

Core Equation: Density, Mass & Volume

$$\rho = \frac{m}{V} \quad (\text{Density} = \text{Mass} / \text{Volume})$$

Rearranged Forms:

$$m = \rho \times V \quad (\text{Mass} = \text{Density} \times \text{Volume})$$

$$V = \frac{m}{\rho} \quad (\text{Volume} = \text{Mass} / \text{Density})$$

Units:

ρ (Density): kilograms per cubic metre (**kg/m³**) or grams per cubic centimetre (**g/cm³**)

m (Mass): kilograms (**kg**) or grams (**g**)

V (Volume): cubic metres (**m³**) or cubic centimetres (**cm³**)

Remember to show all your working, including substitutions and units, and convert units where necessary!

Section A: Formula Recall & Unit Conversions

1. Complete the table below by stating the symbol and SI unit for each variable in the density formula.

Variable	Symbol	SI Unit
Density	_____	_____
Mass	_____	_____
Volume	_____	_____

2. Rearrange the density formula ($\rho = \frac{m}{V}$) to make:

- a) Mass (m) the subject: $m =$ _____
 b) Volume (V) the subject: $V =$ _____

3. Perform the following unit conversions. Show your working where appropriate.

- a) Convert 2500 g to kilograms.

- b) Convert 150 cm³ to cubic metres.

- c) Convert 8000 kg/m³ to grams per cubic centimetre.

Section B: Practice Calculations

4. A block of wood has a mass of 1.2 kg and a volume of 0.0015 m³.

- a) Calculate the density of the wood.

- b) A different block of wood has a mass of 850 g and a volume of 1100 cm³. Calculate its density in g/cm³.

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- c) An object has a density of 2700 kg/m^3 and a volume of 0.005 m^3 . Calculate its mass in kilograms.

- d) A liquid has a density of 0.92 g/cm^3 . What volume (in cm^3) would 230 g of this liquid occupy?

Section C: Challenge & Contextual Problems

5. A solid metal cuboid has dimensions $10.0 \text{ cm} \times 5.0 \text{ cm} \times 2.0 \text{ cm}$ and a mass of 890 g.

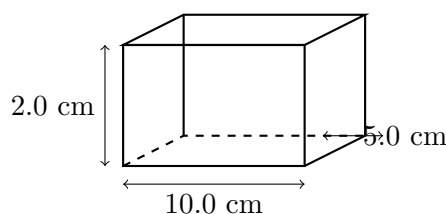


Figure 1: Metal Cuboid

- a) Calculate the density of the metal in kg/m^3 . Give your answer to an appropriate number of significant figures.

- b) The cuboid is then melted down and recast into a sphere. Explain how the mass and density of the metal sphere would compare to the original cuboid. Assume no material is lost during melting.
