

Density

We can compare the weights of things made of different materials.

For a fair test, we weigh objects made of different materials which have the **same size**.

1 cm³ of iron is heavier than 1 cm³ of plastic.

This is because the **iron** has more **mass** even though the **volume** is the same.

Iron is more **dense** than plastic.

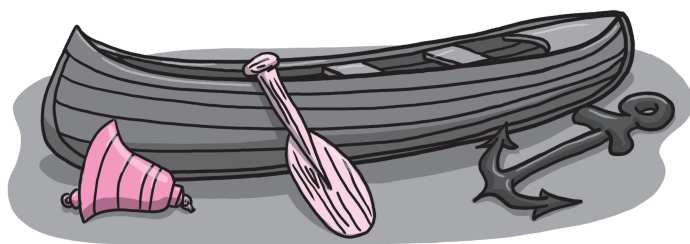
Glass marbles **sink** in water. This means that glass is **more** dense than water.

A cork **floats** in water. This means that cork is **less dense** than water.

- 1 "Iron is heavier than wood." This is not true. Give an example of something made of wood, and something made of iron where the wooden object is heavier.

(a) Object made of wood:

(b) Object made of iron:



- 2 Rewrite "Iron is heavier than wood" to make it scientifically correct.

(a) Rewrite it using the word **dense**.

(b) Rewrite it without using the words **dense** or **density**. Explain what you meant in (a).

- 3 Here is a list of materials. Number them in order of density. Put 1 against the least dense material, and 5 against the most dense.

(a) air (b) wood (c) water (d) helium (e) steel

Density tells us the mass of 1 cm³ of material. It enables materials to be compared.

A 100 cm³ block of iron has a mass of 790 g. So 1 cm³ of iron has a mass of $790 \div 100 = 7.9$ g.

The **density** of iron is 7.9 g/cm³.

- 4 Calculate the density of these materials in g/cm³.

(a) Uranium: 20 cm³ has a mass of 380 g.

(b) Lead: 60 cm³ has a mass of 660 g.

- 5 The volumes of liquids are measured in $\text{m}\ell$ (millilitres). $1 \text{ m}\ell = 1 \text{ cm}^3$.
Calculate the density in g/cm^3 of
- (a) Olive oil, if $750 \text{ m}\ell$ has a mass of 675 g ,

(b) Water, if $350 \text{ m}\ell$ has a mass of 350 g .

Silver has a density of $10 \text{ g}/\text{cm}^3$. The mass of 1 cm^3 is 10 g .
The mass of 15 cm^3 of silver will be $15 \times 10 = 150 \text{ g}$.

- 6 Calculate the mass in grams of
- (a) 200 cm^3 of flour with a density of $0.8 \text{ g}/\text{cm}^3$,
- (b) 60 cm^3 of cheese with a density of $1.1 \text{ g}/\text{cm}^3$.

Jelly has a density of $1.5 \text{ g}/\text{cm}^3$. 180 g of jelly contains $180 \div 1.5 = 120$ lots of 1.5 g lumps.
Each lump has a volume of 1 cm^3 . So the total volume is 120 cm^3 .

- 7 Calculate the volume in cm^3 of
- (a) 39 g of chocolate with a density of $1.3 \text{ g}/\text{cm}^3$,
- (b) 112 g of treacle with a density of $1.4 \text{ g}/\text{cm}^3$.

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- 8 Complete the word equations using **Density**, **Mass** and **Volume**.
- (a) Density = (b) Mass = (c) Volume =

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- 9 Rewrite your word equations using symbols.
 ρ (rho) is the density, m is the mass and V is the volume.
- (a) $\rho =$ (b) $m =$ (c) $V =$

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- 10 A gold bar is a $15 \text{ cm} \times 8 \text{ cm} \times 6 \text{ cm}$ rectangular block. The density of gold is $19 \text{ g}/\text{cm}^3$.
- (a) Calculate the volume in cm^3 . (b) Calculate the mass in grams.

(c) If each gram of gold is worth $\pounds 50$, calculate the cost of the bar.

