its mean position.



6. For what minimum value of m_1 the block of mass m will just leave the contact with surface?



7. Velocity-time graph of a particle of mass 2 kg moving in a straight line is as shown in figure. Work done by all the forces on the particle is
(a) 400 J (b) -400 J (c) -200 J (d) 200 J

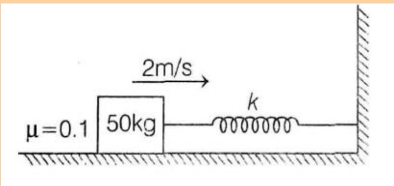


8. A particle moves on a rough horizontal ground with some initial velocity say v_0. If the $\frac{3}{4}th$ of its kinetic energy is lost in friction in time t_0, then coefficient of friction between the particle and the ground is

(a) $\frac{v_0}{2gt_0}$ (b) $\frac{v_0}{4gt_0}$ (c) $\frac{3v_0}{4gt_0}$ (d) $\frac{v_0}{gt_0}$

9. A block of mass 50 kg is projected horizontally on a rough horizontal floor. The coefficient of friction between the block and the floor is 0.1. The block strikes a light spring of stiffness k = 100 N/m with a velocity 2 m/s. The maximum compression of the spring is

(a) 1m (b) 2m (c) 3m (d) 4m



10. The potential energy U of a particle of mass m = 1 kg moving in the xy-plane is given by U = 2x + 5y – xy. If the particle is at rest at (2, -2), its acceleration (in m/s^2) at this position is given by

(a) zero (b) 3 (c) 4 (d) 5

11. A particle moving along X-axis has potential energy $U = 2 + 20x - 5x^2$ J. The particle is released from x = -3. The maximum value of x will be [x is in metre and U in in joules]

(a) 5m (b) 3m (c) 7m (d) 8m

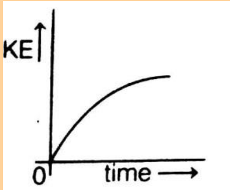
12. A rigid body is acted upon by a horizontal force which is inversely proportional to the distance covered s. The work done by this force will be proportional to

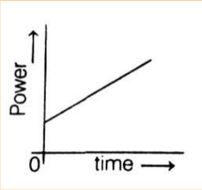
(a) s (b) $\sqrt{s}$ (c) s^2 (d) None of these

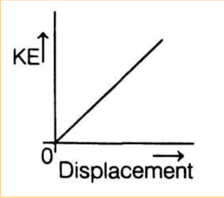
13. If a simple pendulum of length l has the maximum angular displacement (θ), then the maximum kinetic energy of its bob of mass m is

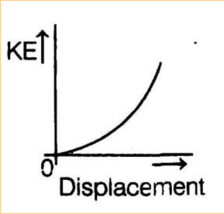
(a) $\frac{1}{2}mgl$ (b) mgl cosθ (c) mgl(1-cosθ) (d) $\frac{1}{2}mgl\, sin\theta$

14. A block is resting over a smooth horizontal plane. A constant horizontal force starts acting on it at t = 0. Which of the following graph is correct?





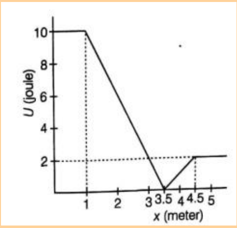




(a) (b) (c) (d)

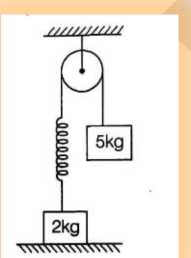
15. A body with mass 2 kg moves in one direction in the presence of a force which is described by the potential energy graph. If the body is released from rest at x = 2m, then its speed when it crosses x = 5m is

(a) zero (b) 1 m/s (c) 2 m/s (d) 3 m/s



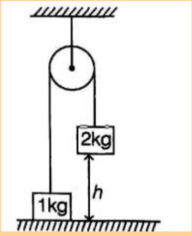
16. System shown in the figure is released from rest. Pulley, string and spring are massless and friction is absent everywhere. The speed of 5 kg block when 2 kg block leaves the contact with ground is (take, force constant of spring = k = 40 N/m and g = 10 m/s²)

(a) $\sqrt{2}\ m/s$ (b) $2\sqrt{2}\ m/s$ (c) 2 m/s (d) $4\sqrt{2}\ m/s$



17. In the figure, 2 kg and 1 kg blocks are joined together by a massless and frictionless pulley. When the mass 2 kg is released from the height 60 cm above the floor, it strikes the floor with a speed (assume string is light) (g = 10 m/s²)

(a) 2 m/s (b) 3 m/s (c) $\sqrt{2}\ m/s$ (d) $\sqrt{3}\ m/s$



18. The upper one third of an inclined plane with inclination ϕ is perfectly smooth, while the rest part is rough. A body starting from rest at the top will again come to rest at the bottom, if the coefficient of friction for the rough part is given by

(a) $\frac{2}{3}\ tan\phi$ (b) $\frac{2}{3}\ cot\phi$ (c) $\frac{3}{2}\ tan\phi$ (d) $\frac{3}{2}\ cot\phi$

19. A particle is projected vertically upwards with a speed of 16 m/s. After sometime, when it again passes through the point of projection, its speed is found to be 8 m/s. It is known that, the work done by air resistance is same during upward and downward motion. Then, the maximum height attained by the particle is (take, g = 10 m/s^2)

(a) 8 m (b) 4.8 m (c) 17.6 m (d) 12.8 m

20. The potential energy for a force field is given by U (x, y) = cos (x + y). The force acting on a particle at position given by coordinates $\left(0, \frac{\pi}{4}\right)$ is

(a) $-\frac{1}{\sqrt{2}}(\hat{\imath}+\hat{\jmath})$ (b) $\frac{1}{\sqrt{2}}(\hat{\imath}+\hat{\jmath})$ (c) $\left(\frac{1}{2}\hat{\imath}+\frac{\sqrt{3}}{2}\hat{\jmath}\right)$ (d) $\left(\frac{1}{2}\hat{\imath}-\frac{\sqrt{3}}{2}\hat{\jmath}\right)$

21. A small mass slides down an inclined plane of inclination θ with the horizontal. The co-efficient of friction is $\mu = \mu_0 x$, where x is the distance through which the mass slides down and μ_0, a constant. Find the distance covered by the mass before it stops.

(a) $\frac{2\tan\theta}{\mu_0}$ (b) $\frac{\tan\theta}{2\mu_0}$ (c) $\frac{\tan\theta}{\mu_0}$ (d) $\frac{4\tan\theta}{\mu_0}$

22. A block of mass m is pulled by a constant power P placed on a rough horizontal plane. The friction co-efficient between the block and surface is μ. Find the maximum velocity of the block.

(a) μmgP (b) $\frac{2P}{\mu mg}$ (c) $\frac{P}{2\mu mg}$ (d) $\frac{P}{\mu mg}$

23. An open knife edge of mass m is dropped from a height h on a wooden floor. If the knife penetrates upto depth d into the wood, the average resistance offered by the wood to the knife edge is

(a) mg (b) mg$\left(1-\frac{h}{d}\right)$ (c) mg$\left(1+\frac{h}{d}\right)$ (d) mg$\left(1+\frac{h}{d}\right)^2$