

MR SULLY UNFOLDS PHYSICS ANSWERS

Density

AQA 4.3.1.1 · RP5
Particle model · Paper 1
Foundation & Higher · Required practical 5

Name _____ Class _____ Date _____

Density tells you how much mass is packed into a certain volume. The particle model explains why solids, liquids and gases have different densities.

KEY EQUATION

$$\rho = m \div V$$

ρ = density (kg/m³)
m = mass (kg)
V = volume (m³)
In the lab you'll often use g and cm³, giving g/cm³.

WORKED EXAMPLE

A block has a mass of 540 g and a volume of 200 cm³.
ρ = 540 ÷ 200 = **2.7 g/cm³**

Section A · Recall and calculate

Grade 4–5

1 Calculate the density of a 2 kg object with a volume of 0.0005 m³. [2]

ρ = 2 ÷ 0.0005 = 4000 kg/m³

2 Use the particle model to explain why gases are much less dense than solids. [2]

Gas particles are much further apart,

so the same mass takes up a much bigger volume.

3 Complete the table. [3]

Mass	Volume	Density
600 g	200 cm³	**3 g/cm³**
50 kg	**0.05 m³**	1000 kg/m³
1.6 kg	0.002 m³	800 kg/m³

Section B · Required practical

Grade 5–6

4 Describe how to find the density of a regular-shaped block. [3]

Measure the mass on a balance.

Measure length, width and height with a ruler (or vernier callipers); V = l × w × h.

Calculate ρ = m ÷ V.

5 Describe how to find the volume of an irregular stone. [3]

Fill a eureka (displacement) can with water up to the spout.

Lower the stone in and collect the displaced water in a measuring cylinder.

The volume of water collected = the volume of the stone.

Section C · Stretch

Grade 7+

6 A 1.5 cm × 2 cm × 4 cm block has a mass of 108 g. Calculate its density in g/cm³ and in kg/m³. [3]

V = 1.5 × 2 × 4 = 12 cm³

ρ = 108 ÷ 12 = 9 g/cm³

= 9000 kg/m³

Exam-style question

AQA style

7 A student finds the density of a liquid using a measuring cylinder and a balance.

a Describe the method. [3]

Put an empty measuring cylinder on the balance and zero it (or record its mass).

Pour in liquid; read the volume at eye level from the bottom of the meniscus.

Record the mass of the liquid; calculate ρ = m ÷ V.

b The student measures 50 cm³ of liquid with a mass of 40 g. Calculate its density. [2]

ρ = 40 ÷ 50 = 0.8 g/cm³

c Suggest how the student could make the result more accurate. [1]

Use a larger volume / repeat and take a mean / read the meniscus at eye level.

Total: _____ / 22

How confident am I?	Not yet	Nearly	Got it
I can use ρ = m ÷ V with different units	☐	☐	☐
I can describe how to find density of regular and irregular objects	☐	☐	☐
I can explain density using the particle model	☐	☐	☐