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Physical Quantities and Measurement

Physical Quantities :-

- A physical quantity is a quantity that can be measured.
- length, time, mass and temperature are the fundamental physical quantity.
- Fundamental physical quantities are those quantities which cannot be measured with another quantities.
- For Example :- Length, time, mass, temparature, amount of substance.

Relation between m^3 & cm^3

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

$= 100\ cm \times 100\ cm \times 100\ cm$

$= 1000000\ cm^3$

Q and A

B. Short / long Answer Questions:

1. Define term volume of an object

Ans) The space occupied by an object is called its volume.

2. State the S.I unit of volume is cubic meter. In short form

Ans) The S.I unit of volume is cubic meter. In short form it is written as m^3

one cubic meter is the volume of a cube of each side 1 meter

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

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3. State two smaller units of volume. How they are related to the S.I unit

Ans) A smaller unit of volume is cubic cm & symbol cm^3 and cubid dm & dm^3

4. How will you determine the volume of a cuboid? write the formula you will use.

Ans) Volume of a cuboid = $l \times b \times h$

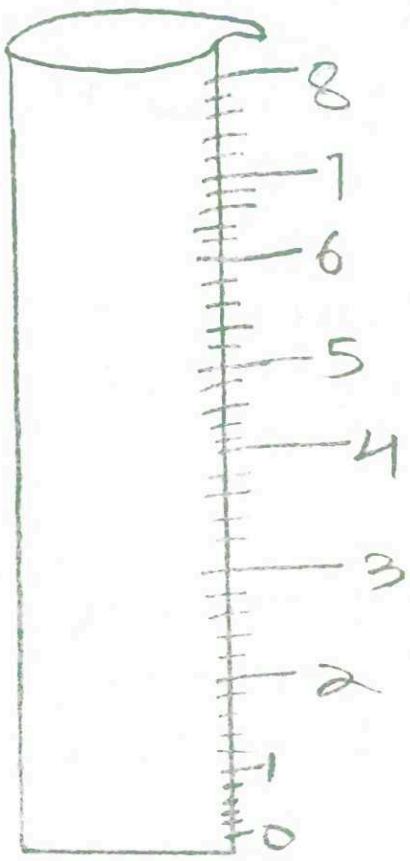
5. Name to device used to measure the volume of an object. with diagram

Ans) Measuring cylinder and beacker

6. How can you determine the volume of an irregular solid (say a piece of brass)? Describe in steps with neat diagram

Ans) To measure the volume of a piece of stone.

5.



Take a piece of brass, a measuring cylinder, fine thread of sufficient length and some water.

Place a measuring cylinder on a flat horizontal surface and fill it partially with water. Note the reading of the water level very carefully. Now tie the piece of brass with a thread and dip it completly into water. We see that the level of water rises. Note the reading of new water level.

The difference in the two level of water gives the volume of the piece of brass.

7. You are required to take out 200ml of milk from a bucket full of milk. How will you do it?

(Ans) A measuring beaker is used to measure a fixed volume of liquid from a large volume. Suppose it is required to measure 200ml of milk from the milk contained in a bucket. For this, take the measuring beaker of capacity 200 ml. Wash it and dry it.

Then immerse the measuring beaker well inside the milk contained in the bucket so that the beaker gets completely filled with milk.

Take out the measuring beaker gently from the bucket so that no milk splashes out and then pour the measuring beaker into the another empty vessel.

The speed of the scooter $\frac{36000\ m}{3600\ s} = 10\ ms^{-1}$

So the car is now faster

Q1) Volume of water tank in m^3

$= L \times B \times H$

$= 5m \times 2.5m \times 1.25m$

$= 15.625 m^3$

∴ volume of water tank in L

$\Rightarrow 1000L = 1m^3$

$\Rightarrow 15.625 m = 15.625m \times 1000$

$= 15,625L$

Note = $1L = 1000m^3$

$= 1000L = 1L$

2) Water in the measuring cylinder

$= 50mL$

Water rises from 50 mL to 62 mL in the immersion of silver

∴ volume of the silver =

$62 - 50 = 12mL$

$1mL = 1cm^3$

$12mL = 12 \times 1 = 12cm^3$

3. Volume of the dish = L x B x H

Volume = 10 x 10 x 5

= 500 cm^3

Volume of the liquid present in the dish ⇒

1 cm^3 = 1 ml

500 cm^3 = 500 x 1

= 500 ml

4. Length of the rectangular field = 60 m

Breadth of the rectangular field = 35 m

Area = 60 x 35

= 2100 m^2

5. Total number of squares = 11 + 10

Area of the squares = 1 cm x 1 cm

= 1 cm^2

Area of lamina = 21 x 1 cm^2

= 21 cm^2

9. Describe the method in steps to find the area of an irregular lamina using graph paper

Ans) First place the lamina over a graph paper and draw boundary line on the graph paper with a pencil then remove the lamina and count number of squares more than half within the boundary line (only squares less than half are not counted.

a. Define the term density of a substance

Ans) The density of a substance is defined as the mass of a unit volume of that substance.

10. (a) State the S.I and CGS units of density

Ans) The S.I unit of mass is KG and volume is m^3

6 Then the SI unit of density is $\frac{Kg}{m^3}$

11.6 The density of brass is 8.4 g cm^{-3}. What do you mean by it?

Ans) Density of brass is 8.4 g cm^3

This means that the unit volume of brass contain 8.4 g mass

12. Arrange the following substance in order of their increasing density:

Ans) b) cork
a) iron
c) brass
d) water
e) Mercury

13. Show the ~~density~~ density of water changes when:

a) It is heated from 0°c to 4°c

Ans) Water contracts on heating from 0°c to 4°c and expands on heating above 4°c

b) It is heated from 4°c to 10°c

Ans) The density of water is maximum at 4°c. It decreased with it is cooled from 4°c to 0°c or it is heated above 4°c

14. write the density of water at 4°c.

Ans) The density of water at 4°c is 1 g cm^{-3}

6. A piece of brass of volume 30cm3 has a mass of 252g. Find the density of brass in (i) $g\,cm^{-3}$, (ii) $kg\,m^{-3}$

Ans) Given Mass $m = 252g$
volume $V = 30cm^3$

i) Density $d = \frac{M}{V} = \frac{252}{30cm^3}$

$= 8.4\,g\,cm^{-3}$

Since $M = 252\,g = 0.252\,kg$

$V = 30cm^3 = 30 \times 10^{-6} m^3$

$D = \frac{0.252kg}{30 \times 10^{-6} m^3} =$

$\frac{0.252\,kg}{30 \times \frac{1}{1000000} m^3}$

$= \frac{2500}{3}\,kg\,m^3$

$= 8400\,kg\,m^{-3}$

7. The mass of an iron ball is 312g. The density of iron is $7.8\ g\ cm^{-3}$. Find the volume of the ball.

Ans) Given Mass $M = 312g$

Density $d = 7.8\ g\ cm^{-3}$

Since $d = \frac{M}{V} \Rightarrow V = \frac{M}{d}$

Hence; V of the iron ball =

$$\frac{312}{7.8} = 40\ cm^3$$

8. A cork has a volume $25\ cm^3$. The density of cork is $0.25\ g\ cm^{-3}$. Find the mass of the cork

Ans) density $d = 0.25\ g\ cm^{-3} = 5000g$

volume $V = .5\ L = 5000\ cm^3$

Density of water $d = \frac{M}{V}$

$$= \frac{5000g}{5000\ cm^3} = 1\ g\ cm^{-3}$$

9. The mass of 5 L of water is 5 kg. Find the density of water in $g\ cm^{-3}$

Ans) Given $m = 5kg = 5000g$

$V = 5L = 5000\ cm^3$

D of water $= \frac{M}{V}$

$= \frac{5000g}{5000\ cm^3} = 1\ g\ cm^{-3}$

10. A cubical tank of side 1 m

Ans i) V of cube $= S \times S \times S$

$S = 1m$

$V = 1 \times 1 \times 1 = 1\ m^3$

ii) D of Liquid in $Kg\ m^{-3}$

$= \frac{M}{V}$

$m = 800\ Kg$

$V = 1\ m^3$

$$D = \frac{800kg}{1m^3} = 800 kg\,m^{-3}$$

11)

Ans) given $L = 2m$

$b = 0.5m$

$h = 0.25m$

D of gmon $= 7.8 g\,cm^{-3} = 7.8 \times 1000 kg\,m^{-3}$

$= 7800 kg\,m^{-3}$

V of block $= l \times b \times h$

$= 2 \times 0.5 \times 0.25 = 0.25 m^3$

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

$m = V \times d$

$= 0.25 \times 7800 kg\,m^{-3}$

$= 1950 kg$

13.

Ans) $D = 8.9\ g\ cm^{-3}$

$= 8.9 \times 1000\ kg\ m^{-3}$

$= 8900\ kg\ m^{-3}$

15. How long a train will take to travel a distance of 200 km with a speed of 60 km^{-1}

Ans) Distance covered by train $= 200$ km

Speed of train $= 60\ km\ h^{-1}$

$$Speed = \frac{D}{T}$$

$$60 = \frac{200}{Time}$$

$$T = \frac{200}{60} = \frac{20}{6} = \frac{10}{2}\ hrs$$

$= 3\frac{1}{3}\ hrs = 3h + \frac{1}{3}\ hrs$

$= 3h + \frac{1}{3} \times 60m$

$= 3h + 20m$

$= 3h\ 20\ min$

17.

Ans) $36\ kmh^{-1} = \frac{36 \times 1000m}{60 \times 60}$

$= 10ms^{-1}$

18.

Ans) $1m = \frac{1}{1000}\ km$

15m $= \frac{15}{1000}$ km

1 s $= \frac{1}{3600}$ hr

Distance D $= \frac{15}{1000}$ km

Time taken $= \frac{1}{3600}$ hr

$S = \frac{D}{T}$

$= \frac{\frac{15}{1000}}{\frac{1}{3600}} = \frac{15}{1000} \times \frac{3600}{1}$

$= 54$ km h^{-1}