Your notes

GCSE Physics: revision notes

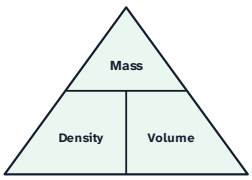
Density

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Density

- **Density** is the **mass** per unit **volume** of a material: $\rho = m \div V$.
- **Density** is measured in kg/m^3 (or g/cm^3). 1 g/cm^3 = 1000 kg/m^3.
- To find **mass**: $m = \rho V$. To find **volume**: $V = m \div \rho$.



Mass = Density × Volume

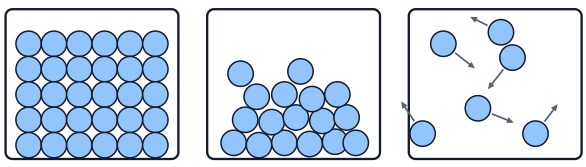
Density = Mass ÷ Volume

Volume = Mass ÷ Density

Cover the one you want: what's left shows how to work it out.

Density and the particle model

- In solids, particles are closely packed in a regular arrangement, so solids are usually the densest state.
- In liquids, particles are close together but randomly arranged, so liquids are usually slightly less dense than solids.
- In gases, particles are far apart, so gases have a much lower **density**.
- Water is an unusual exception: ice is less dense than liquid water, so ice floats.



Solid
regular pattern, touching
vibrate in fixed places

Liquid
close together, random
move past each other

Gas
far apart, random
move fast in all directions

Required practical: regular solids

- Measure the **mass** of the object with a balance.
- Measure its length, width and height with a ruler and calculate the **volume** (length × width × height for a cuboid).
- Calculate the **density**: ρ = m ÷ V.

Required practical: irregular solids and liquids

- For an irregular object: fill a eureka (**displacement**) can with water, lower in the object, and collect the water that overflows in a measuring cylinder. Its **volume** equals the **volume** of the object.
- For a liquid: measure the **mass** of an empty measuring cylinder, add a known **volume** of liquid, and measure the **mass** again. The difference is the mass of the liquid.
- Read measuring cylinders at eye level, from the bottom of the **meniscus**.

Worked examples

A block has a mass of 540 g and a volume of 200 cm³. Find its density.

Use density = mass ÷ volume. **ρ = m ÷ V**

Put the numbers in. **540 ÷ 200**

Answer: 2.7 g/cm³

Key terms

Density	Mass per unit volume: ρ = m ÷ V.
Mass	The amount of matter in an object, measured in kilograms.
Volume	The amount of space an object takes up, measured in m³ or cm³.
Eureka can	A container with a spout used to measure the volume of an irregular object by displacement.
Displacement	Water pushed out of the way by an object, equal to the object's volume.
Meniscus	The curved surface of a liquid in a measuring cylinder.

Quick questions

Cover the answers and test yourself: remembering is what makes it stick.

1. What is the equation for density?
2. A block has a mass of 100 g and a volume of 50 cm³. What is its density?
3. How many kg/m³ is 1 g/cm³?
4. Why are gases much less dense than solids?

Your notes

5. How can you find the volume of an irregular stone?
6. A cuboid is 2 cm × 3 cm × 5 cm and has a mass of 81 g. What is its density?
7. What mass of water (density 1000 kg/m³) fills 0.002 m³?
8. Where should you read a measuring cylinder?

Answers

1. Density = mass ÷ volume
2. 2 g/cm³
3. 1000 kg/m³
4. Their particles are far apart
5. Use a eureka can and measure the water displaced
6. 2.7 g/cm³
7. 2 kg
8. At eye level, from the bottom of the meniscus

What to do next

Practise 10 questions on this topic

Try 7 exam questions, with mark schemes

Read the lesson, one step at a time

Free revision for GCSE and KS3 at lycolearn.co.uk. Some notes are for one exam board only, and say so in brackets.

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