SUBJECT : PHYSICS (Work, Power and Energy)

1. A position dependent force F = $(7 - 2x + 3x^2)$ N acts on a small body of mass $2kg$ and displaces it from $x = 0$ to $x = 5m$. Work done in joule is :
(a) 35 (b) 70
(c) 135 (d) 270

2. A uniform force of $(3i + j)$ newton acts on a particle of mass 2kg. Hence, the particle is displaced from position $(2i + k)$ metre to position $(4i + 3j + k)$ metre. The work done by the force on the particle is :
(a) 9 J (b) 6 J
(c) 13 J (d) 15 J

3. A force $(3\hat{\boldsymbol{\imath}} + 4\hat{\boldsymbol{\jmath}})$ newton acts on a body and displaced it by $(3\hat{\boldsymbol{\imath}} + 4\hat{\boldsymbol{\jmath}})$ metre. The work done by the force is :
(a) 5 J (b) 25 J
(c) 10 J (d) 30 J

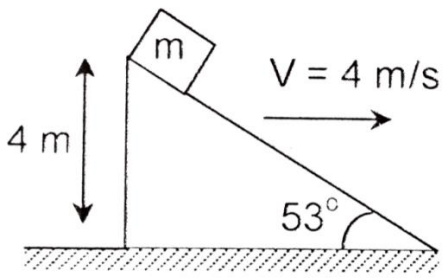
4. How much work is required to raise a stone of mass 5kg and relative density 3, lying at the bed of a lake, through height of 3 m ?
(a) 25 J (b) 40 J
(c) 75 J (d) None of these

5. A particle moves under the effect of a force $F = kx^2$ from $x = 0$ to $x = 4$, the work done by the force is :
(a) $\frac{8k}{3}$ (b) $\frac{32k}{3}$
(c) $\frac{64k}{3}$ (d) $\frac{128k}{3}$

6. A body constrained to move in the y-direction is subjected to a force F = $(2\hat{\boldsymbol{\imath}} + 15\hat{\boldsymbol{\jmath}} + 6\hat{\boldsymbol{k}})$ N. The work done by this force, in moving the body through a distance of 10 m along y-axis is :
(a) 100 J (b) 150 J
(c) 120 J (d) 200 J
(e) 50 J

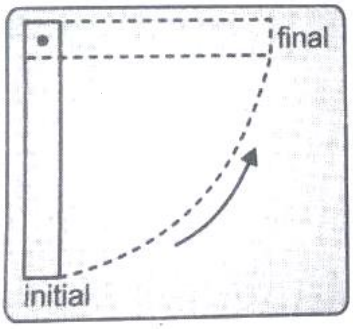
7. A small block of mass m is kept on a rough inclined surface of inclination θ fixed in an elevator. The elevator goes up with uniform velocity v and the block does not slide on the wedge. The work done by the force of friction on the block in time t in the ground frame is :
(a) *zero* (b) $mgvt \cos^2\theta$
(c) $mgvt \sin^2\theta$ (d) $mgvt \sin 2\theta$

8. A block is raised to the top of an inclined plane from its bottom as shown in figure. The work done by gravity in this process is :



(a) FL (b) $-mgl$
(c) $-mgl \cos\theta$ (d) $-mgl \sin\theta$

9. A uniform metal rod of 2 kg is hinged at one end and is rotated by 90° anticlock wise as shown. Find the work done by the gravity in this process : (take g = 10 m/s^2)



(a) –5J (b) –10J
(c) –20J (d) –15J

10. A bob of mass '*m*' is released from angle θ with vertical as shown in figure. Find the work done by gravity when pendulum stop vibrating :

(a) *mgL*
(b) *mgL* cos θ
(c) *mgL* sin θ
(d) *mgL* (1 – cos θ)

11. The work done against gravity in taking 10 kg mass at 1 *m* height in 1 *sec* will be :

(a) 49 J (b) 98 J
(c) 196 J (d) None of these

12. A force $\overrightarrow{F} = 6\hat{\imath} + 2\hat{\jmath} - 3\hat{k}$ acts on a particle and produces a displacement of $\overrightarrow{s} = 2\hat{\imath} - 3\hat{\jmath} + sk$. If the work done is zero, the value of *x* is :

(a) –2 (b) 1/2
(c) 6 (d) 2

13. A particle moves from position $\overrightarrow{r_1} = 3\hat{\imath} + 2\hat{\jmath} - 6\hat{k}$ to position $\overrightarrow{r_2} = 14\hat{\imath} + 13\hat{\jmath} - 9\hat{k}$ unde the action of force $4\hat{\imath} + \hat{\jmath} - 3\hat{k}$ N. The work done will be :

(a) 100 J (b) 50 J
(c) 200 J (d) 75 J

14. 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

(a) its velocity is constant
(b) its acceleration is constant
(c) its kinetic energy is constant
(d) it moves in a straight line

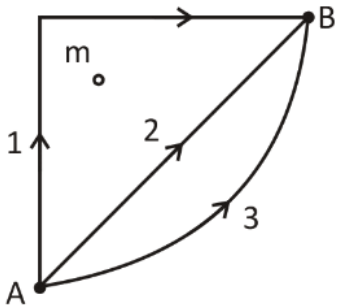
15. A ball is released from the top of a tower. The ratio of work done by force of gravity in first, second and third second of the motion of the ball is :

(a) 1 : 2 : 3 (b) 1 : 4 : 9
(c) 1 : 3 : 5 (d) 1 : 5 : 3

16. A cord is used to lower vertically a block of mass M by a distance *d* with constant downward acceleration g/2. Work done by the cord by the cord on the block is :

(a) $Mg\frac{d}{4}$ (b) $3Mg\frac{d}{4}$
(c) $-3Mg\frac{d}{4}$ (d) Mgd

17. If W_1, W_2 and W_3 represent the work done in moving a particle from A to B along three different paths 1, 2 and 3 respectively (as shown) in the gravitational field of a point mass *m*, find the correct relation between *W*, W_2 and W_3



(a) $W_1 > W_2 > W_3$
(b) $W_1 = W_2 = W_3$
(c) $W_1 < W_2 < W_3$
(d) $W_2 > W_1 > W_3$

18. A force F = $(5\hat{\imath} + 3\hat{\jmath})$ newton is applied over a particle which displaces it from its origin to the point r = $(2\hat{\imath} - 1\hat{\jmath})$ metres. The work on the particle is :

(a) –7 joules (b) +13 joules
(c) +7 joules (d) +11 joules

19. A body of mass 10 kg is dropped to the ground from a height of 10 metres. The work done by the gravitational force is :

(a) –490 joules (b) +490 joules
(c) –980 joules (d) +980 joules

20. An elastic string of unstretched length L and force constant k is stretched by a small length *x*. It is further stretch by small length *y*. The work done in the second stretching is :

(a) $\left(\frac{1}{2}\right)ky^2$
(b) $\left(\frac{1}{2}\right)k(x^2 - y^2)$
(c) $\left(\frac{1}{2}\right)k(x - y)^2$
(d) $\left(\frac{1}{2}\right)ky(2x - y)$

21. When a rubber-band is stretched by a distance *x*, it exertes a restoring force of magnitude $F = ax + bx^2$ where *a* and *b* are constants. The work done in stretching the unstretched rubber-band by L is :

(a) $\frac{1}{2}\left(\frac{aL^2}{2} + \frac{bL^3}{3}\right)$ (b) $aL^2 + bL^3$
(c) $\frac{1}{2}(aL^2 + bL^3)$ (d) $\frac{aL^2}{2} + \frac{bL^3}{3}$

22. 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) 30 (b) 40
(c) 10 (d) 20

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

(a) 70 (b) 270
(c) 35 (d) 135

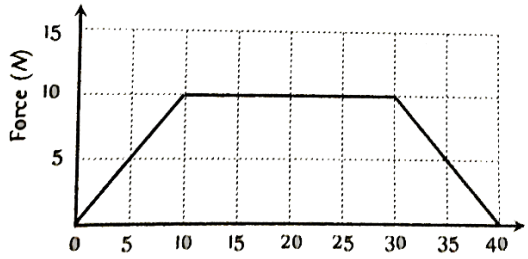
24. The force constant of a wire is *k* and that of another wire is 2*k*. When both the wires are stretched through same distance, then the work done

(a) $W_2 = 2W_1^2$ (b) $W_2 = 2W_1$
(c) $W_2 = W_1$ (d) $W_2 = 0.5W_1$

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

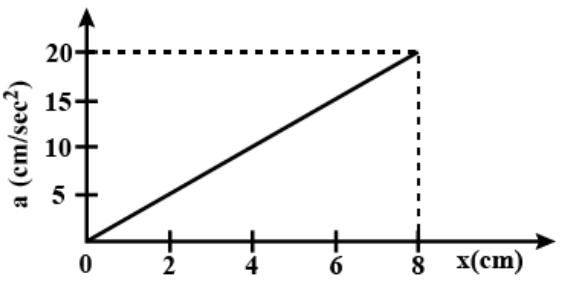
(a) 16 J (b) 8 J
(c) 32 J (d) 24 J

26. Adjacent figure shows the force-displacement graph of a moving body, the work done in displacing body from *x* = 0 to *x* = 35 *m* is equal to :



(a) 50 J (b) 25 J
(c) 278.5 J (d) 200 J

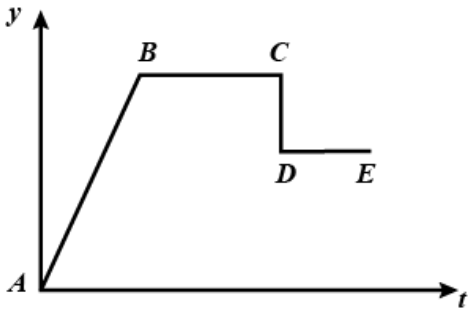
27. A 10 kg mass moves along *x*-axis. Its acceleration as a function of its position is shown in the figure. What is the total work done on the mass by the force as the mass moves from *x* = 0 to *x* = 8 *cm*



(a) 8×10^{-2} joules

(b) 16×10^{-2} joules
(c) 4×10^{-4} joules
(d) 1.6×10^{-3} joules

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



(a) A to B (b) B to C
(c) C to D (d) D to E

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

(a) No work is done in case of both the springs
(b) Equal work is done in case of both the springs
(c) More work is done in case of second spring
(d) More work is done in case of first spring

30. A body of mass 5 kg is placed at the origin, and can move only on the *x*-axis. A force of 10 N is acting on it in a direction making an angle of 60° with the *x*-axis and displaces it along the *x*-axis by 4 metres. The work done by the force is :

(a) 2.5 J (b) 7.25 J
(c) 40 J (d) 20 J

****