Cambridge Assessment International Education

Cambridge IGCSE™ (9–1)

CANDIDATE NAME

CENTRE NUMBER

CANDIDATE NUMBER

PHYSICS **0972/61**

Paper 6 Alternative to Practical **May/June 2025**

1 hour

You must answer on the question paper.

No additional materials are needed.

INSTRUCTIONS

- Answer **all** questions.
- Use a black or dark blue pen. You may use an HB pencil for any diagrams or graphs.
- Write your name, centre number and candidate number in the boxes at the top of the page.
- Write your answer to each question in the space provided.
- Do **not** use an erasable pen or correction fluid.
- Do **not** write on any bar codes.
- You may use a calculator.
- You should show all your working and use appropriate units.

INFORMATION

- The total mark for this paper is 40.
- The number of marks for each question or part question is shown in brackets [ ].

This document has **12** pages. Any blank pages are indicated.

DC (EV) 353474

[Turn over

1 A student determines the density of a ball.

(a) He places the ball between two wooden blocks, as seen from above in Fig. 1.1.

He takes two measurements, d_1 and d_2.

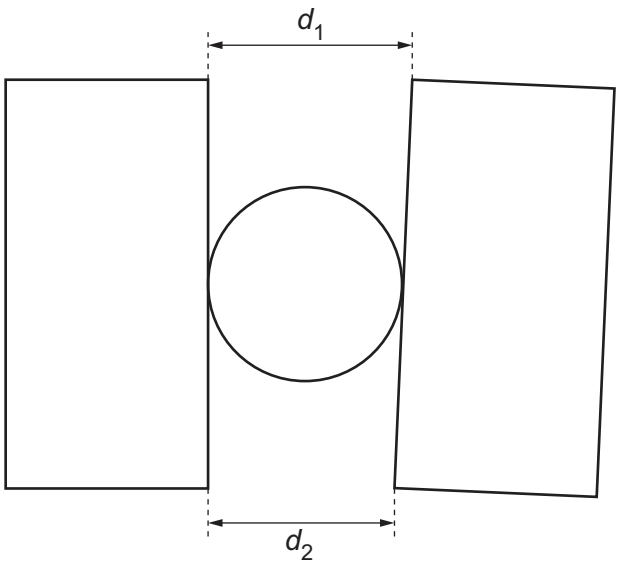


Fig. 1.1

(i) On Fig. 1.1, measure the lengths d_1 and d_2.

d_1 = ... cm

d_2 = ... cm [1]

(ii) Using your measurements, calculate the diameter d of the ball. Show your working.

d = ... cm [1]

(iii) Explain why this method is used to measure the diameter of the ball.

.....

..... [2]

(b) Calculate the volume V of the ball using the equation $V = 0.52d^3$.

Include the unit.

V = ... [2]

(c) The student measures the mass m_D of a dish.

m_D = 102.5 g

He places the ball in the dish and measures the combined mass m_C of the dish and the ball.

Fig. 1.2 shows the dish and the ball on a balance.

Record the reading shown on the balance.

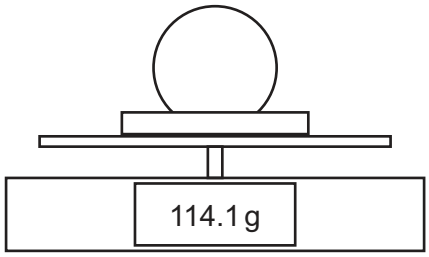


Fig. 1.2

m_C = ... g

Calculate the mass m_B of the ball. Show your working.

m_B = ... g
[2]

(d) Calculate the density ρ of the ball using the equation:

$$\rho = \frac{m_B}{V}.$$

Give your answer to a suitable number of significant figures for this experiment. Include the unit.

ρ = ... [3]

[Total: 11]

2 A student investigates the cooling of hot water in a beaker.

The apparatus is shown in Fig. 2.1.

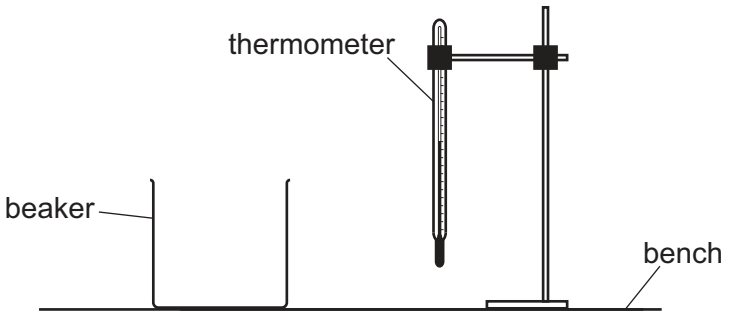


Fig. 2.1

(a) The student uses a thermometer to measure room temperature θ_R. Room temperature is 22 °C.

On Fig. 2.2, show clearly the reading θ_R.

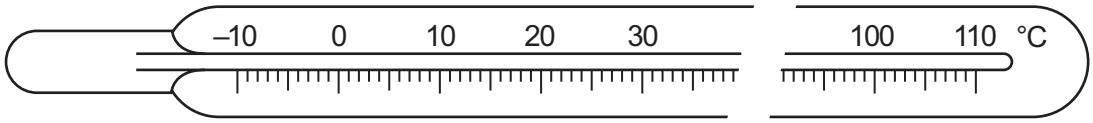


Fig. 2.2

[1]

(b) The student pours 100 cm^3 of hot water into an empty beaker. She records the temperature θ of the hot water in the V = 100 cm^3 row of Table 2.1, as shown.

Without delay, she pours 20 cm^3 of cold water into the beaker. She stirs the water and measures the temperature of the mixture of hot and cold water. She repeats the procedure until she has added a total of 100 cm^3 of cold water to the beaker.

All the readings are shown in Table 2.1. V is the total volume of water in the beaker.

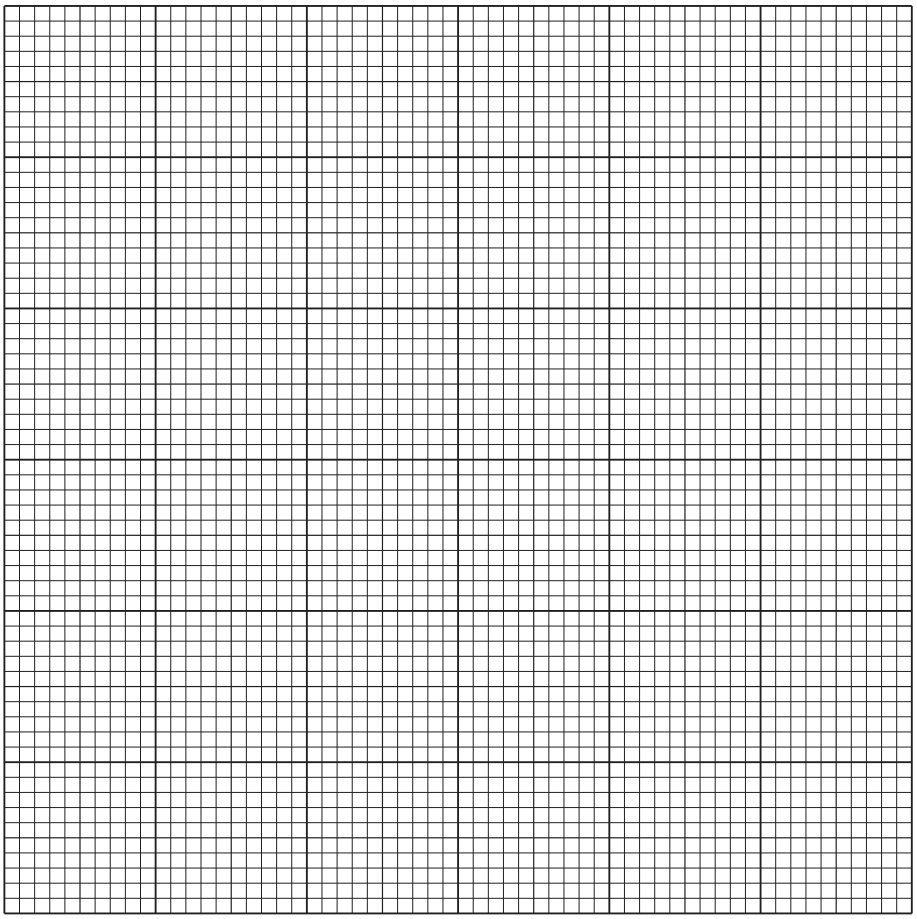
Complete the column headings in Table 2.1. [1]

Table 2.1

V/	θ/
100	87
120	73
140	65
160	59
180	54
200	49

(c) Plot a graph of temperature θ (y-axis) against total volume of water V (x-axis). You do **not** need to start the axes at the origin $(0, 0)$.

Draw the best-fit curve.



[4]

(d) In the experiment, the student aims to investigate the effect on the temperature of the hot water as cold water is added.

(i) Complete the sentence to explain why it is important to add the cold water without delay at each stage.

The cold water is added without delay .....

.....

..... [1]

(ii) Complete the sentence to explain the reason for stirring the water at each stage.

The student stirs the water before recording the temperature .....

.....

..... [1]

(e) Suggest **two** ways to minimise the loss of thermal energy from the beaker during the experiment.

1 .....

.....

2 .....

.....

[2]

(f) Name the apparatus that the student uses to measure the volume of water.

..... [1]

[Total: 11]

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3 A student investigates reflections in a plane mirror.

A ray-trace sheet is shown in Fig. 3.1.

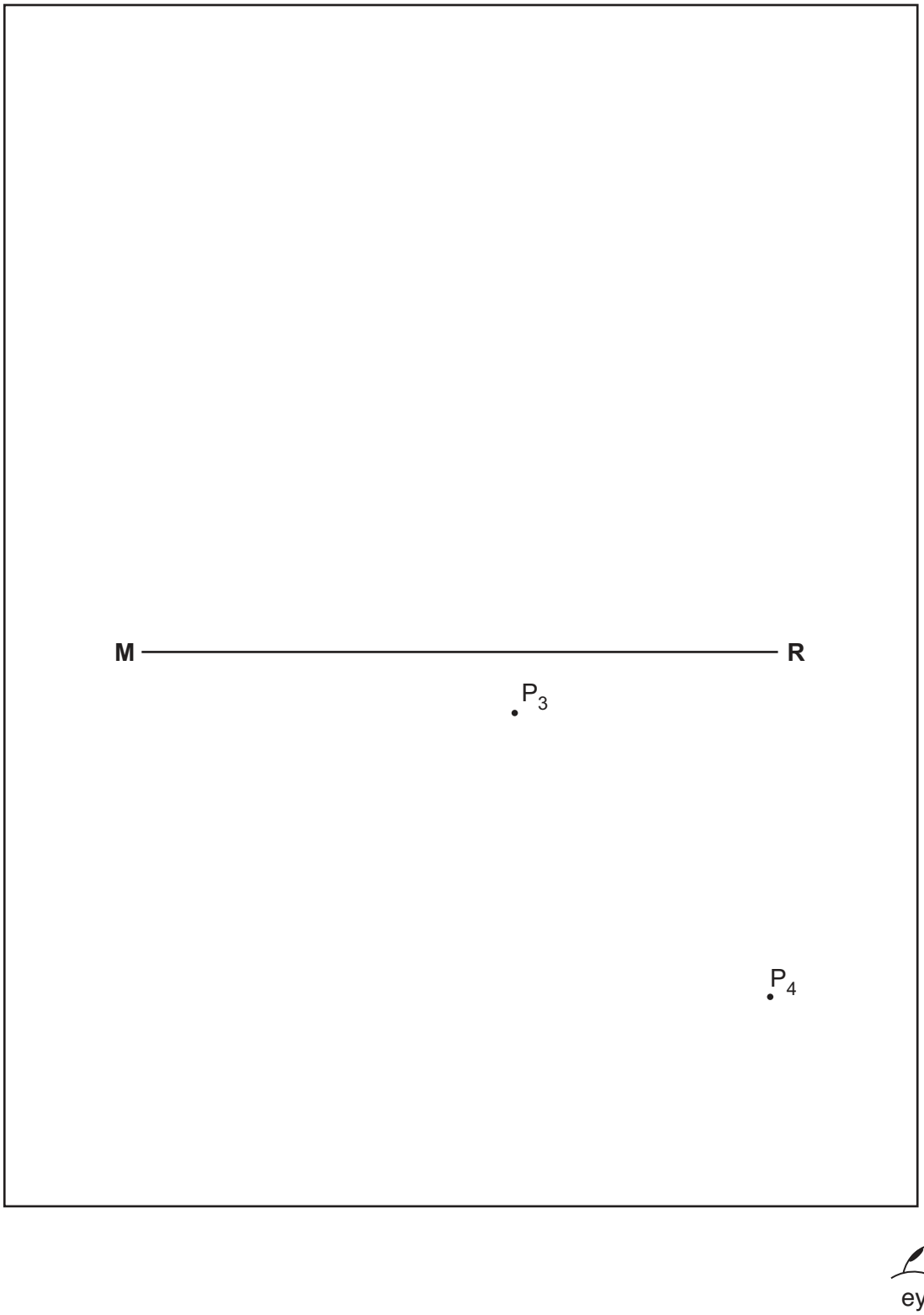

Fig. 3.1

(a)
- Draw a normal to the line **MR** that passes through the centre of **MR**. Label the normal **NL**.
- Label the point at which **NL** crosses **MR** with the letter **B**.
- Draw a line 10.0 cm long from **B** at an angle of incidence $i = 40°$ to the normal below **MR** and to the left of the normal. Label the end of this line **A**.

[2]

(b) The student places the reflecting face of the mirror vertically on the line **MR**.

He places **two** pins, P_1 and P_2, on line **AB**.

Mark the positions of P_1 and P_2 with crosses (X) on line **AB** at a suitable distance apart for this type of ray-trace experiment. Label the positions of P_1 and P_2. [1]

(c) The student views the images of pins P_1 and P_2 from the direction indicated by the eye in Fig. 3.1. He places two pins, P_3 and P_4, so that pins P_3 and P_4 and the images of P_2 and P_1 all appear exactly one behind the other. The positions of P_3 and P_4 are shown on Fig. 3.1.

(i) Draw a line through the positions of P_3 and P_4. Continue the line until it meets **MR**. [1]

(ii) Measure the acute angle α between this line and the horizontal line **MR**. An acute angle is an angle less than 90°.

α = ... ° [1]

(d) The student turns the mirror through 180°. He draws a new incident ray at an angle of incidence i = 50° to the normal above **MR** and to the left of the normal.

He labels the end of this line **C**. This line is **not** shown on Fig. 3.1. You may draw the line on Fig. 3.1.

He places two pins on the line **CB** and views the images of the two pins from near the top right-hand corner of the ray-trace sheet.

On Fig. 3.1, draw a reflected ray 10.0 cm long from **B** with an angle of reflection β equal to the angle of incidence. Label the end of the line **D**.

[2]

(e) Suggest a relationship between α and β. Justify your answer by reference to the results.

relationship .....

justification .....

.....

.....

[2]

(f) State **two** techniques that you use in this type of experiment to obtain an accurate ray trace.

1 .....

.....

2 .....

.....

[2]

[Total: 11]

4 A student investigates the relationship between the diameter and the resistance of wires.

The following apparatus is available:

- wires with different diameters
- instrument for measuring the diameter of a wire
- metre ruler
- ammeter
- voltmeter
- power supply.

Other apparatus normally found in a school laboratory is also available.

Plan an experiment to investigate how the diameter of a wire affects its resistance.

Resistance R is given by the equation $R = \frac{V}{I}$, where V is the potential difference (p.d.) across the wire and I is the current in the wire.

You do **not** need to write about safety precautions.

In your plan:

- draw a circuit diagram to show the circuit you use
- explain briefly how to do the investigation
- state **one** key variable to keep constant
- draw a table, or tables, with column headings, to display the readings (you are **not** required to enter any readings in the table)
- explain how to use your results to reach a conclusion.

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