

CHAPTER 08**FLOATING BODIES**

Q5. The volume of 50g of substance is 20 cm^3 . If the density of water is 1 g/cm^3 , will the substance sink or float when placed on the surface of water? What will be the mass of water displaced by the substance?

Ans.

Given that mass of substance is = 50g and volume is = 20 cm^3 .

Then the density of the substance will be =


$$\begin{aligned} & \frac{\text{Mass of substance}}{\text{Volume of substance}} \\ &= \frac{50\text{g}}{20\text{cm}^3} \\ &= 2.5 \frac{\text{g}}{\text{cm}^3} \end{aligned}$$

As we know that density of water = 1 g/cm^3

According to Archimedes principle, the substances having higher density than water will sink in water & substances having density lower than water will float on the surface of water.

Since the density of the substance is greater than the density of water, it will sink in water.

$$\begin{aligned}\text{The volume of water displaced} &= \text{Volume of substance} \\ &= 20 \text{ cm}^3\end{aligned}$$

Mass of water displaced by substance

$$= \text{Volume} \times \text{Density} = 20 \times 1 = 20\text{g}$$

Q6. Find the pressure at a depth of 10 m in water if the atmospheric pressure is 100kPa. [1Pa = 1N/M²] [100kPa = 105Pa = 105N/m² = 1 atm]

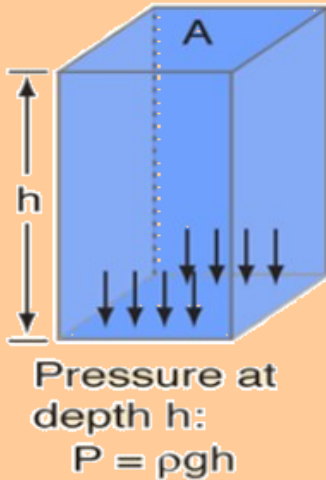
Answer:

If we consider a tank of height 'h', filled with water then the pressure at the bottom surface of tank will be (look at the figure also)

$$\begin{aligned}\text{Pressure} &= \frac{\text{Weight}}{\text{Area}} \\ &= \frac{mg}{\text{Area}} \\ &= \frac{\rho Vg}{\text{Area}}\end{aligned}$$

$$= \frac{\rho \times \text{area} \times h \times g}{\text{Area}}$$

$$= \rho gh$$



As the pressure at the surface of water is atmospheric, so

Pressure at a depth 'h' below the surface of water =

Atmospheric pressure + Pressure due to water column of height 'h'

Given that height of tank is $h = 10\text{m}$

The atmospheric pressure = 100 kPa

Density of water = $1\text{g/cm}^3 = 10^3\text{ kg m}^{-3}$

The gravitational constant $g = 10\text{ ms}^{-2}$

Then the pressure at a depth 'h' will be

= atmospheric pressure + Pressure at bottom

$$= 100\text{kpa} + \rho gh$$

$$= 10^5 \text{ N / m}^2 + 10^3 \text{ k / m}^3 \times 10\text{m / s}^2 \times 10\text{m}$$

$$= 10^5 \frac{\text{N}}{\text{m}^2} + 10^3 \text{ km}^{-3} \times 10\text{ms}^{-2} \times 10\text{m}$$

$$= 10^5 \frac{\text{N}}{\text{m}^2} + 10^6 \frac{\text{N}}{\text{m}^2}$$

$$= 2.0 \times 10^5 \frac{\text{N}}{\text{m}^2} = 200\text{kpa}$$

