Work Done by Constant Force

21. (d) $W = \vec{F}.\vec{s} = (3\hat{i} + 4\hat{j}).(3\hat{i} + 4\hat{j}) = 9 + 16 = 25J$

22. (d) Total mass = (50 + 20) = 70 *kg*

Total height = 20 × 0.25 = 5*m*

∴ Work done = *mgh* = 70 × 9.8 × 5 = 3430 *J*

23. (d) $W = \vec{F}.\vec{s} = (6\hat{i} + 2\hat{j} - 3\hat{k}).(2\hat{i} - 3\hat{j} + x\hat{k}) = 0$

$12 - 6 - 3x = 0 \Rightarrow x = 2$

24. (a) $W = \vec{F}.(\vec{r_2} - \vec{r_1}) = (4\hat{i} + \hat{j} + 3\hat{k})(11\hat{i} + 11\hat{j} + 15\hat{k})$

$W = 44 + 11 + 45 = 100Joule$

25. (c) $W = (3\hat{i} + c\hat{j} + 2\hat{k}).(-4\hat{i} + 2\hat{j} + 3\hat{k}) = 6Joule$

$W = -12 + 2c + 6 = 6 \Rightarrow c = 6$

26. (a) Both part will have numerically equal momentum and lighter part will have more velocity.

27. (d) *Watt* and *Horsepower* are the unit of power

28. (b) Work = Force × Displacement

If force and displacement both are doubled then work would be four times.

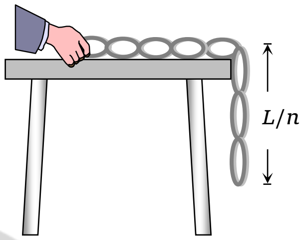
29. (d) $W = FS\cos\theta = 10 \times 4 \times \cos 60° = 20Joule$

30. (a) $W = \vec{F}.\vec{s} = (5\hat{i} + 4\hat{j}).(6\hat{i} - 5\hat{j} + 3\hat{k}) = 30 - 20 = 10J$

31. (b) Fraction of length of the chain hanging from the table

$$=\frac{1}{n}=\frac{60cm}{200cm}=\frac{3}{10}\Rightarrow n=\frac{10}{3}$$

Work done in pulling the chain on the table



$$W=\frac{mgL}{2n^2}$$

$$=\frac{4\times10\times2}{2\times(10/3)^2}=3.6J$$

32. (c) When a force of constant magnitude which is perpendicular to the velocity of particle acts on a particle, work done is zero and hence change in kinetic energy is zero.

33. (a) The ball rebounds with the same speed. So change in it's Kinetic energy will be zero *i.e.* work done by the ball on the wall is zero.

34. (b) $W=\vec{F}.\vec{r}=(5\hat{\imath}+3\hat{\jmath}+2\hat{k}).(2\hat{\imath}-\hat{\jmath})=10-3=7J$

35. (a) K.E. acquired by the body = work done on the body

$K.E.=\frac{1}{2}mv^2=Fs$ *i.e.* it does not depend upon the mass of the body although velocity depends upon the mass

$v^2\propto\frac{1}{m}$ [If *F* and *s* are constant]

36. (d) $W=\vec{F}.\vec{s}=(4\hat{\imath}+5\hat{\jmath}+0\hat{k}).(3\hat{\imath}+0\hat{\jmath}+6\hat{k})=4\times3$ *units*

37. (a) As surface is smooth so work done against friction is zero. Also the displacement and force of gravity are perpendicular so work done against gravity is zero.

38. (c) Opposing force in vertical pulling = *mg*

But opposing force on an inclined plane is *mg* sinθ, which is less than *mg*.

39. (c) Velocity of fall is independent of the mass of the falling body.

40. (a) Work done $= \vec{F} \,.\, \vec{s}$

$= (6\hat{i} + 2\hat{j}) \cdot (3\hat{i} - \hat{j}) = 6 \times 3 - 2 \times 1 = 18 - 2 = 16J$

41. (c) When the ball is released from the top of tower then ratio of distances covered by the ball in first, second and third second

$h_I : h_{II} : h_{III} = 1:3:5:$ [because $h_n \propto (2n-1)$]

$\therefore$ Ratio of work done $mgh_I : mgh_{II} : mgh_{III}$= 1:3:5