Cambridge Assessment International Education

Cambridge O Level

CANDIDATE NAME	
CENTRE NUMBER	
CANDIDATE NUMBER	

7955080172

PHYSICS **5054/32**

Paper 3 Practical Test **October/November 2025**

1 hour 30 minutes

You must answer on the question paper.

You will need: The materials and apparatus listed in the confidential instructions

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 [ ].

For Examiner's Use	
1	
2	
3	
4	
Total	

This document has **16** pages. Any blank pages are indicated.

1 In this experiment you will investigate a light dependent resistor (LDR).

You are provided with:

- a power supply
- a switch
- a voltmeter with two leads that may be connected between different points in the circuit
- a light dependent resistor (LDR)
- a 560 Ω resistor
- a piece of card.

The supervisor has constructed a series circuit consisting of the power supply, the LDR, the resistor and the switch. The circuit has three points labelled P, Q and S.

(a) Draw a diagram of the circuit arrangement using the correct symbols for the components in the circuit.

Choose from the symbols shown in Fig. 1.1.

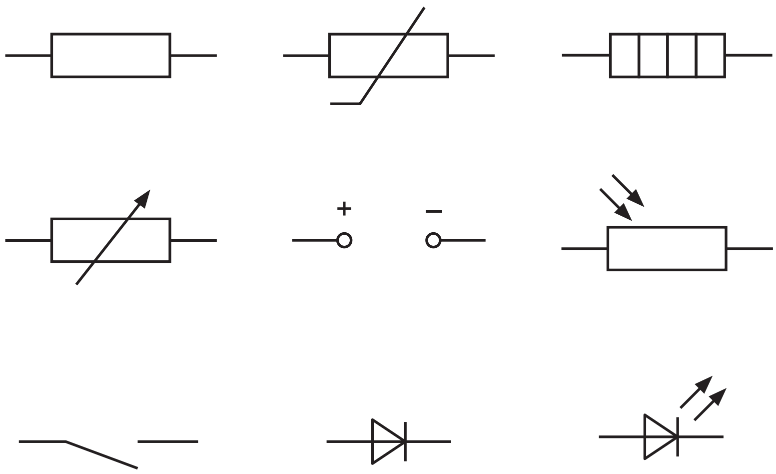

Fig. 1.1

You do **not** need to label points P, Q and S on your diagram.

[2]

(b) **(i)** Connect the voltmeter across the LDR between points P and Q.

Close the switch.

Record V_{PQ}, the voltmeter reading across P and Q.

This is V_{PQ} under normal lighting conditions.

V_{PQ} = ... V [1]

Open the switch.

(ii) Disconnect the voltmeter from points P and Q.

Reconnect the voltmeter across the 560 Ω resistor between points Q and S.

Close the switch.

Record V_{QS}, the voltmeter reading across Q and S.

V_{QS} = ... V [1]

Open the switch.

(c) The current I in the circuit is calculated using the equation:

$$I = \frac{V_{QS}}{R}$$

where R = 560 Ω.

Use your reading in **(b)(ii)** to calculate the current I.

I = ...A [1]

(d) Calculate the resistance R_{LDR} of the LDR under normal lighting conditions using the equation shown.

$$R_{LDR} = \frac{V_{PQ}}{I}$$

R_{LDR} = ... Ω [1]

(e) Disconnect the voltmeter from points Q and S.

Reconnect the voltmeter across the LDR between points P and Q.

Place the piece of card on top of the LDR.

Close the switch.

Record a new value of V_{PQ} for the LDR in the dark.

V_{PQ} = ... V [1]

Open the switch.

(f) Compare your reading for V_{PQ} with the LDR under normal lighting conditions in **(b)(i)** with V_{PQ} with the LDR covered by card in **(e)**.

Suggest what causes the change in the voltmeter readings as the intensity of the light reaching the LDR decreases.

....

.... [1]

(g) Close the switch.

Hold the card horizontally about 50 cm above the LDR.

Slowly move the card towards the LDR until it rests on top of the LDR.

Observe the reading on the voltmeter as you move the card.

Open the switch.

Describe the changes you see to the voltmeter reading as the card is moved downwards.

....

....

....

.... [2]

[Total: 10]

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2 In this experiment, you will investigate the absorption of thermal radiation by different coloured surfaces.

You are provided with:

- a lamp connected to a power supply
- a thermometer with a piece of white card attached to its bulb
- a thermometer with a piece of black card attached to its bulb
- a clamp, boss and stand
- a stopwatch
- a 30 cm ruler.

The supervisor has arranged the thermometer which has a piece of white card attached to its bulb so that the bulb is level with the filament of a lamp.

The lamp is switched off.

Fig. 2.1 shows the apparatus.

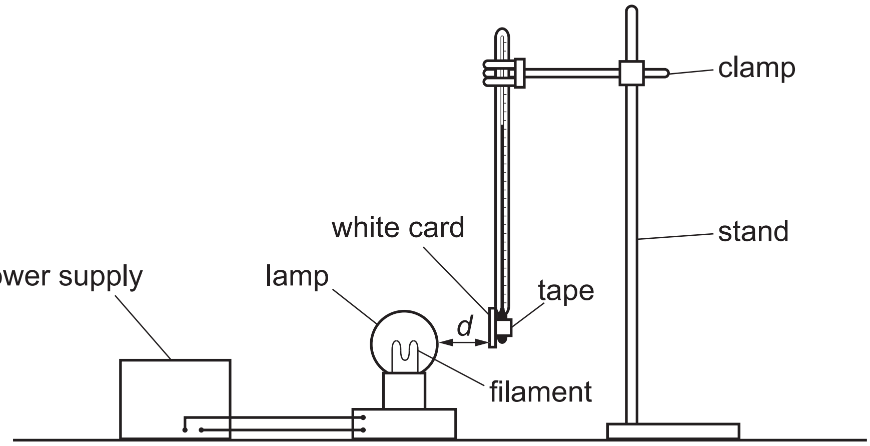

Fig. 2.1

(a) Adjust the distance *d* of the white card attached to the thermometer bulb from the lamp until it is approximately 1 cm.

(i) Record, in Table 2.1, the initial temperature θ_W shown on the thermometer. [1]

(ii) Switch on the lamp, and at the same time, start the stopwatch.

Record, in Table 2.1, the reading on the thermometer every 60 s for 300 s.

Switch off the lamp. [2]

Table 2.1

time t / s	white card temperature θ_W / °C	black card temperature θ_B / °C
0		
60		
120		
180		
240		
300		

(b) Carefully remove the thermometer from the clamp and place it on the bench.

Place the thermometer which has a piece of black card attached to its bulb in the clamp.

Make sure that the black card is facing the lamp and that the bulb of the thermometer is level with the filament of the lamp.

Adjust the distance *d* between the lamp and the black card so that it is approximately 1 cm.

Repeat the procedure in **(a)(i)** and **(a)(ii)** and record, in Table 2.1, the temperatures θ_B for the black card. [1]

(c) **(i)** Determine the temperature increase $\Delta\theta$ between t = 0 and t = 300 s for each card.

$\Delta\theta$ for white card = ... °C

$\Delta\theta$ for black card = ... °C
[1]

(ii) Calculate the average rate of increase of temperature of each card. Use the equation:

$$\text{average rate of temperature increase} = \frac{\Delta\theta}{t}$$

where t = 300 s.

Include the unit in your answers.

average rate of temperature increase of white card = ... unit ....

average rate of temperature increase of black card = ... unit ....
[2]

(d) Use your answers to **(c)(ii)** to deduce a conclusion which compares the absorption of thermal radiation by the two different coloured cards.

State your conclusion.

....

.... [1]

(e) State **two** variables that should be controlled in this experiment to ensure a valid conclusion.

controlled variable 1 ....

....

controlled variable 2 ....

....
[2]

[Total: 10]

3 In this experiment you will use a balancing method to determine the mass of a metre rule.

You have been provided with:

- a metre rule with a millimetre scale
- a triangular block to act as a pivot
- slotted masses making a total of 100 g.

(a) Place the metre rule on the pivot.

Place a mass m = 20 g on the metre rule with its centre at the 5.0 cm mark.

Adjust the position of the metre rule on the pivot until the metre rule is as close to balance as possible.

The mass **must** stay at the 5.0 cm mark.

Fig. 3.1 shows the balanced metre rule.

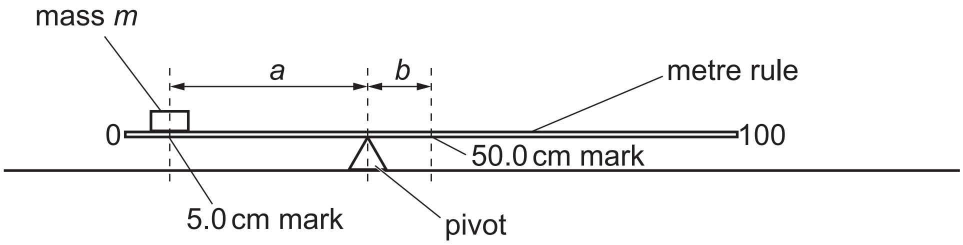

Fig. 3.1

(i) Read the position of the pivot on the metre rule when the metre rule is balanced. The position of the pivot is the distance between the 0 cm mark on the rule and the tip of the pivot.

Record the position of the pivot, in centimetres to the nearest millimetre, in Table 3.1 on page 10. [1]

(ii) Calculate and record, in Table 3.1 on page 10:

1 the distance a between the 5.0 cm mark and the pivot

2 the distance b between the pivot and the 50.0 cm mark.

[1]

(b) **(i)** Repeat the procedure in **(a)** for m = 40 g, 60 g, 80 g and 100 g. [2]

(ii) Describe how you ensure that the centre of each mass placed on the metre rule is directly above the 5.0 cm mark.

....

....

.... [1]

(c) Calculate the ratio $r = \frac{b}{a}$ for each value of m. Record your answers in Table 3.1.

[1]

Table 3.1

m / g	position of pivot / cm	a / cm	b / cm	$r = \frac{b}{a}$
20				
40				
60				
80				
100				

(d) On the grid provided in Fig. 3.2 on page 11, plot a graph of r on the y-axis against m on the x-axis.

Start your axes from the origin (0, 0).

Draw the straight line of best fit.

[4]

(e) **(i)** Calculate the gradient G of your graph.

Show clearly on the graph how you obtained the numbers you use for your calculation, and show your working.

G = ... [2]

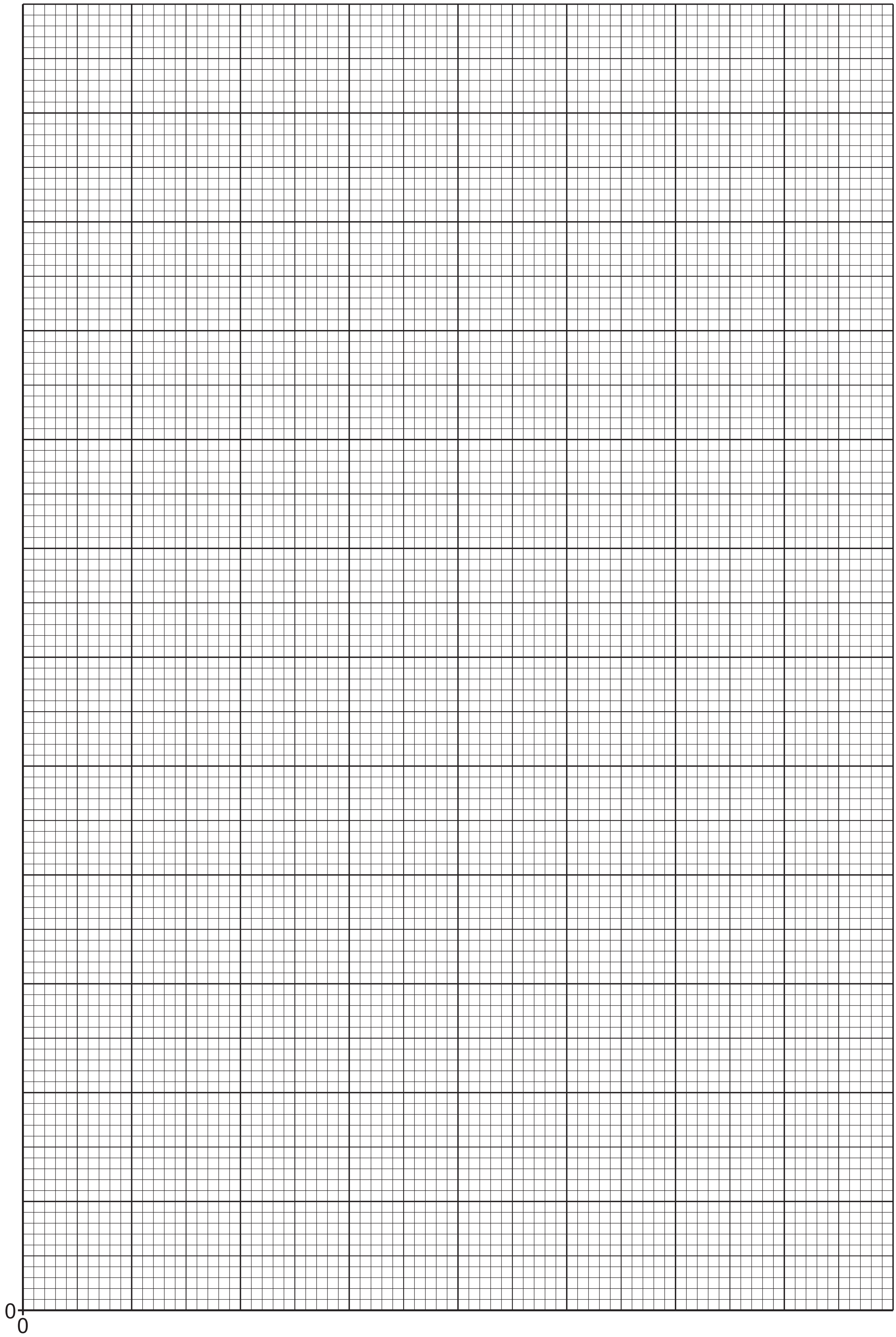

Fig. 3.2

(ii) The mass M of the metre rule is given by the equation shown.

$$M = \frac{1}{G}$$

Determine the mass of the metre rule to the nearest gram.

M = ... g [1]

(f) A student says that the centre of gravity of the metre rule is at the 50.0 cm mark.

Describe how you use the apparatus provided to check that this statement is correct.

....

....

.... [1]

[Total: 14]

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

Plan an experiment to investigate the relationship between the thickness of the cardboard insulation wrapped around the beaker and the rate of cooling of the hot water in the beaker.

The apparatus available includes:

- a supply of hot water
- a beaker
- a thermometer
- a supply of 1 mm thick cardboard sheets.

You are **not** required to do this experiment.

In your plan include:

- any other apparatus needed
- a brief description of the method, including what you will measure and how you make sure that your measurements are accurate
- the variables you will control
- a results table to record your measurements (you are not required to enter any readings in the table)
- how you will process your results to reach a conclusion.

[6]

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