PHYSICS

1. The 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: When it is filled with alcohol = 59g

Mass of alcohol = $\frac{\text{Mass}}{\text{Volume of Bottle}} = \frac{24}{30} = \boxed{0.8 \text{ g/cc}}$

RD = $\frac{\text{density of alcohol}}{\text{density of water}} = 0.8$

Let V be the volume of bottle whose mass is 35 gm.

When filled with water the bottle mw = 65 - 35 = 30 gm

Density of water = $\frac{mw}{V} = 1$

$\Rightarrow \frac{30}{V} = 1$

$\Rightarrow \boxed{30 = V}$

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

sol: Density bottle is a small glass bottle having a glass stopper at its neck. The bottle can store a fixed volume of a liquid. Generally, the volume of the bottles is 25 ml or 50ml. The stopper has a narrow hole through it. When the bottle is filled with liquid and stopper is inserted, the excess liquid rises through

the hole and drains out. Thus the bottle will contain the same of liquid each time when it is filled. It is used to determine the density of a liquid.

3. Distinguish between density and relative density.

Density -

1. It's the ratio of mass to volume; Density $\frac{mass}{volume} = \frac{M}{V}$
2. Units are g/cm^{-3}
3. Density in $kg/m^{-3} = R.D = 1000$

Relative Density.

1. It is the ratio of density of substance to density of water.
2. It is a pure quantity. It has no units.
3. R.D. = Density in g/cm^{-3}
R.D = Density in $kg/m^{-3}/1000$

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

sol: The statement 'Relative density of aluminium is 2.7 means.
A piece of aluminium of any volume has mass 2.7 times that of equal volume of water i.e. Aluminium is 2.7 times heavier than water.

5. The 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. find:

a. The volume of the density bottle.
b. The relative density of liquid.

Density of water = 1 g cm^3
(a) Volume of density bottle.
Mass of empty density bottle = M1 = 21.8 g
Mass of bottle + water = M2 = 41.8 g
So, mass of water completely filling the density bottle = M2 − M1
= 41.8 − 21.8 = 20 g
1 g of water has volume = cc
So, volume of bottle = volume of water = 20 cc = 20 ml
(b) The relative density of liquid
Mass of 20 cc of liquid.
= (mass of density bottle + mass of 20 cc of liquid) − mass of density bottle
= 40.6 − 21.8
= 18.8 g
Mass of 20 cc of water = 20 g
Relative density of liquid.
R.D = \frac{Mass of 20 cc of liquid}{Mass of 20 cc of water} = \frac{18.8}{20} = 0.94