Work Done by Constant Force

1. (b) Work done by centripetal force is always zero, because force and instantaneous displacement are always perpendicular.

$W = \vec{F}.\vec{s} = Fs\cos\theta = Fs\cos(90°) = 0$

2. (a) Work = Force × Displacement (length)

If unit of force and length be increased by four times then the unit of energy will increase by 16 times.

3. (c) No displacement is there.

4. (d) Stopping distance $S \propto u^2$. If the speed is doubled then the stopping distance will be four times.

5. (c) $W = Fs\cos\theta \Rightarrow \cos\theta = \frac{W}{Fs} = \frac{25}{50} = \frac{1}{2} \Rightarrow \theta = 60°$

6. (b) Work done = Force × displacement

= Weight of the book × Height of the book shelf

7. (b) Work done does not depend on time.

8. (c) $W = \vec{F}.\vec{s} = (5\hat{\imath} + 3\hat{\jmath}).(2\hat{\imath} - \hat{\jmath})$ = 10 – 3 = 7 J

9. (a) $v = \frac{dx}{dt} = 3 - 8t + 3t^2$

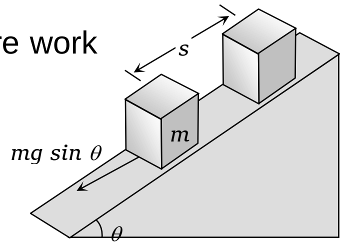
$\therefore v_0 = 3m/s$ and $v_4 = 19m \rightleftarrows\rightleftarrows/\rightleftarrows s$

$W = \frac{1}{2}m(v_4^2 - v_0^2)$ (According to work energy theorem)

$= \frac{1}{2} \times 0.03 \times (19^2 - 3^2) = 5.28J$

10. (d) As the body moves in the direction of force therefore work done by gravitational force will be positive.

$W = Fs = mgh = 10 \times 9.8 \times 10 = 980$



11. (d)

12. (b) $W = mg \sin\theta \times s$

$= 2 \times 10^3 \times \sin 15° \times 10$

$= 5.17 kJ$

13. (d) $W = \vec{F} . \vec{s} = (5\hat{\imath} + 6\hat{\jmath} - 4\hat{k}).(6\hat{\imath} + 5\hat{k}) = 30 - 20 = 10$ *units*

14. (b) $W = Fs = F \times \frac{1}{2}at^2 \left[\text{from } s = ut + \frac{1}{2}at^2\right]$

$\Rightarrow W = F\left[\frac{1}{2}\left(\frac{F}{m}\right) t^2\right] = \frac{F^2t^2}{2m} = \frac{25\times(1)^2}{2\times15} = \frac{25}{30} = \frac{5}{6} J$

15. (b) Work done on the body = K.E. gained by the body

$FS \cos\theta = 1 \ Joule \Rightarrow F \cos\theta = \frac{1}{s} = \frac{1}{0.4} = 2.5N$

16. (b) Work done= $mgh = 10 \times 9.8 \times 1 = 98J$

17. (b)

18. (d) $s = \frac{t^2}{4} \therefore ds = \frac{t}{2}dt$

$F = ma = \frac{md^2s}{dt^2} = \frac{6d^2}{dt^2}\left[\frac{t^2}{4}\right] = 3N$

Now $W = \int_0^2 Fds = \int_0^2 3\frac{t}{2}dt = \frac{3}{2}\left[\frac{t^2}{2}\right]_0^2 = \frac{3}{4}[(2)^2 - (0)^2] = 3J$

19. (d) Net force on body= $\sqrt{4^2+3^2}=5N$

$\therefore a = F/m = 5/10 = 1/2m \rightleftarrows/\rightleftarrows s^2$

Kinetic energy = $\frac{1}{2}mv^2 = \frac{1}{2}m(at)^2 = 125 Joule$

20. (d) $s = \frac{u^2}{2\mu g} = \frac{10\times10}{2\times0.5\times10} = 10m$