Physical Quantity and Measurement

1. **How can we define density?**
   Ans. Density is the property of an object which depicts the amount of matter in a given volume.
   Density of an object can be defined as the mass of an object in a given volume.
   Density= $\frac{\text{Mass}}{\text{Volume}}$

2. **What is the SI unit of Density?**
   Ans. The SI unit of Density is - Kg/m^3

3. **Which instrument is required to measure density of an irregular solid?**
   Ans. Measuring Cylinder or Eureka Can.

4. **How can we measure density of irregular solid?**
   Ans. A measuring Cylinder is an instrument used to measure volume of an irregular solid. In this method, water is poured into the cylinder and the reading taken as the initial volume.
   Let it is V_1.
   Now tie the solid with a thread and immerse in the cylinder. Thus the water level increases.
   Now take the reading of the cylinder as final volume.
   Let it is V_2.
   So the volume of solid is
   $V= (V_2-V_1)$
   Let the mass of the solid is M
   So the density is
   $$D=\frac{M}{V}$$

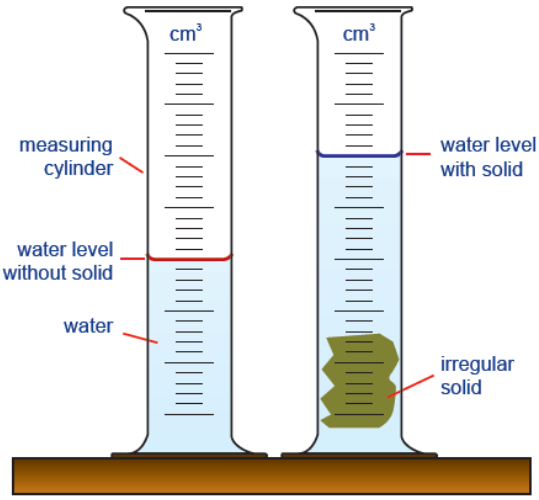

Fig. 4.3 Measuring the volume of an irregular solid

5. **How can we measure the density of an irregular solid with the help of Eureka Can?**
   Ans. Eureka Can is called Displacement Vessel.

It is based on Archimedes' Principle. According to which the amount of water displaced by an object is equal to its volume.
First of all measure the mass of the irregular solid using beam balance.
Now, tie this irregular solid with a thread and drop it in the water in Eureka can, make sure that it does not touch the base of the can
Keep a small measuring beaker on the mouth of the Eureka can.
Now, after dropping the irregular solid the water flows from the Eureka can into measuring beaker through the pipe like structure.

Collect the water in the measuring beaker and measure its volume.
The volume this flowed water gives the volume of irregular solid.
Let the Volume is V
And the mass of the Irregular solid is M
So the Density of the solid is

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

6. **How can we measure density of Liquid using Graduated Gas Cylinder?**
   Ans. Take a Graduated Gas Cylinder and take its mass through physical balance.
   Let the mass is m_1.
   Now take the cylinder with the liquid and measure the volume.
   Let the volume is V.
   Now then take the mass of the cylinder with liquid is m_2.
   So the density can be determined by

$$D=\frac{m2-m1}{V}$$

7. **How can we measure the density of Gas?**
   Ans. Take a flask of volume V. Take the mass of the flask. Let it is m_1.
   Then using vacuum pump remove all the air from the flask and then take the mass of the flask. Let it is m_2.
   So the density can be determined by

$$D=\frac{m2-m1}{V}$$

8. **What is Relative density?**
   Ans. Relative Density of a substance is the ratio of its density to that of the water.
   Relative Density=$\frac{\text{Density of Substance}}{\text{Density of Water}}$
   Now Density=$\frac{Mass}{Volume}$
   So Relative Density= $\frac{\text{Mass of the substance}}{\text{Volume of the Substance}} \times \frac{\text{Volume of Water}}{\text{Mass of Water}}$

9. **Why Relative Density has no unit?**
   Ans. Relative Density is the ratio of two similar quantity. So that it has no Unit.

10. **With which instrument we can measure relative density?**
    Ans. Relative Density Bottle.

11. **Why a ship loaded with cargo submerges more in river water than sea water?**
    Ans. The sea water has more density than river water. Ship which is made by steel or aluminium alloy is denser than water.
    So when the loaded ship when submerged in river water it sinks more than sea water.

12. **Why the wax float on water?**

Ans. The relative density of wax is 0.93. And the density of water is 1. So the wax float on the water.

13. **Why hydrogen balloons rise up in air?**
Ans. The hydrogen filled balloons have lesser density than the components of gases present in the air. This is why the balloon rise up.

14. **What is Hydrometer?**
Ans. Hydrometer is a device based on principle of floatation to read the relative density of the liquid density.

15. **Write the comparative study of solid liquid and gas.**
Ans.

Solid	Liquid	Gas
Not very compressible	Not very compressible	Highly compressible
High denisty	High density	Low density
Definite volume	Definite volume	Fills container competely
Retains its own shape	Assumes shape of container	Assumes shape of container
Motion limited to vibrational movement	Slow diffusion – particles can slip past each other	Rapid diffusion
Low expansion on heating	Low expansion on heating	High expansion on heating

16. **The density of an item is dependent on which factors?**
Ans. Some factors which can affect the density of an item.
a. Physical State of Matter
b. Temperature
c. Pressure

17. **How the density of an item can changes with temperature?**
Ans. As the temperature of a substance of fix mass is increased the atoms gain energy and move far apart. This leads to the rise in the volume and the density decreases. And due to decrease of temperature the volume of a substance decrease and the density increase.

18. **How the density of a substance change with the pressure.**
Ans. When pressure of any substance increase then atoms of any substance come closer and its volume decreases and the density increases. On the same way when the pressure of any substance decrease the atoms go far away and the volume increases. So that its density decreases.