

Particle Model Density

GCSE Physics · Written to the shared content for AQA, Edexcel and OCR

Name _____ Class _____ Date _____

1. Worked example

A block has a mass of 240 g and a volume of 30 cm³. Calculate its density. (2 marks)

Step 1 · Write the equation

$$\text{density} = \text{mass} \div \text{volume}, \rho = m \div V$$

Step 2 · Substitute and calculate

$$\rho = 240 \div 30 = 8.0 \text{ g/cm}^3$$

Answer: 8.0 g/cm³

Check: g ÷ cm³ gives g/cm³.

2. Now try one with the steps

A metal block measures 10 cm × 5.0 cm × 2.0 cm and has a mass of 0.27 kg. Calculate its density in kg/m³. (4 marks)

Step 1 · Convert lengths to metres

Step 2 · Volume

Step 3 · Density

Answer:

3. Practice

Show your working. The marks tell you how much is expected.

1. Write the equation for density and give its SI unit. [2]

2. An object has a mass of 60 g and a volume of 20 cm³. Calculate its density in g/cm³. [2]

3. Describe the arrangement and movement of particles in a solid, a liquid and a gas. [3]

4. Explain why a gas is much less dense than the solid form of the same substance. [2]
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5. A block has a mass of 2.0 kg and a volume of 0.0025 m³. Calculate its density in kg/m³. [2]
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6. Convert a density of 2.7 g/cm³ into kg/m³. [1]
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7. Water has a density of 1000 kg/m³. Calculate the mass of 0.50 m³ of water. [2]
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8. Iron has a density of 7.8 g/cm³. Calculate the volume of a 39 g piece of iron. [2]
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9. Explain why the mass of an ice cube stays the same when it melts. [2]
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10. State why a change of state is described physical change. [1]
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11. A rectangular block measures 5.0 cm × 4.0 cm × 2.0 cm and has a mass of 108 g. Calculate its density in g/cm³. [3]
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12. A 250 cm³ bottle is filled with oil of density 0.92 g/cm³. Calculate the mass of the oil. [2]
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13. Ice floats on water. Explain what this tells you about the spacing of water molecules in ice compared with liquid water. [2]
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14. A ring has a mass of 9.65 g and a volume of 0.60 cm³. Pure gold has a density of 19.3 g/cm³. Use a calculation to decide whether the ring is pure gold. [3]

4. Before you hand it in

Using weight in newtons instead of mass

Use mass in kg (or g). If you are given weight, divide by g to find mass first.

Mixing g with m³ or kg with cm³

Use g and cm³ for g/cm³, or kg and m³ for kg/m³. 1 g/cm³ = 1000 kg/m³.

"Particles in a gas are bigger, so gases are less dense."

The spaces between the particles are bigger; the particles themselves are the same.

Converting cm³ to m³ by dividing by 100

1 m³ = 100 × 100 × 100 cm³ = 1 000 000 cm³. Divide by 1 000 000 (or convert each length to metres first).