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PHYSICS **0625/62**

Paper 6 Alternative to Practical **October/November 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 **16** pages. Any blank pages are indicated.

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[Turn over

1 A student investigates the reflection of light by a plane mirror.
The student's ray-trace is shown full-size in Fig. 1.1.

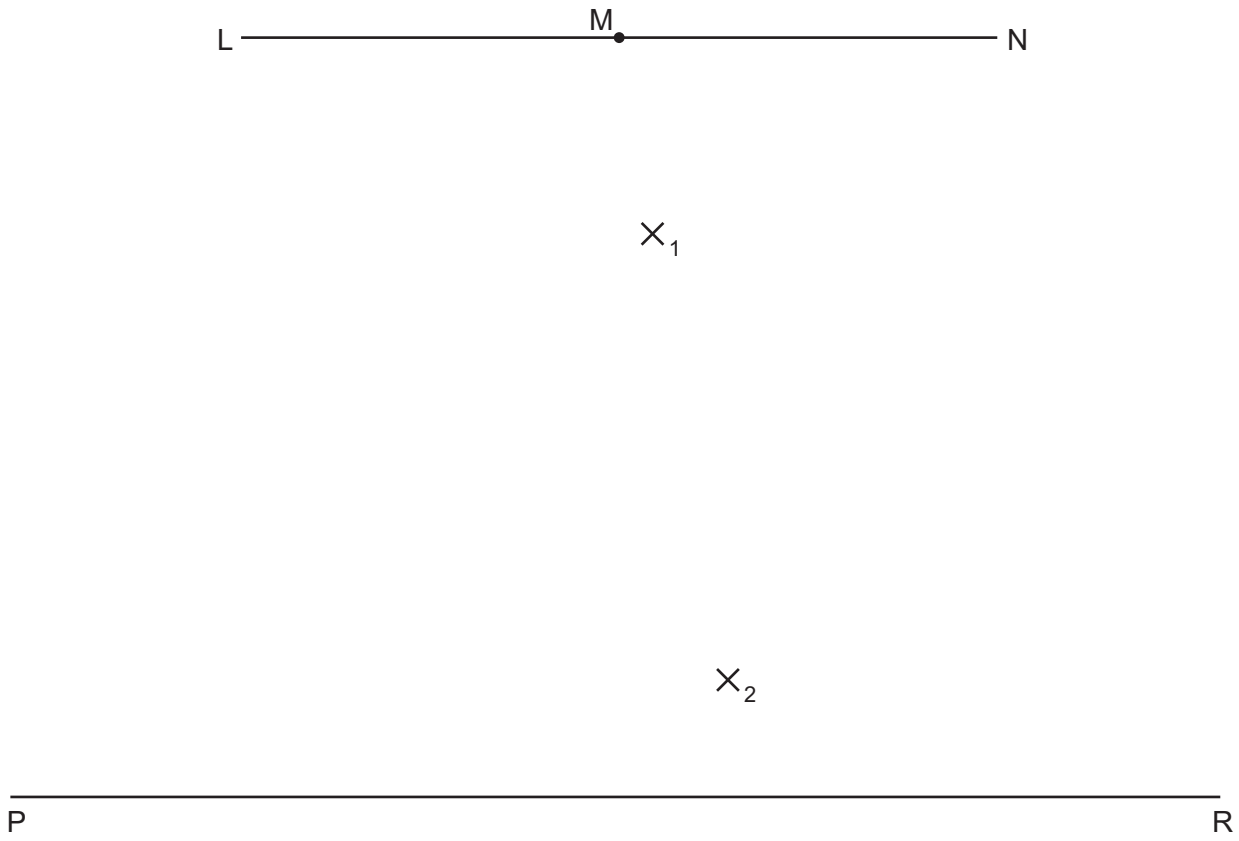


Fig. 1.1

(a) The student:

- draws line **LN**
- labels the mid-point of **LN** with the letter **M**
- draws a line **PR** parallel to **LN** and 10.0 cm below it

On Fig. 1.1, draw a normal to **LN** at the point **M**. Extend the normal downwards until it crosses the line **PR**. Label the point at which the normal crosses **PR** with the letter **Q**. [1]

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(b) On Fig. 1.1, draw a line 14.0 cm long from point **M** at an angle $\theta = 10°$, as shown in Fig. 1.2. Label the other end of the line **O**. [2]

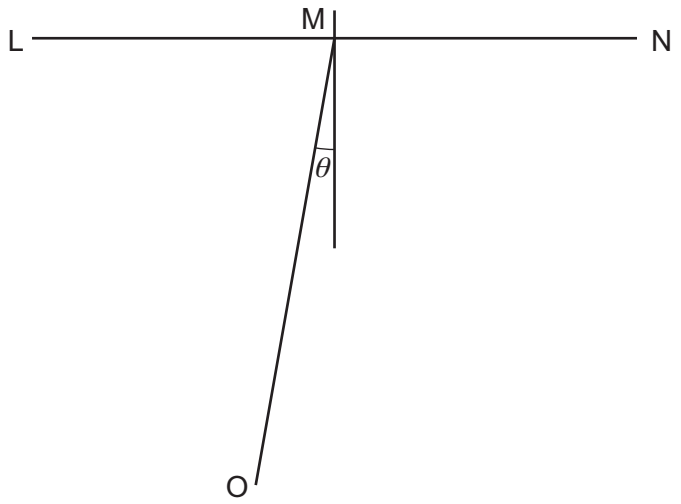


Fig. 1.2

(c) The student:

- places the reflecting surface of a mirror along the line **LN**, with its reflecting surface facing the bottom of the page, and with the centre of the mirror at **M**
- positions a light source and slit so that a ray of light passes along the line **OM** towards **M**
- marks two small crosses X_1 and X_2, a suitable distance apart on the ray reflected from the mirror
- removes the mirror and the illuminated slit.

(i) On Fig. 1.1, draw a line joining **M** to X_1 and X_2.

Continue the line until it crosses the line **PR** and label the point where it crosses **PR** with the letter **T**. [1]

(ii) Measure the length *a* of the line **QT** in centimetres to the nearest millimetre and the length *b* of the line **MT** in centimetres to the nearest millimetre. Record your measurements below and in Table 1.1.

a = ... cm

b = ... cm
[1]

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(d) Calculate the ratio $r = \frac{a}{b}$. Record your answer in Table 1.1.

Give your answer to 2 significant figures.

Table 1.1

θ / °	a / cm	b / cm	$r = \frac{a}{b}$
10			
20	4.2	12.8	0.33
30	6.8	13.7	0.50

[2]

(e) The student repeats the procedure in **(b)** and **(c)** for values of $\theta = 20°$ and $\theta = 30°$.

The student's results are recorded in Table 1.1.

The student states that r is directly proportional to θ.

State if you agree with the student.

Use values from Table 1.1 to justify your answer.

statement .....

justification .....

.....

.....

[2]

(f) Suggest what the student can do to have more confidence in their answer to part **(e)**.

.....

.....

..... [1]

(g) Suggest **one** source of inaccuracy in this experiment, even if it is carried out very carefully.

.....

..... [1]

[Total: 11]

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2 A student investigates an electric circuit to find the resistance of an unknown resistor Z.

The student sets up the incomplete circuit shown in Fig. 2.1. There is a gap between the points labelled X and Y.

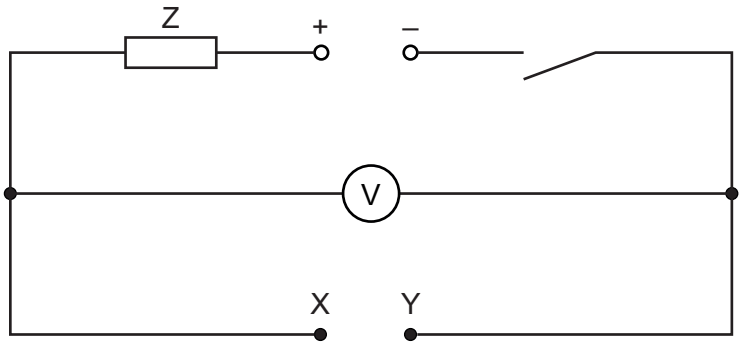


Fig. 2.1

(a) The student:

- closes the switch
- records the voltmeter reading V_0
- opens the switch.

The reading on the voltmeter is shown in Fig. 2.2.
Record the voltmeter reading V_0.

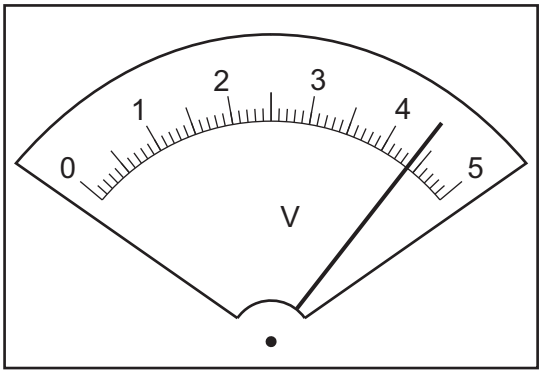


Fig. 2.2

V_0 = ... V [1]

(b) The student:

- connects a 10 Ω resistor between points X and Y
- closes the switch
- records, in Table 2.1, the reading V on the voltmeter
- opens the switch
- repeats this procedure for resistors of resistances R = 22 Ω, 39 Ω, 47 Ω and 68 Ω.

Table 2.1

resistance R/Ω	voltmeter reading V/V	current I/A
10	1.35	
22	2.20	0.10
39	2.85	0.073
47		0.064
68	3.37	0.050

(i) Use the voltmeter reading in Table 2.1 when the 10 Ω resistor is connected between X and Y to calculate the current I in the circuit. Use the equation:

$$I = \frac{V}{R}$$

Record your value of I in Table 2.1 to 2 significant figures. [2]

(ii) The voltmeter reading V for the 47 Ω resistor is missing. Calculate V.

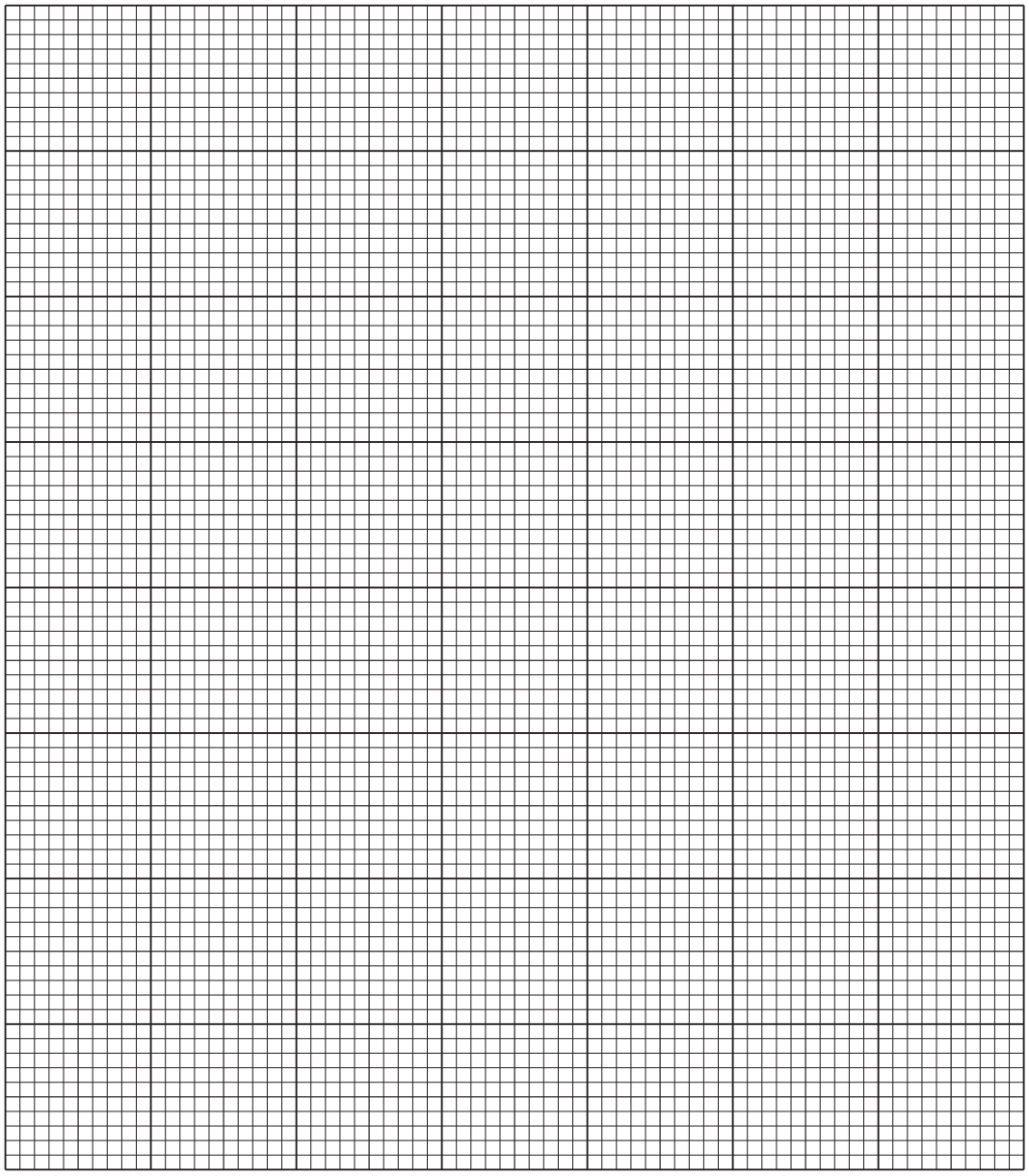
V = ... V

Add your answer to Table 2.1. [1]

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(c) Plot a graph of V/V (y-axis) against I/A (x-axis). Start your axes at the origin (0,0).

Draw a best-fit straight line.



[4]

(d) Determine the gradient G of your line. Show all working and indicate on the graph the values you use.

G = ... [2]

(e) The gradient of your line is numerically equal to the resistance R_Z of the unknown resistor Z.

Write down the value of the resistance R_Z.

Record your answer to the nearest ohm.

R_Z = ... Ω [1]

[Total: 11]

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3 A student investigates the cooling of water.
The student sets up the apparatus shown in Fig. 3.1.

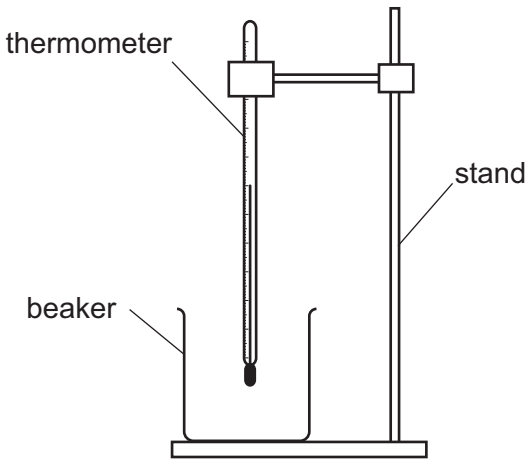


Fig. 3.1

(a) The student records the room temperature θ_R.

θ_R = 21.5 °C

The student:

- pours 60 cm^3 of hot water into the beaker
- waits for 30 s
- measures, and records in Table 3.1 at time t = 0, the temperature θ of the water
- immediately starts a stop-watch and measures the temperature of the water at one-minute intervals for 5 minutes.

The reading on the thermometer for time t = 0 is shown in Fig. 3.2.

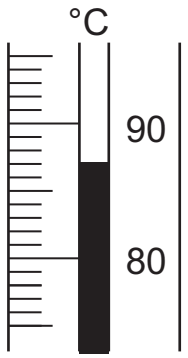


Fig. 3.2

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(i) Record the temperature in Table 3.1 to the nearest 0.5 °C. [1]

(ii) Complete the time *t* column. [1]

Table 3.1

time *t* /	temperature θ / °C
0	
	80.5
	75.5
	71.0
	67.5
	64.0

(b) (i) Suggest why the student waits for 30 s before measuring the initial temperature of the hot water.

.....

..... [1]

(ii) State how the student ensures that the temperature readings are as accurate as possible.

.....

..... [1]

(c) (i) Calculate the decrease in temperature $\Delta\theta$ of the hot water during the **first two** minutes of cooling.

$\Delta\theta$ = ... °C [1]

(ii) Calculate the average rate of cooling R_1 of the hot water during the **first two** minutes of cooling.

Use the equation:

$$R_1 = \frac{\text{decrease in temperature}}{\text{time}}$$

Include the unit in your answer.

R_1 = ... unit = ... [2]

(iii) Calculate the average rate of cooling R_2 of the hot water during the **final two** minutes of cooling.

R_2 = ... [1]

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(d) Use your answers in **(c)(ii)** and **(c)(iii)** to write a conclusion about the way in which hot water in a beaker cools.

.....

..... [1]

(e) The water in the beaker is left to continue cooling.

(i) Estimate the temperature of the water θ_5 after a further 5 minutes of cooling.

θ_5 = ... °C [1]

(ii) Estimate the temperature of the water θ_{50} after a further 50 minutes of cooling.

θ_{50} = ... °C [1]

[Total: 11]

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4 A student sets up a flexible track on the laboratory bench.

The student investigates the motion of a metal ball as it rolls from rest down the track. The metal ball rolls down the track, up the other side of the track, and comes momentarily to rest at a height *h* above the bench before rolling back down again.

Plan an experiment to investigate how **one** variable affects the size of this height *h*.

The apparatus available includes:

- flexible track
- two clamps, bosses and stands to support the track
- selection of metal balls.

Fig. 4.1 shows how the flexible track is supported.

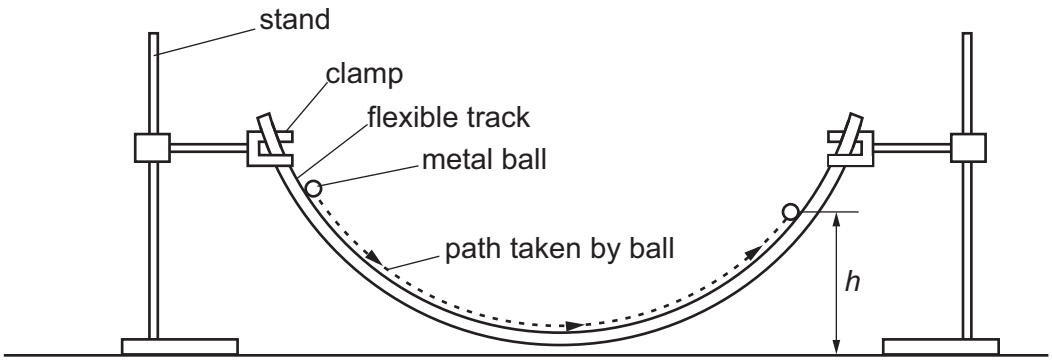


Fig. 4.1

In your plan:

- state the **one** variable you have chosen to investigate
- list any additional apparatus needed
- explain how to do the experiment
- state the key variables to be kept constant
- draw a table, with column headings, to show how to display the readings (you are **not** required to enter any readings in the table)
- explain how to use the readings to reach a conclusion.

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