HW
24.07.21

HOME ASSIGNMENT (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.

Given,

M_1 (Mass of density bottle) = 35g

M_2 (Mass of density bottle + water) = 65g

M_3 (Mass of density bottle + alcohol) = 59g

Mass of water = $M_2 - M_1$

$= (65 - 35)g$

$= 30g$

Mass of alcohol = $M_3 - M_1$

$= (59 - 35)g$

$= 24g$

Volume of water = 30g = $30 cm^3$

Volume of density bottle = Volume of water = 30g = $30 cm^3$

1gm of water = $1 cm^3$ = 1ml

Volume of alcohol = 30g Volume of density bottle = 30g = $30 cm^3$

Density of alcohol = $\frac{\text{Mass of alcohol}}{\text{Volume of alcohol}}$

$= \frac{24g}{30 cm^2} = \frac{4g}{5 cm^3} = 0.8 g cm^{-3}$

Density of water = $\frac{\text{Mass of water}}{\text{Volume of water}} = \frac{30g}{30 cm^3}$

Therefore,

Relative density of alcohol = $\frac{\text{Density of alcohol}}{\text{Density of water}}$

$= \frac{4g}{5cm^3} \div \frac{30g}{30cm^3}$

$= 0.8$.

∴ Hence, the R.D. of alcohol is 0.8.

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

Density bottle is a small glass bottle having a glass stopper at its neck. The bottle can store a fixed volume of a liquid. 6

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 volume 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 of a substance is its mass per unit volume, while relative density of a substance is the ratio of the density of the substance to the density of water.

4. Explain the meaning of the statement 'Relative density of aluminum is 2:7'.

The statement 'Relative density of aluminium is 2:7' means a piece of aluminium of any volume has mass 2.7 times that of an equal volume of water, i.e., Aluminium is 2.7 times heavier than water.

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

a. The volume of density ~~volume~~ bottle.

b. The relative density of bottle.

Given,

M1 (Mass of empty density bottle) = 21.8g

M2 (Mass of density bottle + water) = 41.8g

M3 (Mass of density bottle + liquid) = 40.6g

Mass of water = M2 - M1

= (41.8 - 21.8)g

= 20g

Mass of liquid = (M3 - M1)

= (40.6 - 21.8)g

= 18.8g

Volume of water = $20\,cm^3$ ($1g = 1cm^3 = 1ml$)
Volume of density bottle = Volume of water = $20cm^3$
Volume of liquid = Volume of density bottle = $20\,cm^3$

$$\text{Density of liquid} = \frac{\text{Mass of liquid}}{\text{Volume of liquid}}$$

$$= \frac{18.8g}{20cm^3} = 0.94\,g\,cm^{-3}$$

$$\text{Density of water} = \frac{\text{Mass of water}}{\text{Volume of water}}$$

$$= \frac{20g}{20cm^3}$$

$$\text{Relative density of liquid} = \frac{\text{Density of liquid}}{\text{Density of water}}$$

$$= \frac{0.94g/cm^3}{} = \frac{18.8g}{20cm^3} \div \frac{20g}{20cm^3}$$

$$= 0.94$$

∴ Hence, the volume of density bottle is $20cm^3$ and the relative density of liquid is 0.94.

6. From the following ~~observations~~ observations calculate the density and relative density ~~of a~~ of a brine solution
a. Mass of empty density bottle = 22g
b. Mass of bottle + water = 50g
c. Mass of bottle + brine solution = 54g

Let,
Mass of empty density bottle be $= M_1$
Mass of bottle + water be $= M_2$
Mass of bottle + brine solution be $= M_3$

Now,
Mass of water $= M_2 - M_1$
$= (50 - 22)\,g$
$= 28\,g$

Mass of brine solution $= M_3 - M_1$
$= (54 - 22)\,g$
$= 32\,g$

Volume of water $= 28\,cm^3$ ($1g = 1cm^3 = 1ml$)
Volume of bottle = Volume of water $= 28\,cm^3$
Volume of brine solution = Volume of bottle $= 28\,cm^3$
Density of brine solution $= \frac{\text{Mass of brine solution}}{\text{Volume of brine solution}}$
$= \frac{32g}{28cm^3} = \frac{8g}{7cm^3} = 1.14\,gm^{-3}$

Density of water $= \frac{\text{Mass of water}}{\text{Volum of water}}$
$= \frac{28g}{28cm^3}$

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

$= \frac{8g}{7cm^3} \div \frac{28g}{28g\,cm^2} = 1.14\,g\,cm^{-3}$

∴ Hence, the density and R.D. of ~~ba~~ brine solution is $1.14\,g\,cm^{-3}$ and 1.14.