14/5/2021

ASSIGNMENT-1

1.) Define the term density of a substance.
2.) Name the SI unit of density. How is it related to $g cm^{-3}$.
3.) The density of brass is $8.4 g cm^{-3}$. what do you mean by this statement?
4.) Arrange the following substances in order of their increasing density: iron, cork, Brass, water, mercury.
5.) How does the density of a liquid or gas vary with temperature?
6.) A given quantity of liquid is heated. which of the following quantity will vary and how?
7.) Describe an experiment to determine the density of the material of a coin.
8.) Describe an exerciperment to determine the density of a liquid.
9.) what is a density bottle? How is it used to find the density of a liquid?

Answers

1.) Density of a substance is defined as "mass per unit volume".

$$\text{Density } (d) = \frac{\text{mass of the substance}}{\text{volume of the substance}}$$

$$d = \frac{m}{V}$$

1. unit of density is kgm^{-3} in C.G.S ~~system~~

2) ~~Name the S.I unit of density How it~~ system unit of mass is g and unit of volume is cm^3, so CGS unit of density of $g\,cm^{-3}$ (gram per cubic centimetre)

Relationship between S.I. and C.G.S. units

$$1\,kgm^{-3} = \frac{1\,kg}{1\,m^3} = \frac{1000\,g}{(100\,cm)^3} = \frac{1}{1000}\,gcm^{-3}$$

Thus,

$$1\,kgm^{-3} = 10^{-3}\,g\cdot cm^{-3}$$

or $$1\,g\,cm^{-3} = 1000\,kgm^{-3}$$

3) This statement means one cubic centimetre volume of brass has mass of 8.4 g.

4) Cork, water, iron, Brass, mercury

5) most of the liquids increase in volume with increase in temperature, but water shows anomalous behaviour. water has maximum volume at 4°C and maximum density at 4°C. Actually, when volume increases density decreases and when volume decreases the density increases. But water when cooled from a high

temperature, contracts up to 4°C because volume decreases and expands when cooled further below 4°C and hence density of water increases when it is cooled upto 4°C while decreases when cooled further below 4°C. In other words, the density of water is maximum at 4°C equal to 1 g cm^{-3} or 1000 kg m^{-3}.

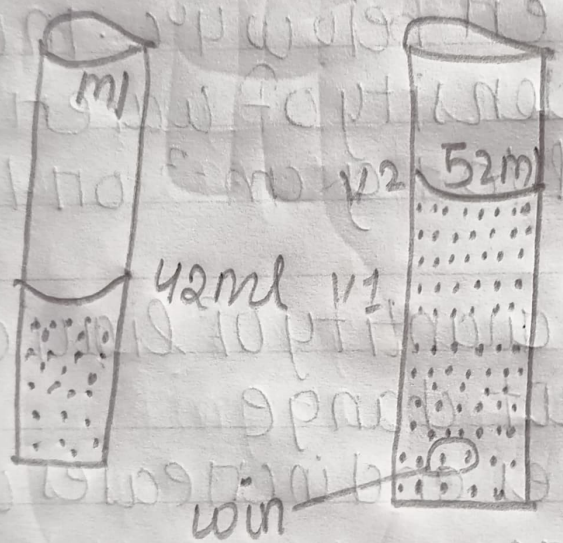
6) When a given quantity of liquid is heated
(a) mass: does not change
(b) volume: changes and increases with rise in temperature.
(c) density: changes and decreases
density = mass / volume

7) density = mass / volume
To find the density of the material of a coin, we need to find its (i) mass - by common beam balance and (ii) its volume by measuring cylinder.
measure the mass of coin.
experiment - let the mass of coin shown by beam balance = M (gram) = 50 g (may)
measuring the vol. of coin.

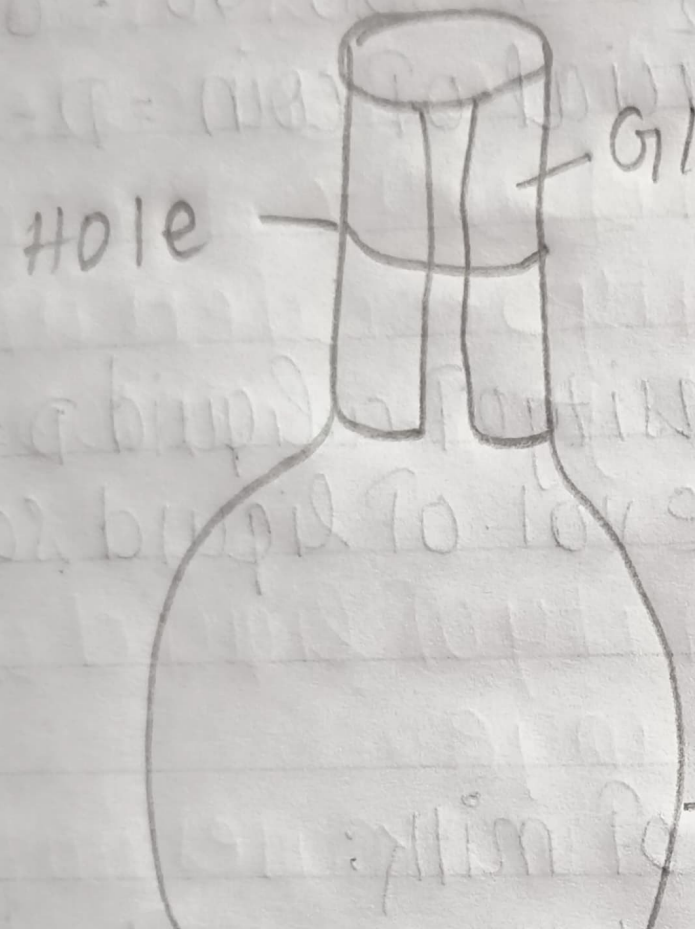
intial volume of water = V_1 = 40 ml (say)
Final volume of water
when coin is added in the cylinder = V_2 = 50 ml (say)
Then vol. of coin = $V_2 - V_1 = 50 - 40 = 10$ ml
Density of material of coin = $D = \frac{M}{V} = \frac{50}{52-42}$
$= \frac{50}{10} = 5\ g\ cm^{-3}$

8.) To determine the density of a liquid $D = M/V$
we need to find (i) the vol. of liquid say milk
(ii) mass of liquid.
Experiment:
(i) To find the mass of milk:
wt. of empty 100 c.c beaker = m_1 g = 70g (say)
Fill the beaker (half) with milk and weigh again = m^2 g = 116 g (say)
(ii) To find the vol. of milk:
Transfer this milk into measuring cylinder and note the volume V = 40 c.c (say)
∴ Density of milk = $D = \frac{M}{V} = \frac{(m_2 - m_1)}{40\ c.c}$
$= \frac{(116-70)}{40} = \frac{46}{40} = \frac{4.6}{4} = 1.15\ g\ cm^3$

9.) ~~What is a density bottle?~~ 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


m1
v1
42ml
v2
52ml
v1
42 ml
10in

Of bottle is 25ml or 50ml. Stopper has a narrow hole through it. When 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 volume of liquid each time when it is filled. It is used to determines the density of a liquid.


Glass stopper
Hole
Glass bottle