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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  $d_2$ .

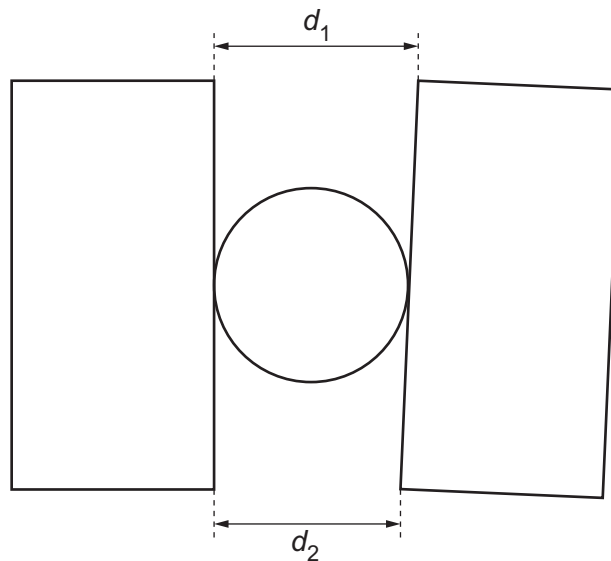


Fig. 1.1

(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.

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

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.

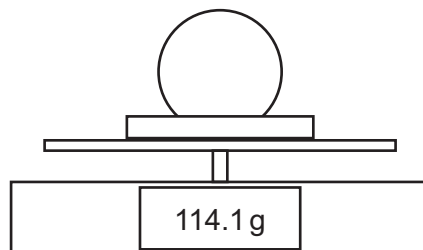


Fig. 1.2

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

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

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

(d) Calculate the density  $\rho$  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.

$$\rho = \dots\dots\dots [3]$$

[Total: 11]



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

The apparatus is shown in Fig. 2.1.

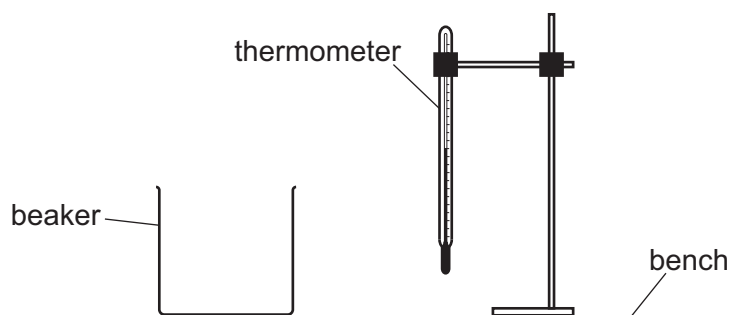


Fig. 2.1

- (a) The student uses a thermometer to measure room temperature  $\theta_R$ . Room temperature is  $22^\circ\text{C}$ .

On Fig. 2.2, show clearly the reading  $\theta_R$ .

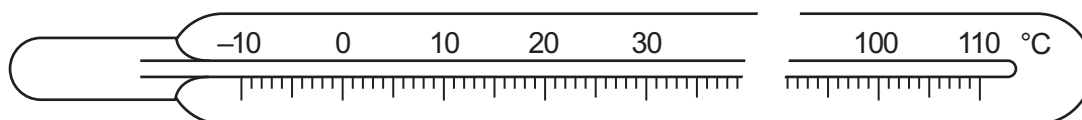


Fig. 2.2

[1]

- (b) The student pours  $100\text{ cm}^3$  of hot water into an empty beaker. She records the temperature  $\theta$  of the hot water in the  $V = 100\text{ cm}^3$  row of Table 2.1, as shown.

Without delay, she pours  $20\text{ cm}^3$  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  $100\text{ cm}^3$  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]

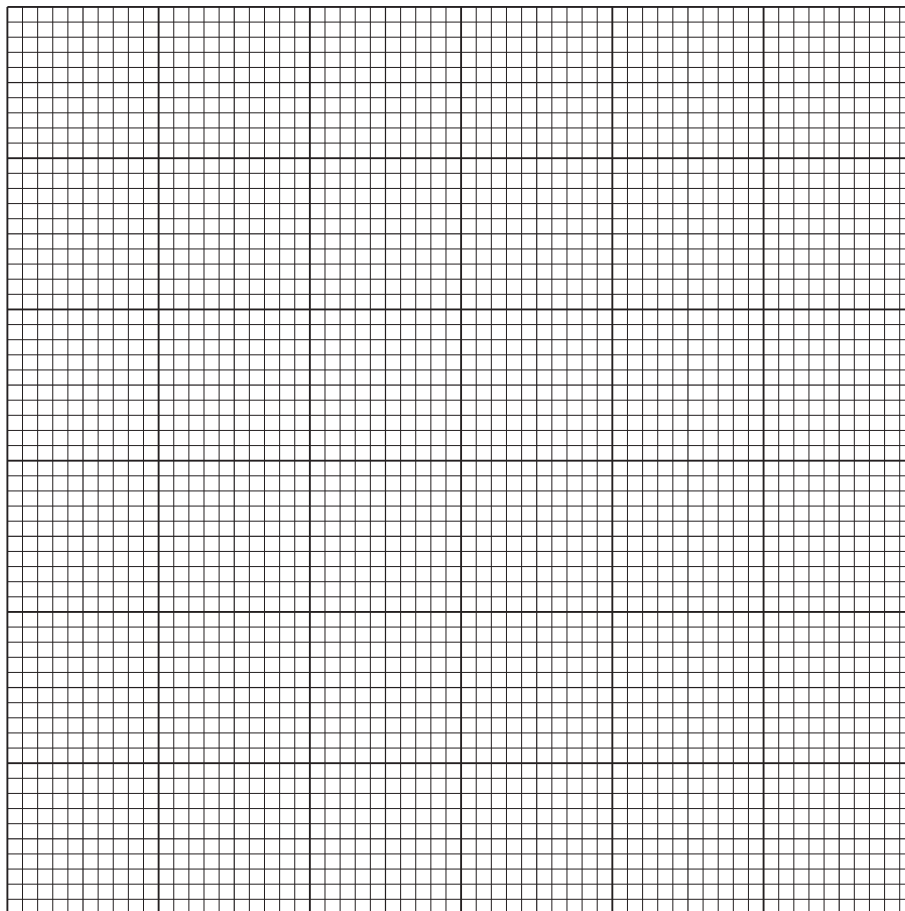
Table 2.1

| $V/$ | $\theta/$ |
|------|-----------|
| 100  | 87        |
| 120  | 73        |
| 140  | 65        |
| 160  | 59        |
| 180  | 54        |
| 200  | 49        |



- (c) Plot a graph of temperature  $\theta$  (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.

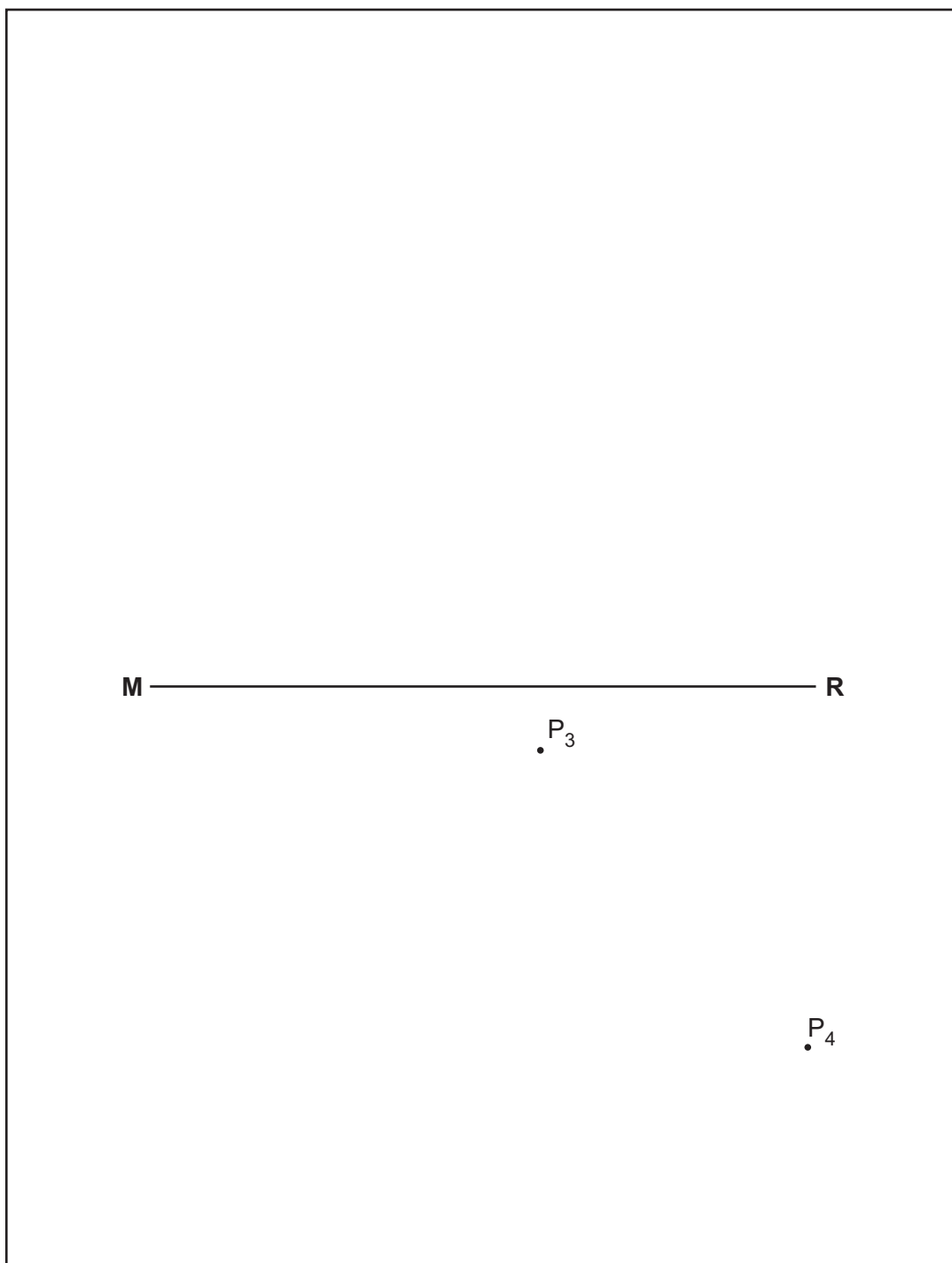


Fig. 3.1

- (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  $\alpha$  between this line and the horizontal line **MR**. An acute angle is an angle less than  $90^\circ$ .

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

- (d) The student turns the mirror through  $180^\circ$ . 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  $\beta$  equal to the angle of incidence. Label the end of the line **D**. [2]

- (e) Suggest a relationship between  $\alpha$  and  $\beta$ . 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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