

Board – ICSE

Class – 7<sup>th</sup>

Topic – Physical Quantities and Measurement

1.

Column A	Column B
1. Volume of a liquid	1. $\text{kg m}^{-3}$
2. Area of a leaf	2. $\text{m}^3$
3. S.I. unit of volume	3. graph paper
4. S.I. unit of density	4. $\text{m s}^{-1}$
5. S.I. unit of speed	5. measuring cylinder

Ans:

Column A	Column B
1. Volume of a liquid	5. measuring cylinder
2. Area of a leaf	3. graph paper
3. S.I. unit of volume	2. $\text{m}^3$
4. S.I. unit of density	1. $\text{kg m}^{-3}$
5. S.I. unit of speed	4. $\text{m s}^{-1}$

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

Ans: A smaller unit of volume is cubic centimetre (symbol  $cm^3$ ) and cubic decimetre ( $1dm^3$ ). One cubic centimetre is the volume of a cube of each side 1 centimetre, i.e

$$1 \text{ cm}^3 = 1 \text{ cm} \times 1 \text{ cm} \times 1 \text{ cm}.$$

### Relationship between $m^3$ and $cm^3$

$$\begin{aligned} 1 \text{ m}^3 &= 1\text{m} \times 1\text{m} \times 1\text{m} \\ &= 100 \text{ cm} \times 100 \text{ cm} \times 100 \text{ cm} \\ &= 10,00,000 \text{ cm}^3 = 10^6 \text{ cm}^3. \end{aligned}$$

### Relationship between $m^3$ and $dm^3$

$$\begin{aligned} 1 \text{ m}^3 &= 1\text{m} \times 1 \text{ m} \times 1 \text{ m} . \\ &= 10 \text{ dm} \times 10 \text{ dm} \times 10 \text{ dm} \\ &= 1000 \text{ dm}^3 \\ &= 10^3 \text{ dm}^3 \end{aligned}$$

Note  $1 \text{ m} = 10 \text{ dm}$

3. A boy travels with a speed of  $10 \text{ m s}^{-1}$  for 30 minute. How much distance does he travel?

Ans:

$$\text{Speed of boy} = 10 \text{ m s}^{-1}$$

$$\text{Time taken} = 30 \text{ minutes}$$

$$\text{speed} = \text{distance travelled} / \text{time taken}$$

$$\text{Distance travelled} = \text{Speed} \times \text{Time taken}$$

Convert 30 minutes to seconds

$$1 \text{ minute} = 60 \text{ sec}$$

$$30 \text{ minute} \times 60 = 1800 \text{ seconds}$$

Putting the value of speed and time we get

$$\begin{aligned} \text{Distance travelled} &= 10 \text{ ms}^{-1} \times (1800 \text{ sec}) = 18000 \text{ m} \\ &= 18000 \text{ metre or } 18 \text{ km Ans.} \end{aligned}$$

4. A car travels a distance of 15 km in 20 minute. Find the speed of the car in  $\text{m s}^{-1}$ .

Ans:

Distance travelled by car = 15 km

Time taken = 20 minutes

Speed of car in  $\text{m s}^{-1}$

Convert 15 km into metres

1 km = 1000 m

15 km =  $1000 \times 15 = 15000$  m

Convert minutes into seconds

1 minutes = 60 sec..

20 minutes =  $60 \times 20 = 1200$  sec

$$\begin{aligned}\text{Speed of car} &= \frac{15000\text{m}}{1200\text{sec}} \\ &= 12.5 \text{ m s}^{-1}\end{aligned}$$

5. A car travels a distance of 15 km in 20 minute. Find the speed of the car in  $\text{km h}^{-1}$ .

Ans:

istance travelled by car = 15 km

Time taken = 20 minutes

Speed of car in  $\text{km h}^{-1}$

Convert 20 minutes to hour

$$1 \text{ minute} = \frac{1}{60} \text{ hour}$$

$$\therefore 20 \text{ minutes} = \frac{1 \times 20}{60} = \frac{1}{3} \text{ hour}$$

$$\begin{aligned}\text{Speed of car} &= \frac{\text{Distance}}{\text{Time taken}} \\ &= \frac{15\text{km}}{\frac{1}{3}\text{h}} \\ &= 15 \text{ km} \times 3\text{h}^{-1} \\ &= 45 \text{ km h}^{-1} = 45 \text{ km h}^{-1}\end{aligned}$$

6. The mass of a lead piece is 115 g. When it is immersed into a measuring cylinder, the water level rises from 20 ml mark to 30 ml mark ,  
Find the density of the lead in  $\text{kg m}^{-3}$

Ans:

$$\text{Given , } M = 115 \text{ g}$$

$$V_1 = 20 \text{ ml , } V_2 = 30 \text{ ml}$$

$$\text{Density of lead piece } d = \frac{M}{V}$$

$$= \frac{115}{10\text{cm}^3}$$

$$= 11.5 \text{ g cm}^{-3}$$

$$(\text{since } 1 \text{ g cm}^{-3} = 1000 \text{ kg}^{-3})$$

$$= 11.5 \times 1000 = 11500 \text{ kg m}^{-3}$$

7. A cubical tank of side 1 m is filled with 800 kg of a liquid. Find:  
(i) the volume of tank,  
(ii) the density of liquid in  $\text{kg m}^{-3}$ .

Ans:

$$(i) \text{ Volume of a cube} = \text{side} \times \text{side} \times \text{side}$$

$$\text{side} = 1 \text{ m}$$

$$\therefore \text{ volume} = 1 \text{ m} \times 1 \text{ m} \times 1 \text{ m} = 1 \text{ m}^3$$

$$(ii) \text{ Density of liquid in } \text{kg m}^{-3}$$

$$= \frac{\text{mass (m)}}{\text{volume (v)}}$$

$$\text{Mass} = 800 \text{ kg}$$

$$\text{Volume} = 1 \text{ m}^3$$

$$\therefore \text{ Density} = \frac{800}{1\text{m}^3} \text{ kg} = 800 \text{ kg m}^{-3}$$

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

Ans:

$$\text{Given, Mass } M = 312 \text{ g}$$

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

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

$$\text{Hence, volume of an iron ball } V = \frac{312}{7.8} = 40 \text{ cm}^3$$

9. A rectangular field is of length 60 m and breadth 35 m. Find the area of the field.

Ans:

$$\text{Length of a rectangular field} = 60 \text{ m}$$

$$\text{Breadth of rectangular field} = 35 \text{ m}$$

$$\therefore \text{Area} = 60 \text{ m} \times 35 \text{ m}$$

$$= 2100 \text{ m}^2$$

10. Find the volume of a liquid present in a dish of dimensions 10 cm x 10 cm x 5 cm.

Ans:

$$\text{Volume of water} = \text{Length} \times \text{breadth} \times \text{height}$$

$$= 10 \text{ cm} \times 10 \text{ cm} \times 5 \text{ cm}$$

$$= 500 \text{ cm}^3 \text{ or } 500 \text{ ml.}$$