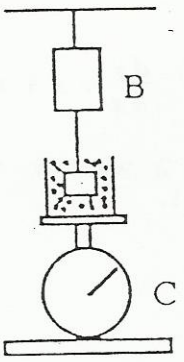
9 (b) 1997

(b) A block hangs from a spring balance B and is submerged in a liquid contained in a beaker. The mass of the beaker is 1 kg, and the mass of the liquid is 1.5 kg. Balance B reads 2.5 kg and balance C reads 7.5 kg. The volume of the block is 0.01 m^3. Calculate

(i) the mass of the block

(ii) the relative density of the liquid.



B measures the ~~Weight~~ of the object — Buoyancy.

In fact B measures 7.5 kg ∴ weight of reading = 7.5g

$\therefore \boxed{2.5g = W - B.}$

C measures Weight of Beaker + W liquid + Buoyancy

Water exerts buoyancy on mass ∴ Mass exerts equal but opposite downward force on water = Buoyancy.

$7.5g = 1g + 1.5g + B \Rightarrow B = 5g$

$W - B = 2.5g$

$W = 7.5g.$

∴ Mass = 7.5 kg.

$\rho = \frac{m}{V} \Rightarrow m = V\rho$

$\Rightarrow 7.5 = 0.01\,\rho$

$\therefore \rho = 750$

$\Rightarrow S_0 = 0.75$

$B = 1g.$ $W = 7.5g \Rightarrow B_L = \frac{S_L W_0}{S_0} =$

$\Rightarrow 5g = \frac{S_L (7.5g)}{0.75}$

$\Rightarrow 5(0.75)g = S_L (7.5)g$

$\Rightarrow 0.5 = S_L$