

① Mass of a density bottle is 35g when empty, 65g when filled with water and 59g when filled with alcohol. Find the relative density of alcohol.

sol: Mass of water = $65 - 35$
 $= 30\text{g}$

density of water = $\frac{m}{V} = 1\text{g/cc}$
 $= V = 30\text{cc}$

Volume of bottle = 30cc

Weight of bottle with alcohol = 59g

Mass of alcohol = $59 - 35$
 $= 24\text{g}$

density of alcohol = $\frac{m}{\text{vol bottle}}$

$= \frac{24}{30}$

$= \frac{4}{5}\text{g/cc}$

$= 0.8\text{g/cc}$

② What is a density bottle? How is it used to find the density of a liquid?

ans: A density bottle is a measuring device which determines

liquid density by measuring the difference between an empty and filled bottle and dividing by an equal volume of water to find the specific density of substance.

③ Distinguish between density and relative density.

ans → Density is mass per unit volume whereas relative density is density of substance by density of water (fixed).

④ Explain the meaning of the statement 'Relative density of Al is 2.7'.

ans → This line states that Aluminium is 2.7 times heavier than water.

⑤ Mass of an empty density bottle is 21.8 g, when filled completely with water, it is 41.8 g and when filled completely with liquid it is 40.6 g.

a) Find the volume of density bottle.

Volume of density bottle:

Mass of density bottle = 21.8g = M_1

Mass of bottle + water = 41.8g = M_2

$$\begin{aligned} \text{Mass of water completely filled} &= M_2 - M_1 \\ &= 41.8 - 21.8 \\ &= 20\text{g} \end{aligned}$$

$$\begin{aligned} \text{Volume of bottle} &= 20 \times 1\text{cc} \\ &= 20\text{cc} = 20\text{ml} \end{aligned}$$

b) Find relative density of liquid.

$$= \text{Mass of } 20\text{cc of liquid} = (\text{mass of } \overset{\text{bottle}}{\text{dens}} + \text{mass of } 20\text{cc liquid}) - \text{mass of density bottle}$$

$$= 40.6 - 21.8$$

$$= 18.8\text{g}$$

$$\text{Relative density} = \frac{\text{density of liquid}}{\text{density of bottle}} = \frac{18.8}{20} = 0.94$$

⑥ From the following observations, find the density and relative density of a brine solution.

a) Mass of empty density bottle = 22g

b) Mass of bottle + water = 50g

c) Mass of bottle + Brine solution = 54g

sol: Mass of empty bottle = 22g = M_1
Mass of bottle + water = 50g = M_2
" " " + brine solution = 54g = M_3

$$\text{Mass of water} = M_2 - M_1 = 50 - 22 = 28\text{g}$$

$$\text{" " " brine solution} = M_3 - M_1 = 54 - 22 = 32\text{g}$$

$$\text{Density of brine solution} = \frac{\text{Mass of brine solution}}{\text{Mass of water}}$$

$$= \frac{32\text{g}}{28\text{g}} = \frac{8}{7} = 1.14 \text{ g/cc}$$

$$\text{R.D.} = \frac{\text{density of brine solution}}{\text{density of bottle}}$$

$$= \frac{1.14}{1}$$

$$= \frac{8}{7} = 1.14$$