HW
19.04.21

Physics

HOME ASSIGNMENT.

1. The density of alcohol is 600 kg/m^3. Express it in gcm^{-3}.

Given,

Density of alcohol in kg m^{-3} = 600 kg/m^3

Density in gcm^{-3} =

1 m^3 = 100 cm

1 m^3 = 100 cm × 100 cm × 100 cm

= 10^6 cm^3

1 kg = 1000 g

600 kg = (600 × 1000) g

= 6×10^5 g

Now,

$$\text{Density} = \frac{\text{Mass}}{\text{Volume}} = \frac{6 \times 10^5 \text{ g}}{10^6 \text{ cm}^3}$$

$$= \frac{6 \text{ g}}{10 \text{ cm}^3}$$

$$= 0.6 \text{ g cm}^{-3}$$

∴ Hence, its density is 0.6 g cm^{-3} in g cm^{-3}.

2. A piece of wood of mass 150 g has a volume of 200 cm^3. Find the density of wood in

(a) C.G.S. unit

Given,

Mass of the piece of wood = 150 g

Volume of the piece of wood = 200 cm^3

Density in C.G.S. unit =

Now,

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

$$= \frac{150 \text{ g}}{200 \text{ cm}^3} = 0.75 \text{ g cm}^{-3}$$

∴ Hence, the density of wood in C.G.S. unit is 0.75 g cm^{-3}.

(b) S.I.

Given,

Mass of the piece of wood = 150 g

Volume of the piece of wood = 200 cm^3

Density of the piece of wood in S.I. unit =

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

1 g = $\frac{1}{1000}$ kg

150 g = $\left[\frac{150 \times 1}{1000}\right]$ kg = 15/100 kg

1 cm = $\frac{1}{100}$ m

1 cm^3 = $\frac{1 \text{ m}}{100} \times \frac{1 \text{ m}}{100} \times \frac{1}{100}$ m = $\frac{1}{10^6}$ m^3

Now,

$$= \frac{0.15 \text{ kg}}{10^6 \text{ cm}^3} = \frac{15 \text{ kg}}{10^8 \text{ m}^3} = 0.$$

$= 1\,g = \frac{1}{1000}\,kg$

$= 950\,g = \left[150 \times \frac{1}{1000}\right] kg$

$= \frac{15}{100}\,kg$

$1\,cm = \frac{1}{100}\,m$

$1\,cm^3 = \frac{1}{100}\,m \times \frac{1}{100}\,m \times \frac{1}{100}\,m$

$= \frac{1}{10^6}\,m^3$

$200\,cm^3 = 200 \times \frac{1}{10^6}\,m^3 = \frac{2}{10^4}\,m^3$

Now,

$\frac{\text{Mass}}{\text{Volume}} = \frac{15 \times 10^{-2}}{2 \times 10^{-4}}\,\frac{kg}{m^3} = \frac{750\,kg}{m^3} = 750\,kg\,m^{-3}$

∴ Hence, the density of the wood in S.I. unit is $750\,kg\,m^{-3}$.

3. Calculate the density of solid from the following data:

(a) Mass of solid (M) = 72g

(b) Initial volume of water in a measuring cylinder = 24ml

(c) Final volume of water when solid is completely immersed in water 42 ml.

Given,

Mass of the solid = 72g

Volume of water = 24 ml.

Volume of water including solid = 42 ml

Amount of water displaced = (42-24)ml

= 18 ml

As we know,

= 1 ml = $1\,cm^3$

= 18 ml = $18\,cm^3$

And,

* Amount of water displaced when a solid is completely immersed into it, defines the volume occupied in the water.

So,

Water displaced = Volume of solid.

Volume of the solid = $18\,cm^3$

Density of the solid = $\frac{M}{V} = \frac{72g}{18\,cm^3} = \frac{4g}{cm^3}$

$= 4\,g\,cm^{-3}$.

∴ Hence, the density of solid is $4\,g\,cm^{-3}$.

4. How does the density of a liquid (or gas) vary with temperature?

When we provide temperature (kinetic energy) to any liquid or gas, the intermolecular distance between their molecules increases and vice versa. So, here, the volume get increased or decreased may result in the change in their density.

Hence, concluded that ~~different~~ substances of equal volumes have different masses, whereas substances of equal masses have different volumes.

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

A density bottle is a specially designed bottle which is used to determine the density of a liquid.

There is stopper provided at the top, which has narrow hole through it. When the bottle is filled with the 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.

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

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

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

Density of alcohol = $\frac{\text{Mass of alcohol}}{\text{Volume of alcohol}} = \frac{24\,g}{30\,cm^3} = \frac{4g}{5\,cm^3} = 0.8\,gcm^{-3}$

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

Therefore,

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

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

= 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. 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 = $20\,cm^3$

Volume of liquid = Volume of density bottle = $20\,cm^3$

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

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

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

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

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

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

$$= 0.94$$

∴ Hence, the volume of density bottle is $20\,cm^3$ 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 $= M_2 - M_1$

$= (50 - 22)g$

$= 28g$

Mass of brine solution $= M_3 - M_1$

$= (54 - 22)g$

$= 32g$

Volume of water $= 28cm^3$ ($1g = 1cm^3 = 1ml$)

Volume of bottle = Volume of water $= 28cm^3$

Volume of brine solution = Volume of bottle $= 28cm^3$

Density of brine solution $= \frac{\text{Mass of brine solution}}{\text{Volume of brine solution}}$

$= \frac{32g}{28cm^3} = \frac{8g}{7cm^3} = 1.14gm^{-3}$

Density of water $= \frac{\text{Mass of water}}{\text{Volum of brine solut- water}}$

$= \frac{28g}{28cm^3}$

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

Theo
2.09.21
2.09.21

HOME ASSIGNMENT (Physics)

1. The ~~mass~~ mass of $10 cm^3$ of silver is 103 gm. Find

(a) The density of silver in kg/m^3

(b) Relative density of silver.

Given,

Mass of silver = 103 gm

Mass of silver in kg = $\frac{103}{1000}$ kg

Volume of silver = $10 cm^3$

Volume of silver in m^3 = $\left(\frac{10 \times 1}{10^6}\right) m^3$

Density of silver = $\frac{103 \times 10^{-3} kg}{10 \times 10^{-6} m^3}$

$= 10300 kg\ m^{-3}$

~~Density~~ Density of water = $1000 kg\ m^{-3}$

Relative density of silver = $\frac{10300 kg\ m^{-3}}{\text{Density of silver}}$

Density of water

$\frac{10300 kg\ m^{-3}}{1000 kg\ m^{-3}}$

$= 10.3$

$\frac{103 \times 10^2 kg\ m^{-3}}{}$

∴ Hence, the density of silver is ~~10.3~~ and the relative density of silver is 10.3

2. A piece ~~of~~ of wood of mass 150 g has a volume of $200 cm^3$. Find the density of wood in C.G.S. ~~unit~~ ~~unit and~~ unit and S.I. unit.

Given,

Mass of the piece of wood = 150 g

Mass of the piece of wood in kg = $\frac{150}{1000}$ kg

Volume of the piece of wood = $200 cm^3$

Volume of the piece of wood in m^3 = $\left(\frac{200 \times 1}{10^6}\right) m^3$

Density of the piece of wood in C.G.S. unit = $\frac{150 g}{200 cm^3}$

$= 0.75 g\ cm^{-3}$

Density of the piece of wood in S.I. unit =

$= \frac{150 \times 10^{-3} kg}{200 \times 10^{-6} m^3}$

$= 750 kg\ m^{-3}$

∴ Hence, the density of wood in C.G.S. and S.I. unit are $0.75 g\ cm^{-3}$ and $750 kg\ m^{-3}$

3. How does the density of a liquid (or gas) vary with temperature?

Any substance belonging to liquid or gaseous state, when given or it generates kinetic energy, their

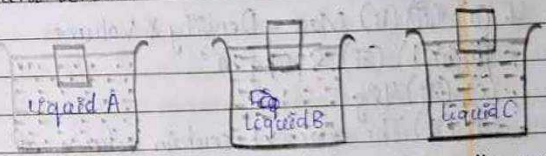
inter molecular distance increases because of their reduction in inter molecular forces of attraction between the particles as their and undergo random motion. Due to these changes, the volume increase, where variations in variation of their density is found on their density increases.

4. Define the term relative density of a substance. What is the unit of relative density?
The relative density of a substance is defined as the ratio of the density of substance to that of density of water.
Relative density = Density of substance / Density of water
As it is a ratio, so, it has no unit. It is unitless.

5. How does the density of a body and that of a liquid determine whether the body will float or sink into that liquid?
The density of a body and that of a liquid determine whether the body will float or sink into that liquid is in follows :-
(i) If the body is more dense than that of a given liquid, then it will sink in which it is placed, it will sink.
(ii) If the body is lesser dense than that of the given liquid in which it is placed, it will float.

6. What is the law of floatation?
The principle of floatation states that when an object floats on a liquid the buoyant force that acts on the object is equal to the weight of the object.
* The law of floatation is also known as the Archimedes principle.

Question: The diagram given below shows a body floating in three different liquids A, B, and C at different levels.



(a) In which liquid does the body experience the greatest buoyant force? In all liquids.
(b) Which liquid has the least density? Liquid A
(c) Which liquid has the highest density? Liquid C