Unit 1- Measurement

Class: VII

Subject: Science

I. Choose the best answer.

1. Which of the following is a derived quantity?

a) Mass b) time **c) area** d) length

2. Which of the following is correct?

a) 1L = 1cc b) 1L = 10 cc c) 1L = 100 cc **d) 1L = 1000 cc**

3. SI unit of density is

a) kg/m2 **b) kg/m^3** c) kg/m d) g/m^3

4. Two spheres have mass and volume in the ratio 2:1. The ratio of their density is

a) 1:2 **b) 2: 1** c) 4:1 d) 1:4

5. Light year is the unit of

a) Distance b) time c) density d) Both length and time

II. Fill in the blanks.

1. Volume of irregularly shaped objects are measured using the law of **Archimedes.**

2. One cubic metre is equal to **10,00,000 (or) 10^6** cubic centimetre.

3. Density of mercury is **13600Kg/m^3.**

4. One astronomical unit is equal to **1.496×10^{11}m**

5. The area of a leaf can be measured using **Graph sheet.**

III. State true or false. If false, correct the statement.

1. The region covered by the boundary of a plane figure is called its volume. **[FALSE]**

2. Volume of liquids can be found using measuring containers. **[TRUE]**

3. Water is denser than kerosene. **[TRUE]**

4. A ball of iron floats in mercury. **[TRUE]**

5. A substance which contains less number of molecules per unit volume is said to be denser. **[FALSE]**

IV. Match the following items.

(1)

1. Area	a. light year	[2]
2. Distance	b. m3	[4]
3. Density	c. m2	[1]
4. Volume	d. kg	[5]
5. Mass	e. kg / m3	[3]

2)

1. Area	a. g / cm3	[3]
2. Length	b. measuring jar	[4]
3. Density	c. amount of a substance	[5]

4. Volume	d. rope	[2]
5. Mass	e. plane figures	[1]

V. Arrange the following in correct sequence.

1. 1L, 100 cc, 10 L, 10 cc - **Ans:** (10 cc, 100 cc, 1L, 10L)

2. Copper, Aluminium, Gold, Iron - **Ans**: (Aluminium, Iron, Copper, Gold)

VI. Use the analogy to fill in the blank

1. Area : m2 :: Volume : **m^3**

2. Liquid : Litre :: Solid : **cm^3**

3. Water : Kerosene :: **Iron** : Aluminium

VII. Consider the following statements and choose the correct option.

1. Assertion: Volume of a stone is found using a measuring cylinder.

Reason: Stone is an irregularly shaped object. **Ans : [a]**

2. Assertion: Wood floats in water.

Reason: Water is a transparent liquid. **Ans : [b]**

3. Assertion: Iron ball sinks in water.

Reason: Water is denser than iron. **Ans : [b]**

a. Both assertion and reason are true and reason is the correct explanation of assertion.

b. Both assertion and reason are true, but reason is not the correct explanation of assertion.

c. Assertion is true but reason is false.

d. Assertion is false but reason is true.

VIII. Answer very briefly.

1. Name some of the derived quantities.

Area, Volume, Density

2. Give the value of one light year.

One light year is defined as the distance travelled by light in vacuum during the period of one year.

1 Light year = 9.46×10^{15} m.

3. Write down the formula used to find the volume of a cylinder.

Volume of a cylinder = $\pi r2h$

4. Give the formula to find the density of objects.

If the mass of a substance is M and volume is V, then then the equation for density is given as Density (D) = $\frac{mass\ (M)}{Volume\ (V)}$

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

5. Name the liquid in which iron ball sinks.

Iron ball sinks in water.

The density of an iron ball is more than that of water so it sinks in water.

6. Name the units used to measure the distance between celestial objects.

The units used to measure the distance between celestial objects:

i. Astronomical unit

ii. Light year

7. What is the density of gold?

The density gold is 19,300 kg/m^3

IX. Answer briefly.

1. What are derived quantities?

Physical quantities which can be obtained by multiplying, dividing or by mathematically combining the fundamental quantities are known as derived quantities.

2. Distinguish between the volume of liquid and capacity of a container.

Volume of Liquid:

When a liquid is poured into a container, it takes the shape and volume of the container. The volume of any liquid is equal to the space that it fills and it can be measured using a measuring cylinder or measuring beaker.

We can understand that the unit of volume is cubic cm.

Capacity of a container:

The Maximum volume of liquid that a container can hold is known as the "Capacity of the container".

The readings are marked in the unit of "ml". This actually represent mililiter.

3. Define the density of objects.

Density of a substance is defined as the mass of the substance contained in unit volume (1 m^3).

If the mass of a substance is M and volume is V, then the equation for density is given as Density (D) = $\frac{mass\ (M)}{Volume\ (V)}$

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

4. What is one light year?

One light year is defined as the distance travelled by light in vacuum during the period of one year.

1 Light year = 9.46×10^{15} m.

5. Define – One Astronomical unit.

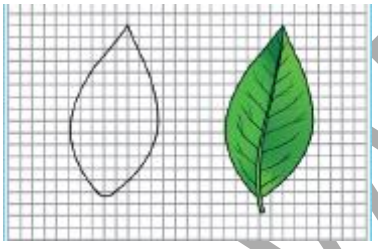
One astronomical unit is defined as the average distance between the earth and the sun.

1 AU = 149.6 million km = 149.6 × 10^{6}km = 1.496 × 10^{11}m.

X. Answer in detail.

1. Describe the graphical method to find the area of an irregularly shaped plane figure.

Take a leaf from any one of the trees. Place it on a graph sheet and draw the outline of the leaf with a pencil. Remove the leaf. You can see the outline of the leaf on the graph sheet.



i. Now, count the number of whole squares enclosed within the outline of the leaf. Take it as M.

ii. Then, count the number of squares that are more than half. Take it as N.

iii. Next, count the number of squares which are half of a whole square. Note it as P.

iv. Finally, count the number of squares that are less than half. Let it be Q.

Now, the approximate area of the leaf can be calculated using the following formula.

Approximate area of the leaf = M + (3/4) N + (1/2) P + (1/4) Q square cm.

Area of the leaf = **52 + 5.25 = 58.2559.mm = 0.582559 cm^2**

2. How will you determine the density of a stone using a measuring jar?

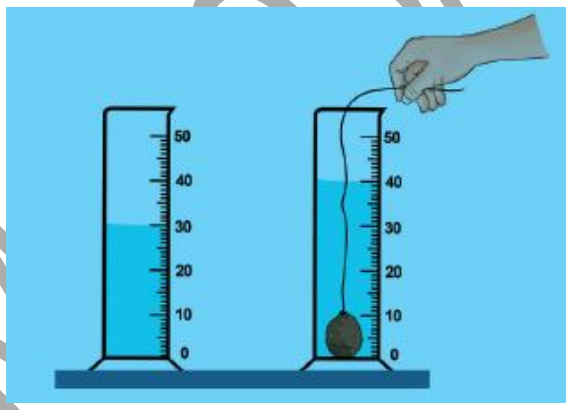
Take a measuring cylinder and pour some water into it (Do not fill the cylinder completely). Note down the volume of water from the readings of the measuring cylinder. Take it as V_1.

Now take a small stone and tie it with a thread. Immerse the stone inside the water by holding the thread.

This has to be done such that the stone does not touch the walls of the measuring cylinder. Now, the level of water will raise.

Note down the volume of water and take it as V_2. The volume of the stone is equal to the raise in the volume of water. $V_2 = 40$, $V_1 = 30$

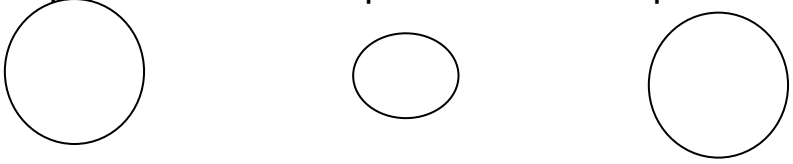
Volume of stone = $V_2 - V_1 = 40 - 30 = 10$



XI. Questions based on Higher Order Thinking Skills:

1. There are three spheres A, B, C as shown below.

Sphere A Sphere B Sphere C



Sphere A and B are made of same material. Sphere C is made of a different material. Spheres A and C have equal radii. The radius of sphere B is half that of A. Density of A is double that of C. Now answer the following questions.

i. Find the ratio of masses of spheres A and B.

ii. Find the ratio of volumes of spheres A and B.

iii. Find the ratio of masses of spheres A and C.

Ans:

i) Ratio of masses of spheres A and B. $M_A : M_B$

$D \times V_A : D \times V_B$

Loss the mass sphere A = M_A

Loss the mass sphere B = M_B

Mass = Density X Volume

$M_A = D_A \times V_A$

$M_B = D_B \times V_B$ (Density is same)

Volume of sphere A = $(4/3)\ \pi r^3$

Volume of sphere B = $(4/3)\ \pi\ (r_A/2)^3$

$D \times \frac{4}{3} \pi r^3 : D \times \frac{4}{3} \pi\ (r_A/2)^3 = 1 : \frac{1}{8} = 8 : 1$

ii) Ratio of volume sphere A and B

$V_A : V_B$ = 8:1 (As mass is directly proportional to volume)

iii) Ratio of masses of sphere A and C

$M_A : M_C$

2D X V: D X V (Density of A is doubt that of C)

2:1

XII. Numerical problems:

1. A circular disc has a radius 10 cm. Find the area of the disc in m^2 (Use π = 3.14).

Ans:

Given: radius = 10 cm = 0.1 m, π = 3.14

Area of circle A = ?

Area of circle A = πr^2

πr^2 = 3.14 x 0.1 x 0.1

A = $0.0314 m^2$

2. The dimension of a school playground is 800 m × 500 m. Find the area of the ground.

Ans:

Given:

The dimension of a school playground = l x b = 800 x 500

The Area of the ground A = l x b = 800 x 500

A = 400000 m^2

3. Two spheres of same size are made from copper and iron respectively. Find the ratio between their masses (Density of copper is 8,900 kg/m 3 and iron is 7,800 kg/m3).

Ans:

Given:

Density of Copper Dc = 8900kg/m^3

Density of Iron D1 = 7800kg/m^3

Volume of copper sphere = volume of iron sphere

To find:

Ratio of Masses of copper (Mc) and Iron (M1)

Solution:

Mass = Density x Volume

Mc = Dc x v_1 X N_1 = D_1 x v

= 8900 v_1m_1 = 7800u

Mc = m_1

8900 u: 7800 u

Ans: **1.14:1**

4. A liquid having a mass of 250 g fills a space of 1000 cc. Find the density of the liquid.

Ans:

Given Mass of a liquid M = 250 g

Volume V = 1000 cc

Density of Liquid D = ?

$$\text{Density (D)} = \frac{mass\ (M)}{Volume\ (V)}$$

$$D=\frac{m}{v}=\frac{250}{1000} = 0.25\ g$$

5. A sphere of radius 1cm is made from silver. If the mass of the sphere is 33g, find the density of silver (Take π = 3.14).

Ans

Given: The radius of sphere R = 1 cm

Mass of sphere M = 33g

Density of Silver D =?

Volume of the sphere =?

D = m/v

V = 4/(3) π r^3

V = $\frac{4}{3}$ x 3.14x1x1x1

V = 4.187

D = $\frac{m}{v}$ = $\frac{33}{4.187}$

XIII. Cross word puzzle.

	(1)			(a)							
	(d)					(b)					(c)
			(2)								
					(3)						
(4)											

Clues – Across

1. SI unit of temperature **Ans: Kelvin**

2. A derived quantity **Ans: Volume**

3. Mass per unit volume **Ans: Density**

4. Maximum volume of liquid a container can hold **Ans:Capacity**

Clues – Down

a. A derived quantity **Ans: Velocity**

b. SI unit of volume **Ans: Cubic metre**

c. A liquid denser than iron **Ans: mercury**

d. A unit of length used to measure very long distances **Ans: Light Year**