Excercise

(B) Short / long answer qsns.

(1) Define the term density of a substance.

ans→ Density of a substance is defined as "mass per unit volm".

(2) Name the SI unit of density. How is it related to g/cm^3.

ans→ S.I unit of density = kg/m^3

$$1\ kg/m^3 = \frac{1\ kg}{1\ m^3} = \frac{1000\ g}{(100\ cm)^3}$$

$$= \frac{1}{1000}\ g\ cm^{-3}$$

(5) The density of brass is 8.4 g/cm³. What is the meaning of this statement?

ans→ It means one cubic cm volm of brass has mass of 8.4g.

(6)(a) A given qty of qty of ~~mass~~ liquid is heated. Which of the following qty will vary and how.

(a) mass (b) volm and (c) density → changes & decreases

(a) ↓ does not change

(b) ↘ changes and increases with rise in temp

(7) Describe an experiment to show the density of the material of a coil.

ans→ Let the mass of coin shown by beam balance = M (gram) = 80 g (say)

Initial volm of water = V_1 = 40 ml

Find volm of water,

when coin is added in the cylinder = V_2 = 50 ml.

then vol of coil = $V_2 - V_1 = 50 - 40 = 10$ ml.

Density = $\frac{m}{V} = \frac{50}{52-42} = \frac{50}{10}$

$= 5 g/cm^3$

(14) How does the density of a body and that of a liquid determine wheather the body will float or sink into that liquid?

ans⇒ the density of an object determines wheather it will float or sink in another substance. An object will float if the density of a body is less than the density of liquid. An object will sink if the density of a body is more than the density of liquid it is placed in.

(15) A cork piece floats on water surface while an iron nail sinks in it. Explain the reason.

ans⇒ Cork floats on water as the density of cork is less than the density of water.

→ Iron nail sinks in water as the density of iron nail is more than the density of water.

(16) Which of the following will sink or float in water? (Density of water = 1 g cm^{-3})

a) Density of Body A = 500 kg m^{-3}

Sol = 500 kg m^{-3} = ~~500~~ 0.5 g/cm^3

As density of body A is less than density of water, so it will float.

b) Body B having density 2520 kg m^{-3}

sol: Density of body B = 2520 kg/m^3 = $\frac{2520}{1000}$ = 2.52 g/cm^3

Ds, density of body B is more than density of water, so it will sink.

c) Body C having density 1100 kg m^{-3}

sol: Density of body C = 1100 kg m^{-3} = 1100 × $\frac{1}{1000}$ = 1.1 g cm^{-3} which is greater than density of water.

d) Body D having density 0.85 g cm^{-3}.

sol: Density of body D = 0.85 g/cm^3 < 1.0 g cm^{-3}

Density of body D is less than that of water ~~that~~ body D will float.

(20) For a floating body, how is its weight related to the buoyant force?

sol: When a body ~~body~~ floats in a liquid, the weight of liquid displaced by its immersed part is equal to the total weight of the body.

(22) Explain why an iron needle sinks in water, but a ship made of iron floats on water.

sol: Density of iron is more than density of water.

∴, ~~weight~~ the nail sinks while the shape of the ship is made in such a way that it displaces more weight

of water than its own weight. Also, the ship is hollow and the empty space contains air which makes the average density of ship less than that of water. Hence, the ship floats water.

C. Numericals

① The density of air is 1.28 g litre^{-1}. Express it in

a) g cm^{-3}

Sol: Density of air = 1.28 g/l

In g cm^{-3} = $\frac{1.28}{1000}$ = 0.00128 g cm^{-3}

b) kg m^{-3}

= 0.00128 × 100 = 1.28 kg/m^3.

② The dimensions of a hall are 10 × 7 × 5 m. If density of air is 1.11 kg m^{-3}. Find mass of air in the hall.

Sol: Dimensions of hall = 10 × 7 × 5 m
Volume of hall = 350 m^3
Density of air = 1.11 kg m^{-3}

M = V × D
= 350 × 1.11
= 388.5 kg

③ The density of aluminium is 2.7 g cm^{-3}. Express it in kg m^{-3}.

sol: density of Al = 2.7 g/cm^3

In kg/m^3 = $\frac{27 \times 1000}{10}$ = 2700 kg m^{-3}

④ The density of alcohol is 600 kg/m^3. Express it in g cm^{-3}.

sol: Density of alcohol = 600 kg/m^3

In g/cm^3 = $\frac{600}{1000}$ = 0.60 g/cm^3

⑤ A piece of zinc of mass 438.6 g has a volm of 86 cm^3. Calculate the density of zinc.

sol: Mass of zinc (M) = 438.6 g

V = 86 cm^3

D = $\frac{m}{V}$ = $\frac{438.6}{86}$ = 5.1 g/cm^3.

⑥ A piece of wood of mass 150 g has a volm of 900 cm^3. Find density of wood in CGS unit & SI unit

sol: Mass of wood = 150g

Volm of wood = 900 cm^3

Density = $\frac{m}{V}$ = $\frac{150}{900}$ = 0.75 g/cm^3

In SI system = 0.75 × 1000 = 750 kg/m^3.

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⑦ Cal. the volm of wood of mass 6000 kg if the density of wood is 0.8 g/cm³.

sol: Mass of wood = 6000 kg
Density of wood = 0.8 g/cm³
= 800 kg/m³

$D = \frac{m}{V}$; $V = \frac{M}{D} = \frac{6000}{800} = 7.5\ m^3$.

⑧ Calculate the density of solid from the following data;

a) Mass of solid = 72 g
b) Initial volm in measuring cylinder = 24 ml.
c) Final volm after completely immersing solid = 42 ml.

sol: Mass of solid = 72 g
Initial volm (V_1) = 24 ml
Final volm (V_2) = 42 ml
Volm of solid = $V_2 - V_1 = 42 - 24 = 18\ cm^3$.

Density = $\frac{m}{V} = \frac{72}{18} = 4\ g/cm^3$.

~~sol:~~
~~a) The mass of a~~

9. a) sol; Density of water = 1 g/cm³. ; volm of density bottle = weight of water completely.

~~Volm of d~~

Mass of empty bottle = M_1 = 21.8 g

Mass of bottle + water = M_2 = 41.8 g

∴, Mass of water = $M_2 - M_1$

= 41.8 − 21.8

= 20 g

Volm of density bottle = volm of water

= 20 c.c. = 20 ml.

b) Sol: ~~R.D. of~~ Mass of 20 cc liquid = mass of density bottle + mass of 20 cc of liquid)

= 40.6 − 21.8

= 18.8 g

Mass of 20 cc of water = 20 g

R.D of liquid = $\frac{\text{mass of liquid}}{\text{" " water}} = \frac{18.8}{20} = 0.94$.

(11) The mass of an empty density bottle is 30 g, it is 75 g when filled completely with water and 65 g when filled completely with a liquid.

Find:

a) Volm of density bottle.

Sol: Mass of density bottle = 30 g = M_1

Mass of bottle + water = 75 g = M_2

" " " + liquid = 65 g = M_3

Mass of water = $M_2 - M_1$ = 75 − 30 = 45 g

Vol^m of density bottle = ~~Mass of water~~ = 45 ml.

b) density of liquid ~~and~~

Sol: $D = \frac{\text{mass of liquid}}{\text{" " water}} = \frac{35}{45} = 0.77\ g/cm^3.$

c) R.D. of ~~the~~ liquid

Sol: Mass of eql vol^m of liquid = 35 g
45 cc of

$R.D. = \frac{\text{mass of liq.}}{\text{" " water}} = \frac{35}{45} = \frac{7}{9} = 0.77.$

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