ODM EDUCATIONAL GROUP
Changing your Tomorrow

PHYSICAL QUANTITIES AND MEASUREMENT

CHAPTER NO.1

SUB: PHYSICS

PHYSICAL QUANTITIES AND MEASUREMENT

Website: www.odmegroup.org
Email: info@odmps.org
Toll Free: **1800 120 2316**
Sishu Vihar, Infocity Road, Patia, Bhubaneswar- 751024

LEARNING OBJECTIVE

Students will be able to

- Define density and write its formula
- Express density in a proper unit and symbol
- Measure density of regular / irregular solid

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Density

The density of material shows the denseness of that material in a specific given area. A material's density is defined as its mass per unit volume.

Density is essentially a measurement of how tightly matter is packed together. It is a unique physical property for a particular object.

Examples

Iron, platinum, and lead are examples of dense materials. Many types of rock and minerals are examples of dense material. Materials that are dense are most likely to 'feel' heavy or hard.

Mathematically, the density of an object is expressed as follows

Density=Mass/Volume

ρ=m/v

Where ρ is the density

m is the mass

V is the volume

Unit of Density

SI unit of density is kg/m^3

for convenience we use g/cm^3 for solids, g/ml^3 for liquids, and g/L for gases

Determination of density of regular solid

- To find the density of a regular solid by using formula, density = mass / volume

We proceed as follows

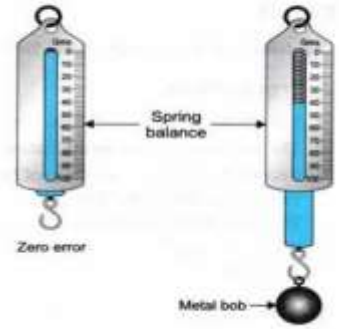
- Using a beam balance, measure the mass (m) of the solid
- Using the meter ruler, measure the length, breath and height of regular solid and find the volume V using the relation V =l×b×h
- Once we know the mass and volume, density is calculated using the relation d=M/V

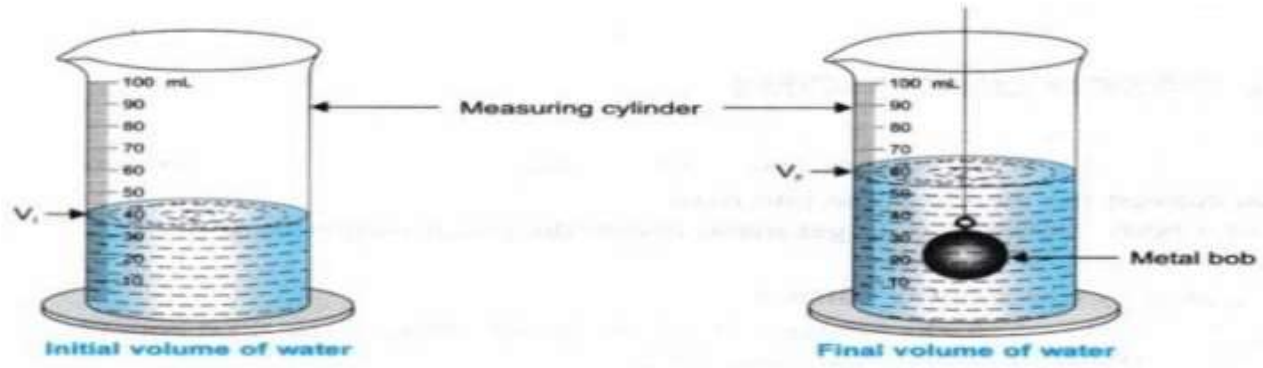
Determination of density of irregular solid

Materials Required A spring balance, a measuring cylinder, a beaker with water, a metal bob (or anybody that is heavier than water and does not dissolve in water), a cotton string, a stand (optional).

Procedure

1. Tie a metal bob (or any solid) with the string of cotton to the hook of the spring balance. The spring balance should be checked for any error. Let the zero error be 'x'.
2. Hold the spring balance (or tie it to the stand), suspended with the metal bob in air. Measure the weight of the bob. Let its weight be 'WF'
3. Pour the water in the measuring cylinder and record the initial volume of water, let it be ' V_1'
4. Suspend the metal bob into the measuring cylinder with water. The bob should not touch the base, nor the sides of the cylinder. The water level rises, measure the increased water level, let this volume be ' V_F'
5. Record all your observations in the observation table and do the calculation to find the density of a given solid metal bob





Determination of density of a liquid

To determine the density of a liquid, follow the procedure given below

Take a beaker, measure the mass of given beaker using a common beam balance. let the mass be M_1 gram.

Now take a measuring cylinder and pour given liquid in to a certain level say 50 Ml

Thus, volume of milk, V = 50 cm^3 .

Transfer the liquid in to the empty beaker.

Measure its mass again. Let's its mass be M_2 gram

The difference between M1 and M2 will give the mass M of the liquid.

Thus mass of liquid M=(M_2-M_1) gram

Calculate the density of liquid using following relation

Density =Mass/Volume

Different substances have different densities.

HOME ASSIGNMENT

1. Define the term density of a substance.
2. State the S.I. and C.G.S. units of density. How are they interrelated ?
3. The density of brass is 8.4 g/cm^{-3}. What do you mean by the statement ?

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