## PRACTICE QUESTIONS ON EQUILIBRIUM OF BODIES IN LIQUIDS

Where necessary take g = 10ms-2

**1**. A substance whose relative density is 1.5 weighs 0.27N when fully immersed in water. Calculate its actual weight in air. (Answer: 0.81N)

**2**. If the relative density of a metal is 19, what will be the mass of 20cm3 of the metal when immersed in the water? (Answer: 360g)

**3**. A river car-ferry boat has a uniform cross-sectional area in the region of its water-line of 720m2. If sixteen cars of average mass 1100 kg are driven on board, find the extra depth to which the boat will sink in the water.

(Density of water = 1g/cm3 or 1000kg/m3) (Answer: 24mm)

**4**. A cube made of oak and of side 15cm floats in water with 10.5cm of its depth below the surface and with its sides vertical. What is the density of oak?

(Answer: 0.7g/cm3)

**5**. A body has mass 10kg in air and 4kg when immersed totally in water. Calculate the volume of the body and its density. (Answer: V = 6 x 10-3m3, ρ = 1.67 x 103 kgm-3)

**6**. The mass of a loaded test tube of a uniform cross-sectional area 4cm2 is 8g. To what depth will it sink in water? (Answer: 2cm)

**7**. State Archimedes principle and hence determine the upthrust on 90cm3 of iron when totally immersed in water of density 1g/cm3. (Answer: 0.9N)

**8**. An iron cube of mass 480g and density 8g/cm3 is suspended by a string so that it is half-immersed in an oil of density 0.9g/cm3. Find the tension (force) in the string.

(V = 60cm3, Vsubmerged = 30cm3, Upthrust = 0.27N, Tension = 4.53N)

**9**. 30cm3 of brine of relative density 1.15 and 42cm3 of water are mixed. What is the density of the final solution? (Answer:1.0625gcm-3)

**10**. A hydrometer of mass 3.60kg and volume 6.00 x 10-5m3 floats in a liquid with 1/5 of its volume above the liquid. Calculate the density of the liquid.

(Answer: 7.5 x 104 kgm-3)

**11**. A cube of volume 125cm3 floats in water. Find the depth to which it will sink in (a) water (b) liquid of density 0.8 If the density of the cube is 0.8g/cm3.

(Answer: 4cm & 5cm respectively)

**12**. A body displaces 4.5cm3 of water floating and 22.5cm3 when fully immersed. What is its density? (Answer: 1/5 g/cm3)

**13**. The horizontal door of a submarine at a depth of 500m has an area of 0.4 m2. Calculate the force exerted by the sea water on the door at this depth.

[Relative density of sea water = 1.03], [Atmospheric pressure = 1.01 x 105 Nm-2]

[Density of pure water = 1000 kgm-3], [g = 10 ms-2] (Answer: 2.06 x 106 N)

**14**. A rectangular metal block has a mass of 480 g and dimensions 5cm by 4cm by 3cm. Calculate the density of the metal.

The same block is now suspended from a balance so that the block is completely immersed in a liquid whose density is 1.2 g/cm3. What will be the reading on the balance? (Answer: 8 g/cm3 or 8000 kg/m3; 0.41 kg)

**15**. An alloy of mass 588g and volume 100 cm3 is made of iron of density 8.0 g/cm3 and aluminium of density 2.7 g/cm3. Calculate the proportion by

(a) volume (b) by mass of the constituents of the alloy. (Ans: 60:40, 480: 108)