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PHYSICS

0625/61

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.

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 .

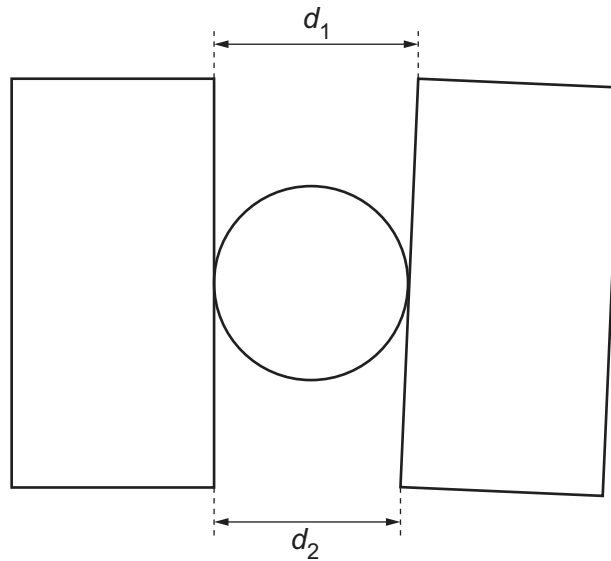


Fig. 1.1

(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.

$$m_D = 102.5 \text{ g}$$

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.

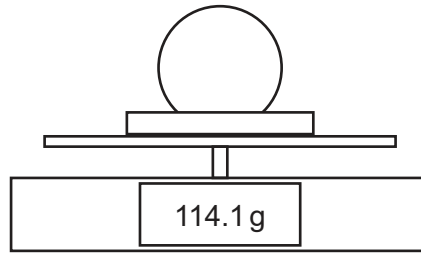


Fig. 1.2

$$m_C = \dots \text{ g}$$

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

$$m_B = \dots \text{ g} \quad [2]$$

(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.

$$\rho = \dots \text{ [3]}$$

[Total: 11]





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

The apparatus is shown in Fig. 2.1.

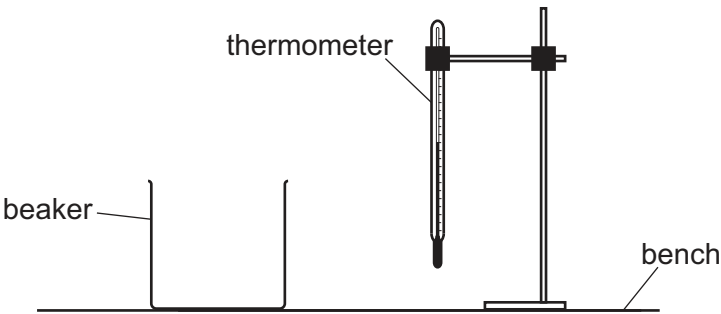


Fig. 2.1

- (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 .

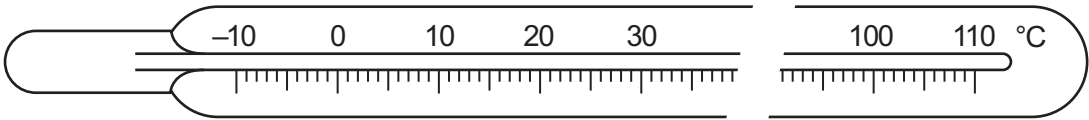


Fig. 2.2

[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 $V = 100\text{ cm}^3$ 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]

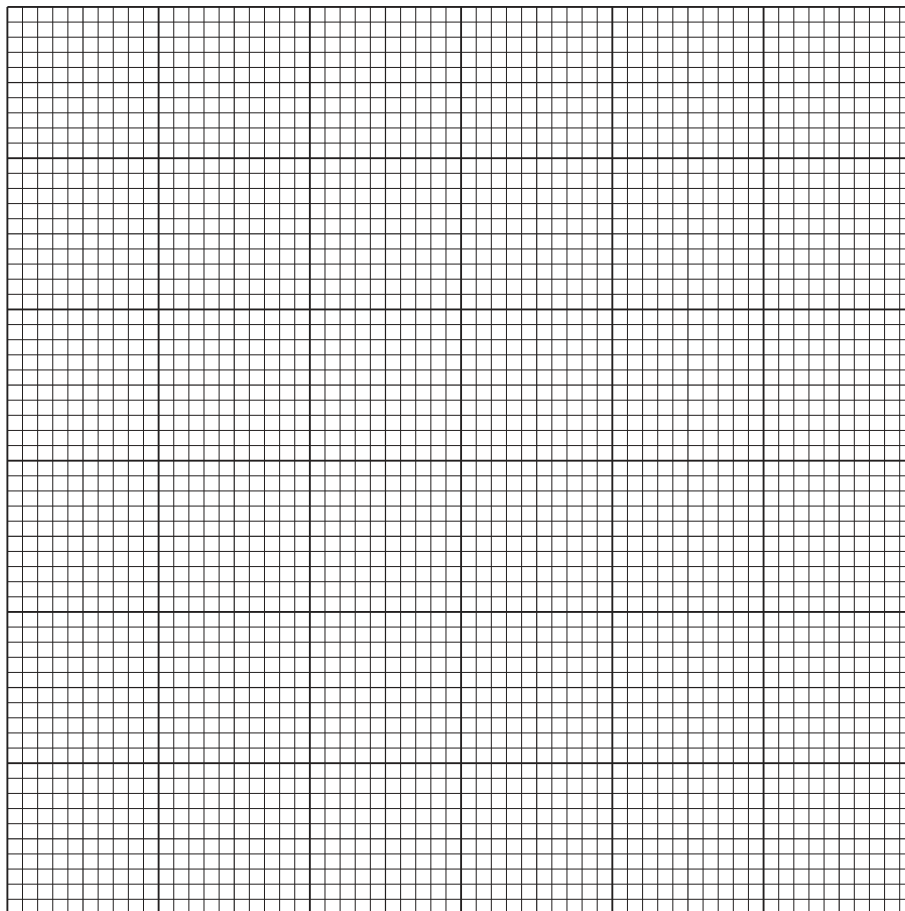
Table 2.1

$V/$	$\theta/$
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.

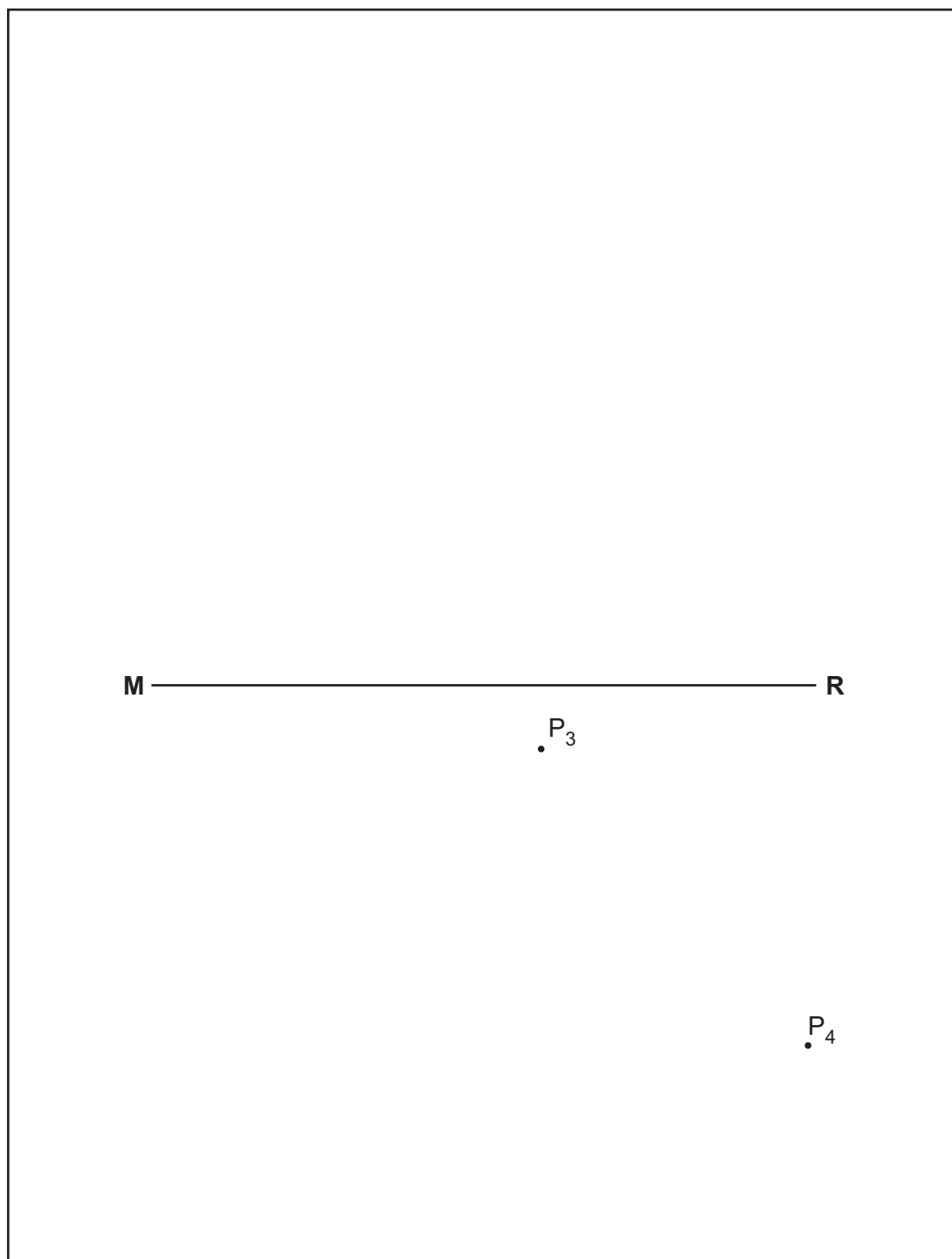


Fig. 3.1

- (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 $i = 40^\circ$ to the normal below **MR** and to the left of the normal. Label the end of this line **A**.



- (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° .

$\alpha = \dots\dots\dots^\circ$ [1]

- (d) The student turns the mirror through 180° . He draws a new incident ray at an angle of incidence $i = 50^\circ$ 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.



[7]





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