

$$(iii) B_{H_2O} = \frac{W_l}{S} = \frac{5174.4}{8} = 646.6$$

$$\begin{aligned} \text{App. Wt.} &= \text{Weight} - \text{Bouyancy} \\ &= 5174.4 - 646.6 \\ &= 4527.6 \text{ N} \end{aligned}$$

Q. 11. Let W = the weight of the body.
Let B = Bouyancy in water.

$$\therefore W_1 = W - B$$

$$B_L = S_L B_W \Rightarrow \text{Bouyancy in liquid 1} = (0.8)B$$

$$\therefore W_2 = W - 0.8B$$

$$\text{Similarly, } W_3 = W - 0.75B$$

$$\begin{aligned} 5W_2 - 4W_3 &= 5(W - 0.8B) - 4(W - 0.75B) \\ &= W - B = W_1 \quad \text{QED} \end{aligned}$$

Exercise 9D

Q. 1. $\frac{3}{4}$ of volume under water $\Rightarrow S = \frac{3}{4}$

$$\begin{aligned} \therefore \rho &= \frac{3}{4} \times 1,000 \\ &= 750 \end{aligned}$$

$$\begin{aligned} W &= V\rho g \\ &= (0.1)(750)g \\ &= 75g \end{aligned}$$

$$B = \frac{W}{S} = \frac{75g}{\frac{3}{4}} = 100g$$

$$B = W + T$$

$$\Rightarrow 100g = 75g + T$$

$$\Rightarrow T = 25g$$

Q. 2. Its specific gravity is 0.8, as in question 1

Let V = its volume, xV = volume under the liquid

$$\begin{aligned} W &= V\rho g \\ &= V(800)g \\ &= 800Vg \end{aligned}$$

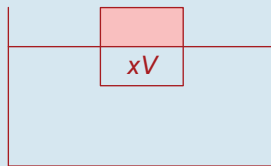
$$\begin{aligned} B &= xV(1,200)g \\ &= 1,200xVg \end{aligned}$$

Since it is in equilibrium, $W = B$

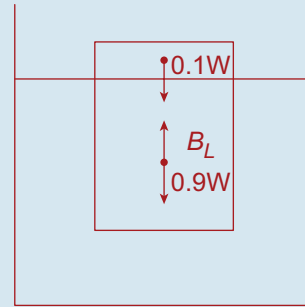
$$\Rightarrow 800Vg = 1,200xVg$$

$$\Rightarrow x = \frac{2}{3}$$

$\therefore \frac{1}{3}$ of its mass, or $33\frac{1}{3}\%$, is above the surface.



Q. 3. (i)



$B_L = S_L B_W = S_L \left(\frac{W}{S}\right)$ where W = weight of the **immersed** part.

$$\therefore B_L = (1.1) \left(\frac{0.9W}{S}\right) = \frac{0.99W}{S}$$

Since it is in equilibrium

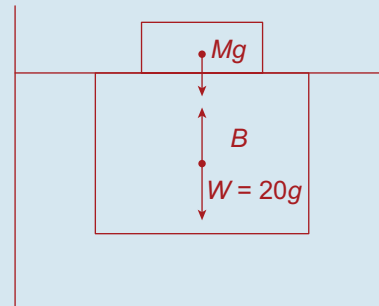
$$0.1W + 0.9W = B_L$$

$$\Rightarrow W = \frac{0.99W}{S}$$

$$\Rightarrow S = 0.99$$

(ii) 0.99 of its mass will be below, as in question 2.

Q. 4. Its specific gravity is $\frac{3}{4}$, as in question 1.



Let M = the mass of the glass

$$B_L = S_L B_W$$

$$= S_L \left(\frac{W}{S}\right)$$

$$= (0.8) \left(\frac{20g}{0.75}\right)$$

$$= 21\frac{1}{3}g$$

$$B = Mg + 20g$$

$$\Rightarrow 21\frac{1}{3}g = Mg + 20g$$

$$\Rightarrow M = 1\frac{1}{3}kg$$

Q. 5. $B = 360 - 330 = 30$

$$B = \frac{W}{S} \Rightarrow 30 = \frac{360}{S}$$

$$\Rightarrow S = 12. \text{ It is lead}$$