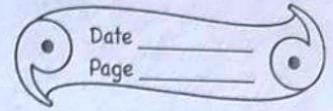


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## Assignment 1

① Define the term density of a substance?

Ans) The density of a substance is its mass per unit volume.

② Name the ~~SI unit~~ SI unit of density. How is it related to  $\text{GCM}^{-3}$ .

Ans) The SI unit of density is  $\text{kg m}^{-3}$  (~~kg per cu~~ (kilogram per cubic meter)). In the C.G.S system unit of mass is g and unit of volume is  $\text{cm}^3$ , so C.G.S unit of density is  $\text{g cm}^{-3}$ . Relationship between SI and C.G.S units:

$$1 \text{ kg m}^{-3} = \frac{1 \text{ kg}}{1 \text{ m}^3} = \frac{1000}{(1000)^3}$$

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

③ The density of brass is  $8.4 \text{ g cm}^{-3}$ . What do you mean by this statement?



Ans) It means that one cm<sup>3</sup> of brass has a mass of 8.1 gram.

④ Arrange the following substances in order of their increasing density: iron, cork, brass, water, mercury.

Ans) Substances in increasing density -

Cork, water, iron, brass and mercury

⑤ How does the density of a liquid or gas vary with temperature?

Ans) The density of a substance decreases with the increase in its temperature if the substance expands on heating. This decreases more in gases, less in liquids for the same rise in temperature. The density of water increases when heated from 0°C to 4°C and then decreases when heated above 4°C.

⑥ A given quantity of liquid is heated. Which of the following quantity will vary and how?



Ans) When a given quantity of liquid is heated the mass does not change, the volume changes and increases and the density ~~is~~ decreases.

7) Describe an experiment to determine the density of the material of a coin.

Ans) To find the density of the material of a coin we need to find its mass by common beam balance and its volume by measuring cylinder.

To measure the mass of a coin, let the mass of a coin shown by a beam balance = ~~A~~  $M$  (gram) = 50 g (coin)

To measure the volume of a coin

Initial volume of water =  $V_1 = 42 \text{ ml}$

Final volume of water

∴ When a coin is added in the cylinder =

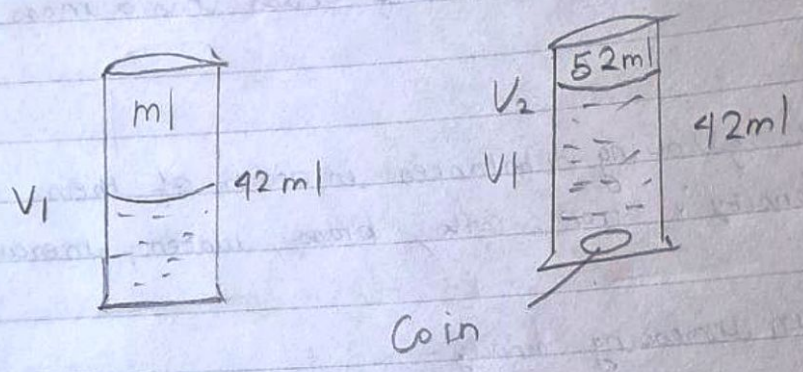
$V_2 = 52 \text{ ml}$

Then the volume of coin =  $V_2 - V_1 = 52 - 42 = 10 \text{ ml} \hat{=} 10 \text{ cm}^3$

Density =  $\frac{\text{mass}}{\text{volume}} = \frac{50}{10} = 5 \text{ g/cm}^3$



7



Coin



8) Describe an experiment to determine the density of a liquid.

Ans) To determine the density of a liquid for example milk, its mass  $M$  is measured by a common beam balance and its volume  $V$  is measured by a measuring cylinder. Then density is calculated by using the relation

$$D = \frac{M}{V}$$

Take the beaker. Measure the mass of the empty beaker using a common beam balance let the mass be  $M_1$  gram.

Now take a measuring cylinder and pour milk into it to a certain level say 50 ml. Thus volume of milk  $V = 50 \text{ ml}$  or  $50 \text{ cm}^3$ .

Transfer the milk into the empty beaker.

Measure its mass again. Let the mass of beaker with milk be  $M_2$  g.

Mass of the milk  $M = M_2 - M_1$  g.

Let  $M = 51.5$  g.

Density of milk =  $\frac{\text{Mass}}{\text{Volume}} = \frac{51.5 \text{ g}}{50 \text{ cm}^3} = 1.03 \text{ g cm}^{-3}$



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

Ans) A density bottle is a specially designed bottle which is used to determine the density of a liquid. It 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 a bottle is 25 ml and 50 ml. The stopper has a narrow hole through it. When the bottle is filled with a liquid and stopper is inserted, the excess liquid rises through the hole and drains out. Thus, the bottle always contains the same volume of liquid each time when it is filled.

To determine the density of a liquid using the density bottle, we have to measure the mass of liquid and mass of water taken in it by using the common balance. The mass of water in the density bottle gives the volume of liquid.