STANDARD VIII PHYSICS

LESSON - 2 PHYSICAL QUANTITIES AND MEASUREMENT.

Q.1. Choose the correct answer.

1. The apparent weight of a floating body.
   a) is less than its weight. b) is more than its weight
   c) is zero d) cannot be measured.

2. If the density of body is more than the density of a liquid than the body.
   a) floats b) first sinks and then floats c)sinks d) none of these

3. The CGS unit of density is
   a)g/cm^3 b)g/m^3 c) kg/cm^3 d) Kg/m^3

4. The correct relation is
   a) Density = mass x volume b) mass = density x volume
   c) Volume = density x mass d) Density = volume ÷ mass

5. The density of alcohol is 800 $kg.m^3$. Its relative density is
   a)8 b) 0.08 c) 0.8 d) 800

6. When a substance is heated its density
   a) increases b) decreases c) remains same d) first decreases then increases

7. A block of silver of density 10.5g/cm^3 has a volume of 50cm^3. The mass of the block is
   a) 105g b) 525g c) 1050g d) 2.1g

8. The density of iron in CGS system is 7.8g/cm^3 its density in SI system is
   a) 7.8 kg/m^3 b) 78kg/m^3 c) 780 kg/m^3 d) 7800 kg/m^3

9. A block of wood has mass 200kg. If the density of wood is 800kg/m^3, its volumes will be
   a) 0.25m^3 b) 25m^3 c) 250cm^3 d) none of these

10) A block of brass (density 8.4g/cm^3) in mercury (density 13.6g/cm^3) will.
   a)sink b) float
   c) neither float nor sink, ie. remain suspended within mercury d) none of these

11) The following is the characteristic property of a substance
   a) density c) weight c) Volume d) none of these

Q.2. Fill in the blanks.

1. The upward force exerted by a liquid on an object immersed in it is called upthrust.
2. When the density of the body is less than the density of the liquid, the body will float.
3. At 4° C the density of water is 1000 kg/m^3.
4. The density of copper is 8.9g/cm^3. Its relative density is 8.9.
5. Equal volumes of iron and aluminium have different masses.
6. With fall in temperature the density of a substance increases.
7. Relative density of a substance is also called its specific gravity.
8. A hydrometer is used to measure relative density of a liquid.
9. We use a acid battery hydrometer to test whether a battery is fully charged or not.
10. 2.4 g/cm^3 = 2400 kg/m^3.

Q.3. State true or false.

1. Density of body is a scalar quantity. [True]
2. Density of a solid varies from place to place. [False]
3. The apparent weight of a floating body is zero. [True]
4. A body sinks deeper in a liquid of low density than in a liquid of high density. [True]
5. The SI unit of density is g/cm^3. [False]
6. 1g/cm^3 = 10000 kg/m^3. [False]
7. Density of a body depends on its shape and size. [True]
8. A piece of iron sinks in water but floats in mercury. [True]

Q.4. Answer the following.

1. What is meant by the statement copper is denser than wood?

   Same volume of copper weighs more than wood.

2. Define the term density. State its SI unit.

   Mass per unit volume of a substance is called its density. SI unit of density is kg/m^3.

3. How does the density of a liquid vary with temperature?

With increase in temperature density decreases. But in some special cases . (like water

Between 0°C and 4°C) density decreases with rise in temperature, called anomalous expansion.

4. What is the unit of relative density?

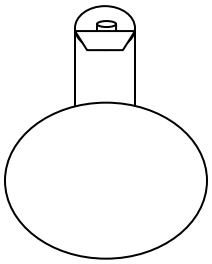
Being the ratio of two densities, Relative density has no unit, it is a pure number.

5. The density of iron is $7.8g/cm^3$. Explain the statement.

The density of iron is $7.8g/cm^3$ state that mass of $1cm^3$ of iron is 7.8g.

6. How is the relative density of a liquid measured with the help of density bottle?

The density bottle is a glass bottle with a ground glass stopper at its neck that has a fine hole in it. When the density bottle is completely filled up with the liquid and the stopper is inserted. The excess liquid flowers out through this hole. The bottle is now filled up with a definite volume of the liquid.
To determine the volume of a liquid, we first weight the empty density bottle, then fill it with water and
take its weight. Next we fill it with the given liquid and again weigh. It we record the observations as follows:



1. Mass of the empty bottle = m_1g
2. Mass of the bottle filled with = m_2g
3. Mass of the bottle filled with = m_3g liquid

Mass of water = $(m_2 - m1)$ g

Mass of liquid = $(m_3 - m1)$ g

Volume of 1g of water = $1cm^3$

.. volume of $(m_2 - m_1)$g of water = $(m_2 - m_1)Cm^3$

Hence, the volume of liquid = volume of water = $(m_2\text{-}m_1)\ cm^3$

.. Density of liquid = $\frac{Mass\ of\ liquid}{volume\ of\ liquid}$

$$= \frac{m_3 - m_1}{m_2 - m_1} \text{ g/ cm}^3$$

7. When does a body float in a liquid?

A body floats in a liquid only when its weight is balanced by the weight of the liquid displaced by

Immersed part of the body.

8. Explain the statement 'relative density of brass is 8.4.

The relative density of brass is 8.4.m State that the ratio of density of brass to the density of water At 4℃ is 8.4.

Q.5.Define

1. Law of flotation: A body floats in a liquid only when its weight is balanced by the weight of the

liquid displaced by the immersed part of the body.

2. Density – Density of a substance is defined as the mass of that substance per unit volume.

3. Relative density-The relative density or specific gravity of a substance is the ratio of the density or specific gravity of a substance is the ratio of the density of substance to the density of water at 4℃.

It has no unit.

4. Force of buoyancy - The upward force experienced by a body when partly or completely immersed In a liquid is called upthrust of buoyant force.

Q.6. Difference between

Floating	Sinking
1. This happens when density of solid is less than or equal to density of liquid. 2. Upthrust is responsible for floating.	1. This happens when the density of solid is greater than the density of liquid. 2. Weight is responsible for sinking.
Density	Relative density
1. Mass per unit volume of a substance is called its density 2) S.I. unit is kg/m^3	The relative density of a solid is the ratio of the density of the substance to the density of water at 4 ℃ 2) It has no unit.

Q.7. Give reasons

1. Relative density has no unit.

   Relative density is ratio of two densities, . Hence it is a pure number and has

   No unit.

2. Density of a substance decreases with the increase in emperature.

   With increase in temperature volume of a substance increases. Hence density (mass per unit volume) decreases.

3. Equal mass of different substances does not have same volume.

   As volume of a substance = $\frac{Mass}{Density}$ and density of different substances are different, hence same

   Mass of different substances of have different volumes.

4. Equal volume of different substances have different masses.

   As mass = volume x density and density of different substances are different . So, same volume o

   Of Different substances have different mass.

5. The lower end of a hydrometer is filled with mercury or lead.

   This is done to make the lower part of the hydrometer heavy, so that when placed in a liquid it ca

   Can float easily.

6. Bodies like cork or wood float on water vertically.

   As densities of wood and cork are less than density of water hence these float on water.

7. An iron needle sinks in water, but it floats mercury of density 13.6g/cm^3

   Density of iron is more than that of water. Hence iron needle sinks in water. But density of iron

   Is Less than that of mercury hence it floats on mercury.

8. It is easier to swim in sea water than in river water.

   Density of sea water is more than that of river. Hence upthrust is also more in sea water.

   So swimming is easier in sea water.

9. Relative density remains same in all systems of unit.

   Relative density being the ratio of two densities, it has no unit. So relative density remains same

   In all systems of unit.

Numericals.

1) A solid block weighs 20kg. Its volume is found to be 4000 cm^3. Find its density in g/cm^3

And In kg/m^3

Given :

Weight (mass= 20kg = 20x1000 = 20000g

Volume = 4000 cm^3

Density = (?)

Density = $\frac{mass}{volume}$

$= \frac{20000}{4000}$

= 5 g/cm^3

1 g/cm^3 = 1000 kg/m^3

5g/cm^3 = 5x1000

= 5000 Kg/m^3

Statement : The density of substance is 5 g/cm^3 and 5000 kg/m^3.

2) Calculate the volume of copper of mass 2000 kg when its density is 8.4 g/cm^3

Given:

Mass = 2000kg = 2000 x 1000 = 20,00,000 g

Density = 8.4 g/cm^3

Volume = (?)

Volume = $\frac{mass}{density}$

$= \frac{20,00,000}{8.4}$

$\frac{20,00,000 \times 10}{84}$

= 2.38 x $10^5 cm^3$

3) A can weights 15g when empty, 75g when filled with water, and 76.8g when filled with glycedrine.

Find the relative density of glycerine.

Given: Mass of empty bottle = 15g (m_1)

Mass of bottle + water = 75g (m_2)

Mass of bottle + glycerine = 7t6.8g (m_3)

Mass of water = $m_2 - m_1$

=75 – 15

= 60g

Mass of glycerine = m_3-m_1

= 76.8 – 15

=61.8g

Relative density of glycerine = $\frac{m3-m1}{m_2-m}$

$=\frac{61.8g}{60g}$

= 1.03

.. Statement : The Relative density of glycerine is 1.03

4) Calculate the density of a solid from the following data:

a) Mass of Solid = 80g

b) Initial Volume of water in a measuring cylinder 35cm^3.

c) Final volume of water when the solid is immersed in water = 35cm^3

Ans:

Given: Mass of solid = 80g

(V_2) Final volume of water = 35cm^3

(V_1) Initial volume of water = 35cm^3

Density of solid = [?]

Density of Solid = $\frac{Mass\ of\ Solid}{V_2 - V_1}$

= $\frac{890}{35-25}$

$= \frac{80}{10}$

$= 8g/cm^3$

Statement : Density of the solid is $8g/cm^3$

5)An empty density bottle weights 25g. When completely filled with water, it weighs 55g and when completely filled with a liquid, it weighs 52g. Calculate:

a) Volume of the density bottle

b) Density of the liquid

Ans:Given:

Mass of empty bottle (m_1) = 25g

Mass of bottle + water (m_2)= 55g

Mass of bottle + liquid (m_3) = 52g

Mass of water = $m_2 - m_1$

=55-25

=30g

1g mass = $1cm^3$ volume

30g mass = $30cm^3$ volume of water.

Mass of liquid = $m_3 - m_1$

=52 – 215

=27g

Density of liquid = m3 – m_1

= M_2-m_1

= $\frac{27g}{30cm^3}$

= $\frac{9}{10}$

$= 0.9g/cm^3$

Statement : Density of liquid is $0.9g/cm^3$

6. An empty density bottle weights 30g. When completely filled with water, it weights 555.

Calculate : a) Volume of the density bottle and b) Density of brine solution.

Ans:

(m_1) Mass of empty bottle = 30g

(m_2) Mass of bottle + water = 55g

(m_3) Mass of bottle + brine = 55.5g

Mass of water = m2 – m1

=55 - 30

=25cm^3

1g mass = 1cm3 volume

25g Mass =25cm^3 Volume of water.

Mass of brine = $m_3 – m_1$

=55.5 – 30

= 25.5g

Density of brine solution = $\frac{m_3 - m_1}{m_2 - m_1}$

= $\frac{25.5g}{25cm^3}$

= 1.02/cm^3

Statement : Density of brine is 1.02g/cm^3

7) How many kilogram of milk can be poured in a jar that can contain 0.5kg of water?

Given : Density of milk is 1040 Kgm^3.

Mass of water = 0.5 kg

Density of Milk = 1040 kg/m^3

Ans:

Mass of water = 0.5 kg

Density of Milk = 1040 Kg/m^3

Density of water = 1000 kg/m^3

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

$= \frac{5}{10000}$

$= 0.0005$

Mass of Milk = Density of milk X Volume Density of water

$= 1040kg/m3 \times 0.0005$

$= \frac{1040kg/m^3 \times 5}{10000}$

$=0.52kg$

: Statement: Mass of milk is 0.52 kg.

8)A container weights 50kg when empty 120g when filled with water and 113g when filled with an oil.

Find the density of the oil.

9) The density of water is 1000Kg/m^3. If a solid of relative density 1.5 is placed in water, will it float or sink?

Ans:

Density of water = 1000 kg/m^3

R.D. of solid =- 1.5

.. Density of Solid = RD x density of water.

$= 1.5 \times 1000$

$= 1500$ kg/m^3

Which is greater than density of water. Hence the solid will sink in water.

10) 1 Litre of water is added to one litre of milk. What will be the density of the mixture?

Given 1 Litre = 1000cm^3 and density of milk is 1.04g/cm^3.

Ans:

1 Litre = 1000cm^3

Density of milk =m 1.04g/cm^3

Volume of water =Volume of milk = 1000cm^3

⇨ Mass of water = Density x Volume

$= 1g/cm^3 \times 1000$

$=1040g$

⇨ Mass of milk = Density x volume

$= 1.04/cm^3 \times 1000$

$= 1040g$

⇨ Density of Mixture = Density of water + Density of milk

$= \frac{Mass\ of\ water}{Volume\ of\ water} + \frac{Mass\ of\ milk}{Volume\ of\ milk}$

$= \frac{1000\ +\ 1040}{1000+1000}$

$= \frac{2040}{2000}$

$= 1.02g/cm^3$

Statement : Density of Mixture is $1.02g/cm^3$

****