**15th June, 2020 JESUS AND MARY SCHOOL AND COLLEGE MODULE-4**

**CLASS 8**

**PHYSICS**

**CHAPTER: DENSITY**

## **Density**

The density of material shows the denseness of that material in a specific given volume. 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. The principle of density was discovered by the Greek scientist Archimedes.  It is easy to calculate density if you know the formula and understand its related units.

## **How is Density Calculated?**

Mathematically, the density of an object is expressed as follows:

 Density = mass / volume

## **Unit of Density**

* Though SI unit of density is kg/m³, for convenience we use g/cm³ for solids, g/ml for liquids and g/L for gases.
* Density can be explained as the relationship between the mass of the substance and volume it takes up.
* In a qualitative term, it shows how much heavy an object is at constant volume.
* Different substances have different density, which means for the same volume of different substances weigh differently.

## **SI Unit of Density**

Each substance has a specific density. Generally, the [density of water](https://byjus.com/physics/density-of-water/) (which is approximately about 1 gram/cubic centimetre) is taken as the standard value for calculating the density of substances. However, the SI unit of Density is measured using **kilogram per cubic metre** (kg/m3).

### **Other Density Units**

Talking about other density units, metric tons and litre are also used even though they are not part of the SI. Some of the other units include:

* gram per millilitre (g/mL)
* kilogram per litre (kg/L)
* gram per cubic centimetre (g/cm3)
1 g/cm3 = 1000 kg/m3
* kilogram per cubic decimetre (kg/dm3)

In addition to this, in the CGS system density is measured in gram per cubic centimetre (g/cm3).

**Applications of Density in Real Life**

Many applications of density are there in our real-life like a few examples are in pipe design, shipbuilding, helium balloons, weight distribution in the aeroplane and the fact that ice floats on water.

* The knowledge of densities of two substances helps you in separation techniques. For example, separation of oil from water. Leakage of an oil tank in the ocean then oil drops starts to float on the water due to their less density in the water.
* Another well-known application of density is determining whether an object will float on water or not. Floating of ships and diving of submarines are due to their density difference.

## **Solved Examples**

### **Question 1:**

Take two boxes which have the same volume. Fill the first box with x balls and the second box with 6x balls. If the mass of each ball is the same, which box would weigh more?

**Solution:**

The box that has more balls has more mass per unit of volume.

Here the first box contains x number of balls and the second box contains 6x number of balls. Since the number of balls in the second box is 6 times the first box, the second box would weigh more. This property of matter is called density.

### **Question 2:**

Calculate the density of water if it has a mass of 1160 Kg and volume of 1m3?

**Solution:**

Given,

Mass = 1160 Kg

Volume = 1m3

Density is given by the formula:

Density = Mass/Volume

ρ = 1160/1 = 1160 kg/m3

### **Questions 3:**

If you find a shiny rock, a carbon allotrope with a volume of 0.042cm³ and a mass of 0.14 g, is it graphite or diamond? The density of graphite is 2.266 g/cm3 and the density of diamond is 3.51g/cm3.

**Solution:**

Given,

Volume of the shiny rock =0.042cm³

Mass of the shiny rock = 0.15 g

Density of graphite = 2.266 g/cm3

Density of diamond = 3.51g/cm3

Use the density equation to solve for m, mass of graphite and for the mass of a diamond.

*ρ = m/V*

*m* = 2.266 g/cm³ x 0.042cm³ = 0.0951g for graphite

*m* = 3.51g/cm3x 0.042cm³ = 0.1474 g for diamond

The mass of the shiny rock you found is identical with the mass of diamond.

**WORKSHEET 4**

**Q 1.** What is density?

**Q 2.** What is its SI unit?

**Q 3.** What is its CGS unit?

**Q4.** Give a relation between SI unit and CGS unit of density.

**Q5.** Write two applications of density in real life.

**Note:- Please do this work in your copies which will be checked when the school reopens. Please consider this important.**

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