8.4.2024

TENDER HEART SCHOOL, SEC.-33'B, CHD.
CLASS - VII SUBJECT - PHYSICS
CHAPTER - 1 TEACHER - CHARANJEET KAUR

Good Morning Students!
This lesson is for Class - VII, for the subject of 'Physics', Topic - "Measurement of Volume', which is covered in Chapter - 1 'Physical Quantities and Measurement', starting on Page Number - 1, of your textbook titled - 'Concise Physics by Selina Publications', and is being submitted to you on 8rd April, 2024.

Now firstly let us understand the meaning of a Physical Quantity.
A Physical Quantity is a quantity which can be measured. It can be expressed as the combination of a numerical value and a unit.
All the substances around us can be measured by using various units like the mass of gold, length of clothes, the quantity of milk, etc. Those quantities which can be measured is known as physical quantities like mass, length, etc.
Measurement is a process of comparison of the given unknown quantity with a fixed known quantity of the same kind called the UNIT.

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CHAPTER-1

The magnitude of quantity is expressed as:

Magnitude = Number of times the unit is contained in the quantity × Unit

For example: ① Mass = 10 kg means that the mass of the given quantity is 10 times of 1 kg.

② Length = 500 cm or 5 m, means that the length of the given quantity is 500 times of 1 cm or it can also be expressed as 5 times of 1m.

DIFFERENT PHYSICAL QUANTITIES

PHYSICAL QUANTITY	DEFINITION	INSTRUMENT FOR MEASUREMENT	S.I. UNIT
• LENGTH	It is the distance between two points.	Metre Rule or Measuring Tape	metre (m)
• MASS	It is the quantity of matter contained in the body.	Beam Balance, Electrical Balance	kilogram (kg)
• TIME	It is the interval of occurrence of an event.	Pendulum Clock or Watch	second (s)
• TEMPERATURE	It measures the degree of hotness or coldness of a body.	Thermometer	Kelvin (K)

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MEASUREMENT OF VOLUME

VOLUME can be defined as the space occupied by an object (3-dimensional object such as cube, cuboid, sphere, cone, cylinder etc.).

→ Students, in your school, which room is bigger - your classroom or basement Your answer must be big basement.

But why so?

If we say that basement of your school is bigger than your classroom, we mean that volume of air in the empty classroom is less than the air in the empty basement.

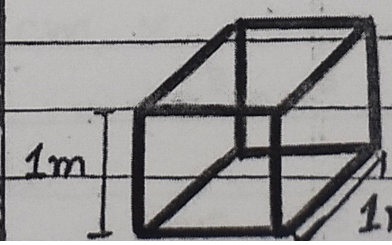
Students, we usually measure volume of liquids, like - MILK, OIL and PETROL in **LITRES**. Small volumes of liquid are measured in millilitres (mL).

S.I. unit of Volume is cubic metre (m^3)

Students, as you have already studied the volume of a cube which is given as product of all the three dimensions

One cubic metre is the volume of a cube with each side 1 metre long as shown in

FIGURE - 1



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Thus, $1m^3 = 1m \times 1m \times 1m$

A smaller unit of volume is cubic centimetre (cm^3).

$1\ cm^3$ is the volume of a cube with each side of length 1 cm.

Thus, $1\ cm^3 = 1\ cm \times 1\ cm \times 1\ cm$

RELATIONSHIP BETWEEN m^3 AND cm^3

Students, you all must be knowing that,

$$1\ m = 100\ cm = 10^2\ cm$$

Thus, $1m^3 = 1m \times 1m \times 1m$

So, $1m^3 = 100\ cm \times 100\ cm \times 100\ cm$

$$\boxed{1m^3 = 10^6\ cm^3}$$

CONVERSIONS OF OTHER UNITS

1.) Also, $1\ litre = 1000\ cm^3 = 10^3\ cm^3$

Thus, $1\ cm^3 = \frac{1}{1000}\ litre = 10^{-3}\ litre$

2.) And, $1\ cm^3 = 10^{-3}\ L = 1\ mL$

3.) Thus, $1m^3 = 10^6 cm^3 = 10^6\ mL$

4.) $1\ dm^3 = 1\ dm \times 1\ dm \times 1\ dm$

$= 10\ cm \times 10\ cm \times 10\ cm$

$1\ dm^3 = 1000\ cm^3 = 10^3\ cm^3$

As, $1000\ cm^3 = 1\ litre$

So, $1\ dm^3 = 1\ litre = 10^3\ cm^3$

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VESSELS FOR MEASURING THE VOLUME OF LIQUIDS

The vessels use to measure volume of liquids such as water, milk, oil etc. are:

1) Measuring cylinder, and
2) Measuring beaker

MEASURING CYLINDER

MEASURING BEAKER

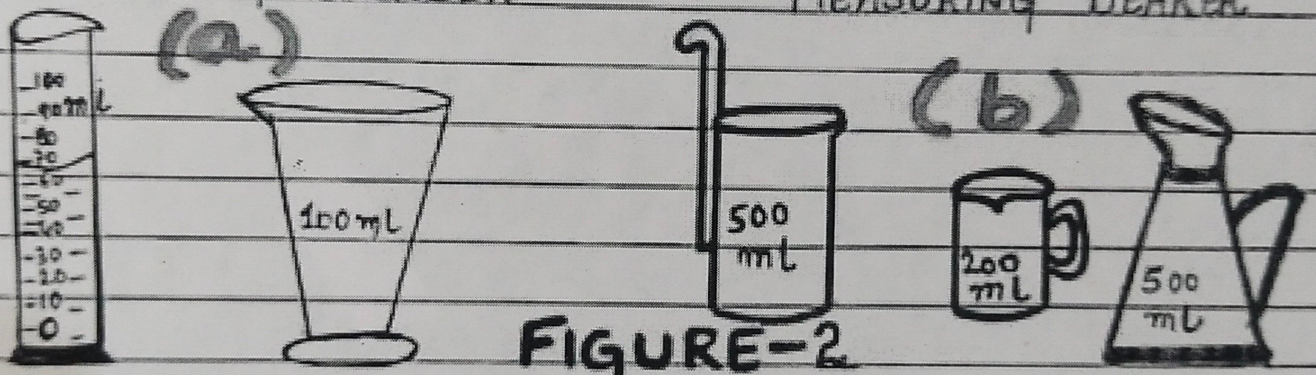

FIGURE-2

Measuring Beaker

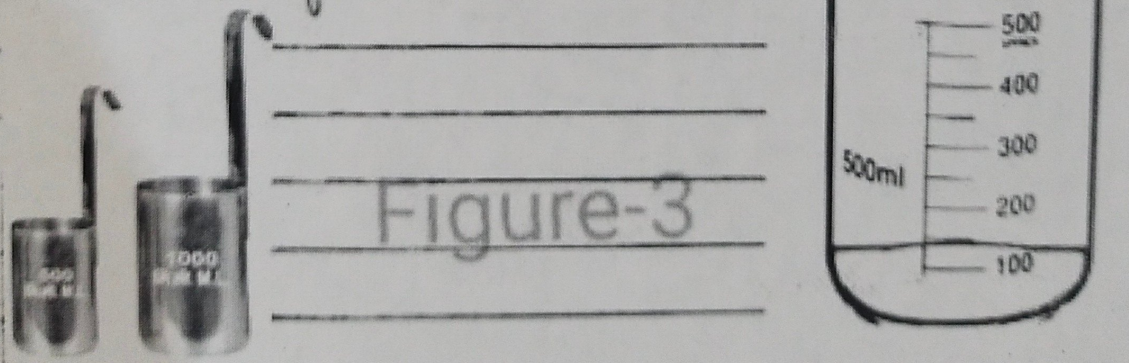

Figure-3

With this I come to an end of this interactive session. Students, you all are required to go through the pdf and learn the conversion as done on Page no.-4 today.

Thank you students!

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CLASS - VII SUBJECT - PHYSICS

CHAPTER - 1 TEACHER CHARANJEET KAUR

Good Morning Students!

This lesson is of class - VII, for the subject of 'Physics', Topic - 'Density', which is covered in chapter - 1 'Physical Quantities and Measurement' of your Physics textbook, titled - 'Concise Physics by Selina Publications' and is given on Page Number - 7.

This lesson is submitted to you on 8th May, 2023.

DENSITY: The density of substance is defined as mass of a unit volume of that substance.

Symbol for density is ρ (rho)

Mathematically, $\text{Density} = \frac{\text{mass}}{\text{Volume}}$

$$\rho = \frac{\text{mass } (m)}{\text{Volume } (V)}$$

- If mass is measured in Kilogram (Kg) and volume is given in cubic metre (m^3), then density is measured in Kg/m^3.
- If mass is being measured in grams and volume in cubic centimetre then the unit of density in g/cm^3.

Thus, it can be observed that:

S.I unit of density = kg/m^3

and, C.G.S. unit of density = g/cm^3

FOR EXAMPLE:

If the mass of $1\ m^3$ of water is 1000 kg, then:

$$\rho = \frac{1000\ kg}{1\ m^3} = 1000\ kg/m^3$$

RELATIONSHIP BETWEEN kg/m^3 and g/cm^3

$$1\ kg/m^3 = \frac{1}{1\ m^3} = \frac{1000\ g}{10^6\ cm^3}$$

$$1\ kg/m^3 = 10^3 \times 10^{-6}\ g/cm^3 = 10^{-3}\ g/cm^3$$

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

$$1\ kg/m^3 = \frac{1}{1000}\ g/cm^3 = 10^{-3}\ g/cm^3$$

NOTE - ① Water has maximum density of $1\ g/cm^3$ ($1000\ kg/m^3$) at 4°C.

② The density of a substance does not change with change in its shape or size.

③ If two substances (liquids) are mixed together, then the denser medium sinks down and less denser medium floats above it. For example - oil floats on surface of water.

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Students now let us do numericals of Chapter-1 (based on Density) (you all are requested to open Page Number -18 of your Physics textbook).

Numericals

6) Volume of brass = $30\ cm^3$

Mass of given brass = 252 g

i) ρ (in g/cm^3) = ?

$$\rho = \frac{\text{mass}}{\text{Volume}} = \frac{252}{30} = 8.4\ g/cm^3$$

ii) ρ (in kg/m^3) = ?

As, $1\ g/cm^3 = 1000\ kg/m^3$

So, $8.4\ g/cm^3 = 8.4 \times 1000\ kg/m^3$

$\rho = 8.4 \times 10^3\ kg/m^3$, or

$\rho = 8400\ kg/m^3$

7) mass of iron ball = 312 g

Density (ρ) of iron = $7.8\ g/cm^3$

Volume of iron ball = ?

Using, $\rho = \frac{\text{mass}}{\text{Volume}}$

$$7.8 = \frac{312}{V}$$

So, $V = \frac{312}{7.8} = \frac{3120}{78} = 40\ cm^3$

Volume of iron ball = $40\ cm^3$

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8) do yourself

9) Volume = 5 litre = 5000 cm^3

(As, 1 l = 1000 cm^3)

Mass = 5 kg = $\frac{5 \times 1000}{1000}$ g = $5 \times 10^{+3}$ g

$\rho = \frac{\text{Mass}}{\text{Volume}} = \frac{5000\ g}{5000\ cm^3} = 1\ g/cm^3$

10) Side of cubical tank = 1 m

Volume of cube = $(\text{side})^3 = (1m)^3$

i) So, Volume = $1\ m^3$

ii) $\rho = \frac{\text{Mass}}{\text{Volume}} = \frac{800\ kg}{1\ m^3}$

$\rho = 800\ kg/m^3$

11) do yourself

12) Mass of lead piece = 115 g

i) Volume of lead piece = volume of water displaced by it

Volume of water displaced = (30 - 20) mL

= 10 mL

As, 1 mL = 1 cm^3, thus

Volume of lead piece = 10 cm^3

ii) $\rho = \frac{m}{V} = \frac{115\ g}{10\ cm^3} = 11.5\ g/cm^3$

or, $\rho = 11.5 \times 1000\ kg/m^3 = 11500\ kg/m^3$

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13) ρ of copper $= 8.9\ g/cm^3$

$= 8.9 \times 1000\ kg/m^3$

ρ of copper $= 8900\ kg/m^3$

NOTE -- Students kg/m^3 can be also written as $kg\ m^{-3}$

- Similarly, $g/cm^3 = g\ cm^{-3}$

With this I come to an end of this interactive session. You all are required to do the Numericals till 13 in your Physics Notebook.

Thank you!

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