

2: Density

Mass and weight depend on size. Density is different.

The density of a material is the same whether you've got a little or a lot.

For example, a bead of lead is heavier than a feather, but lighter than a pillow full of feathers. However, lead is always denser than feathers.

Density is the mass of either 1 cm^3 or 1 m^3 of the material.

The symbol for density is ρ .

$$\text{density} = \frac{\text{mass}}{\text{volume}} \quad \text{or, using symbols: } \rho = \frac{m}{V}$$

The units for density are either grams per centimetre cube, g cm^{-3} or kilograms per metre cube, kg m^{-3} .

No instrument measures density. You measure the mass and volume of a sample and then do a calculation.

You will be given a block and a rod made of different materials. You have to work out the densities of the materials they are made from using *Standard Procedure: Determining the density of regular objects*.



Standard procedure: Determining the density of regular objects

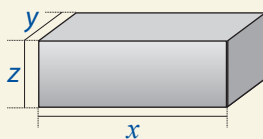
Health and safety

A risk assessment must be carried out before starting work. Take care when handling heavy objects. Dropping them can injure fingers or toes.

Procedure

- Weigh the sample and record its mass, m .
Mass of block = _____ g
Mass of rod = _____ g
- Measure and record the dimensions, in centimetres, of the sample as shown.

Block: length in each direction (x , y and z)

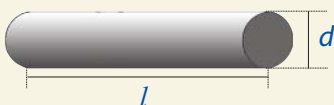


$$x = \text{_____ cm}$$

$$y = \text{_____ cm}$$

$$z = \text{_____ cm}$$

Rod: length, l , and diameter, d .



$$l = \text{_____ cm}$$

$$d = \text{_____ cm}$$

$$\text{radius, } r = d/2 = \text{_____ cm}$$

Calculations

Work out the volume, V and density, ρ of each sample.

Then say what material it's made from.

Block

$$V = x \times y \times z$$

$$V = \text{_____ cm}^3$$

$$\rho = \frac{m}{V}$$

$$\rho = \text{_____ g cm}^{-3}$$

Material = _____

Rod

volume = area of circular end \times length

$$V = \pi r^2 \times l$$

$$V = \text{_____ cm}^3$$

$$\rho = \frac{m}{V}$$

$$\rho = \text{_____ g cm}^{-3}$$

Material = _____