$W_H = ?$

$= 8 \times 1 = 8\ J$

WS-15 For class 7th

Ttable

(1) Given

$dQ = 30$ kcal

$m = 15$ kg

$\theta_1 = 20^\circ c \quad \theta_2 = 40^\circ c$

$$c = \frac{dQ}{dt} = \frac{30}{40-20}$$

$$= \frac{30}{20} = 1.5\ \text{kcal}/^\circ c.$$

(2) Given $m = 20 \times 10^{-3}$ kg

$v = 210$ m/s.

$$K.E = \frac{1}{2} m v^2$$

$$= \frac{1}{2} \times 20 \times 10^{-3} \times (210) \times (210)$$

$$= 105 \text{ cal}$$

(3) Given $\frac{r_1}{r_2} = \frac{2}{3}; \frac{s_1}{s_2} = \frac{3}{4}$.

$\frac{d_1}{d_2} = \frac{4}{5}$

water equivalent $w = Ms$

$$\frac{w_1}{w_2} = \frac{m_1}{m_2} \frac{s_1}{s_2}$$

$\left(m = dv = d \frac{4\pi}{3} r^3 \quad m \propto d r^3 \right)$

$$\frac{w_1}{w_2} = \frac{d_1}{d_2} \left[\frac{r_1}{r_2}\right]^3 \frac{s_1}{s_2}$$

$$= \frac{4}{5} \left[\frac{2}{3}\right]^3 \frac{3}{4} = \frac{8}{45}$$

$$\Rightarrow \frac{8}{45}$$

(4) Given $u = 42$ m/sec

$v = 0$; $K.E = dQ = ms d\theta$

$$\Rightarrow d\theta = \frac{1}{2s} v^2 = \frac{42 \times 42}{2 \times 126 \times 3}$$

$$= 0.69$$

$$= 0.7^\circ c$$

(5) Given $m = 2$ kg

$v = 20$ kmph

$$= 20 \times \frac{5}{18} = \frac{100}{18} \text{ m/sec}$$

$u = 0.5$

$t = 1$ hr $= 3600$ sec.

$$s = ut = \frac{100}{18} \times 3600$$

$$= 2 \times 10^4 \text{ m}$$

$W = JQ \Rightarrow Q = \frac{0.5 \times 21 \times 20 \times 10}{4200}$

$\Rightarrow fs = JQ$

$\Rightarrow \mu mg s = JQ \Rightarrow Q = 0.5 \times 10^3$

$$\Rightarrow Q = \frac{\mu mg s}{J} = 500\ J$$

(6) $dQ = 50\%\ mgh$

$$\Rightarrow ms\,dt = \frac{50}{100} mgh$$

$$\Rightarrow 0.03 \times 4200 \times dt = \frac{1}{2} \times 10 \times 210$$

$$\Rightarrow dt = \frac{1}{2 \times 2 \times 0.03} = \frac{25}{3}^\circ c$$

(7) Given $m = 2$ kg; $v = 2$ m/s

$u = 0.3$; $t = 5$ sec

$W = JQ$ [use $s = ut + \frac{1}{2}at^2$]

$\Rightarrow fs = JQ$

$\Rightarrow 0.6 \mu mg s = JQ$

$\Rightarrow 0.3 \times 2 \times 9.8 \times 46.75 = JQ$

$$Q = \frac{216.09}{4.2} = 51.45\ J$$

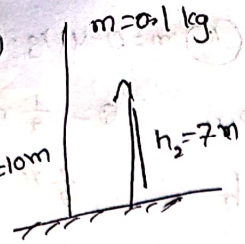
(8) Given $dQ = 270$ kcal

$t = 1$ hr; $L = 540$ cal/gm

$$L = \frac{dQ}{m}$$

$$\Rightarrow m = \frac{dQ}{L} = \frac{270}{540}$$

$$\Rightarrow m = \frac{1}{2} = 0.5\ \text{gm}$$

(9) 

$dQ = ms\,dt$

$W = mg(h_1 - h_2)$

$\downarrow$

$dQ = mg(h_1 - h_2)$

$\Rightarrow ms\,dt = mg(h_1 - h_2)$

$\Rightarrow 4200 \times 0.1 \times dt = 10(10-7)$

$\Rightarrow dt = \frac{3}{420 \times 0.1} = 0.071^\circ C.$

(10) Given $S = 30m$

$f = 100\ N$

$s = 600\ J/kg\ k.$

$W = Q$

$\Rightarrow f s = ms\,d\theta$

$\Rightarrow 100 \times 30 = 1 \times 600 \times d\theta$

$\Rightarrow d\theta = 5^\circ C.$

(16) Given $m = 180\ gm$

$\frac{d\theta}{dt} = 0.5^\circ C/s$

$dQ = ms\,d\theta$

$\Rightarrow \frac{dQ}{dt} = ms\frac{d\theta}{dt}$

$= 180 \times 0.1 \times 0.5$

$\frac{dQ}{dt} = 9\ cal/sec.$

Power $= \frac{dQ}{dt}$

$= 9 \times 4.2\ J/sec$

$= 37.8\ W.$

(17) Given initial temperature $\theta = 0^\circ C$

$u = 0$

$W \propto Q$

$\Rightarrow W = JQ \quad [Q = ML]$

$\Rightarrow mgh = J\ 0.7\%\ mL$

$\Rightarrow h = \frac{J \times \frac{0.1}{100} \times L}{g}$

$\Rightarrow h = 42 \times 8 = 33.6\ m$

(18) $m = 4.2\ gm = 4.2 \times 10^{-3}\ kg$

$Q = 20\ cal. \quad [1\ cal = 4.2\ J]$

$\Rightarrow \frac{1}{2}mv^2 = 20 \times 4.2\ J$

$\Rightarrow \frac{1}{2} \times 4.2 \times 10^{-3} \times v^2 = 20 \times 4.2$

$\Rightarrow v^2 = 2 \times 20 \times 10^3$

$\Rightarrow v = \sqrt{4 \times 10^4} = 200\ m/sec$

LTask

(1) Given $m = 200\ gm$

$Q = ms = m \times \frac{1}{m}\frac{dQ}{d\theta}$

$Q = \frac{252}{10} = 25.2\ J/k.$

(2) $\frac{s_1}{s_2} = \frac{2}{3}; \frac{d_1}{d_2} = \frac{6}{5}$

$\frac{\text{heat capacity}}{\text{volume}} = \text{density} \times s$

$\frac{(C_v)_1}{(C_v)_2} = \frac{d_1}{d_2}\frac{s_1}{s_2}$

$\Rightarrow \frac{(C_v)_1}{(C_v)_2} = \frac{6}{5} \times \frac{2}{3} = \frac{2 \times 2}{5}$

$= \frac{4}{5}.$

(3) Given $m = 300\ gm.$

$h = 3m.$

$Q = P.E$

$\Rightarrow mgh = 300 \times 10^{-3} \times 9.8 \times 3$

$= 9 \times 10^{-1} \times 9.8\ J$

$\Rightarrow \frac{9 \times 9.8 \times 10^{-1}}{4.2}\ cal$

$= 21 \times 10^{-1} = 2.1\ cal.$

(4) Given $v = 420\ m/sec.$

$S = 0.03\ cal/gm$

$= 0.03 \times 4200\ J/kg$

$dQ = \frac{1}{2} \cdot k.E$

$\Rightarrow ms\,d\theta = \frac{1}{2}\frac{1}{2}mv^2$

$\Rightarrow 0.03 \times 4200\,d\theta = \frac{1}{4}(420)^2$

$\Rightarrow 3 \times 42 \times d\theta = \frac{1}{4} \times \frac{210}{420} \times 420 \times 105$

$\Rightarrow d\theta = \frac{210 \times 5}{3} = 70 \times 5$

$= 350^\circ$

(5) Given $v = 100\ m/s; S = 100\ J/kgk$

$K.E = dQ$

$\Rightarrow ms\,d\theta = \frac{1}{2}mv^2$

$\Rightarrow 100\,d\theta = \frac{1}{2}(100)^2$

$\Rightarrow d\theta = 50\ k.$

(6) $\frac{m_A}{m_B} = \frac{1}{2}; \frac{S_A}{S_B} = \frac{2}{3}.$

$\Rightarrow$ Loss of $P.E = dQ$

$\Rightarrow mgh = ms\,d\theta$

$\Rightarrow gh = s\,d\theta \Rightarrow h \propto s$

$\Rightarrow \frac{h_1}{h_2} = \frac{s_1}{s_2} = \frac{2}{3}$

(7) Given $\frac{d_1}{d_2} = \frac{3}{4}$

$\frac{s_1}{s_2} = \frac{4}{3}$

$C = ms$

$C = dVS$

$\Rightarrow \frac{C}{V} = dS$

$\Rightarrow \frac{C\left(\frac{C}{V}\right)_1}{\left(\frac{C}{V}\right)_2} = \frac{d_1}{d_2}\frac{s_1}{s_2}$

$= \frac{3}{4} \times \frac{4}{3}$

$= \frac{1}{1}$

(8) Given $d_A = 0.5$ gm/c.c

$d_B = 0.6$ gm/c.c

$V_A = 8$ lit ; $V_B = 10$ lit

$Q_A = Q_B$.

$\Rightarrow m_A s_A = m_B s_B$

$\Rightarrow d_A V_A s_A = d_B V_B s_B$

$\Rightarrow 0.5 \times 8 \times s_A = 0.6 \times 10 \times s_B$

$\Rightarrow 4 \times s_A = 6 s_B$

$\Rightarrow \frac{s_A}{s_B} = \frac{3}{2}$

(9) Given

75% Q = Loss of P.E

$\Rightarrow \frac{75}{100} mL = mgh$

$\Rightarrow \frac{3}{4} \times 80 \times 4200 = 10h$

$\Rightarrow h = 25.2$ km

(10) $m = 0.42$ kg ; $V = 200$ m/s

$Q = \frac{1}{2} m v^2$

$= \frac{1}{2} \times 0.42 \times (200)^2$

$= \frac{1}{2} \times 42 \times 4 \times 10^4$

$\Rightarrow \frac{42 \times 2}{4200}$ kcal

$= 2$ kcal

(16) Given $h = 500$ m

$s = 4200$ J/kg k

Loss of P.E = dQ

$\Rightarrow mgh = m s d\theta$

$\Rightarrow d\theta = \frac{gh}{s}$

$d\theta = \frac{10 \times 500}{4200} = \frac{25}{21} = 1.16°C$

$L = \frac{dQ}{m} = s\, d\theta$

$L = 4200 \times 1.16$

$L = 4872$ J/k