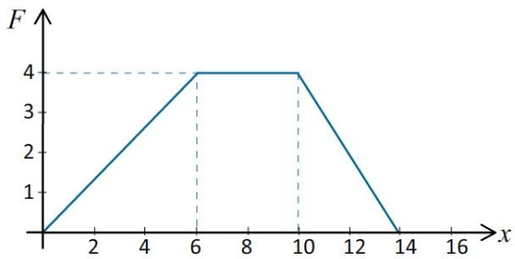
Work, Energy and Power

Objective : Calculation of work done by different forces acting on a body simultaneously.

1. A ball is released from the top of a tower. Ratio of work done by force of gravity in 1st second, 2nd second and 3rd second of the motion of ball is
   a) 1 : 2 : 3 b) 1 : 4 : 16 c) 1 : 3 : 5 d) 1 : 9 : 25

2. Force (in N) acting on an object varies with the distance travelled by the object as shown in the figure. Work done by the force in moving the object from x = 2 m to x = 4 m is



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

3. A body travels through a distance of 10m on a straight line, under the influence of 5N. If work done by the force is 25J , then angle between applied force and displacement is
   a) 0° b) 30° c) 60° d) 90°

4. Work done (in joules) in increasing the extension of a spring of force constant 10N cm^{-1} from 4cm to 6cm is
   a) 1 b) 10 c) 50 d) 100

5. A body of mass m acceleration uniformly from rest to a speed v_o in time t_o . Work done on the body in time t is
   a) $\frac{1}{2}mv_o^2\left(\frac{t^2}{t_o^2}\right)$ b) $\frac{1}{2}mv_o^2\left(\frac{t_o^2}{t^2}\right)$ c) $\frac{1}{2}mv_o^2\left(\frac{t_o}{t}\right)$ d) $\frac{1}{2}mv_o^2\left(\frac{t}{t_o}\right)$

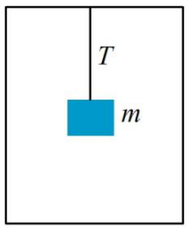
6. Work done in pushing a block of mass 10 kg from the bottom to the top of a frictionless inclined plane 5m long and 3m high is (g = 9.8ms^{-2})
   a) 392J b) 294J c) 98J d) 0.98J

7. Work done (in joules) in increasing the extension of a spring of force constant 10N cm^{-1} from 4cm to 6cm is
   a) 1 b) 10 c) 50 d) 100

8. A 10 kg satellite completes one revolution in 108 minutes around the earth at a height of 100 km from the surface of the earth. Work done on the satellite by the gravitational force of earth is
   a) 10800 J b) 1080 J c) 0 J d) 108000 J

9. A particle moves along the x-axis from x = 0 to x = 5 m under the influence of a force given by $F = 7 - 2x + 3x^2$ N. Work done in the process is
   a) 70N b) 270N c) 35N d) 135N

10. A block of mass m is suspended by a light thread from an elevator. The elevator has a uniform upward acceleration a. Work done by tension on the block in t seconds is



   a) $\frac{m}{2}(g+a)at^2$ b) $\frac{m}{2}(g-a)at^2$ c) $\frac{m}{2}(g)at^2$ d) $\frac{m}{2}(a)at^2$

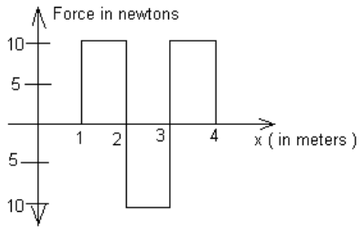
11. A force $\boldsymbol{F} = 2\hat{i} + 3\hat{j} - 4\hat{k}$ acts on a body changing its position from (1, 1, 2)m to (2, 1, 3) m. Work done by the force on the body is
   a) +2 J b) -2 J c) 1 J d) $2\sqrt{2}$ J

12. An elastic spring of unstretched length L and force constant K is stretched by small amount l_1 . It is further stretched by another small amount l_2 . Work done in the second case is
   a) $\frac{1}{2}k\ell_2^2$ b) $\frac{1}{2}k\left[\ell_2^2 - \ell_1^2\right]$ c) $\frac{1}{2}k\ell_2\left[2\ell_1 + \ell_2\right]$ d) $\frac{1}{2}k\ell_2\left[\ell_1 + \ell_2\right]$

13. Displacement of a body of mass 6 kg is given as a function of time by the relation $s = \frac{t^2}{4}\text{m}$ where t is time in seconds. Work done by all the forces acting on the body in 2 seconds is

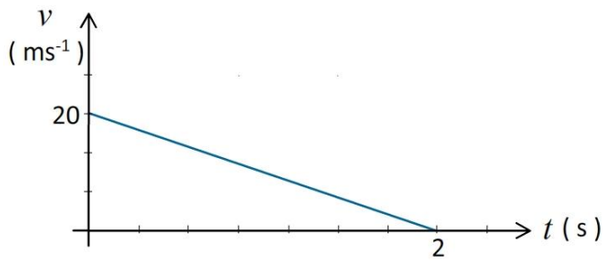
a) zero b) 9 J c) 6 J d) 3 J

14. The given figure shows the variation of the force applied as a function of displacement for a body moving in a straight line. The work done by the force in 4 seconds is



a) 10 J b) 20 J c) 30 J d) 40 J

15. Velocity – time graph of a particle of mass 2 kg moving in a straight line is as shown in the figure. Work done by all the forces acting on the particle is



a) 400 J b) –400 J c) –200 J d) 200 J

Answers

1. c
2. a
3. c
4. a
5. a
6. b
7. a
8. c
9. d
10. a
11. b
12. c
13. d
14. a
15. b

For detailed solutions mail your request to sigmaprc@gmail.com (mention the class / chapter / assignment number in the mail)