



IB Demystified

Examiners · Moderators · Mentors

Physics

Standard Level

Paper 1B — Mock Examination

Mock Exam 2

Calculator required

Time allowed: **40 minutes**

Maximum mark: **20 marks**

Candidate information

Candidate name:

Session number:

Date:

Topic emphasis: instrument precision, propagation of uncertainties, linear graphs and gradient analysis

Instructions to candidates

- Write your session number in the box on the cover.
- Do not open this examination paper until you are told to do so.
- Answer **all** questions.
- Answers must be written within the answer boxes provided.
- A calculator is required for this paper.
- A clean copy of the **physics data booklet** is required for this paper.
- The maximum mark for this paper is **[20 marks]**.

Where necessary, take the magnitude of the gravitational field strength at the Earth's surface to be $g = 9.81 \text{ N kg}^{-1}$. Values of all other constants are given in the data booklet.

Graphs must be drawn in pencil. Show all of your working: marks are available for correct method even when the final answer is incorrect.

Marks awarded

Question 1 / 11

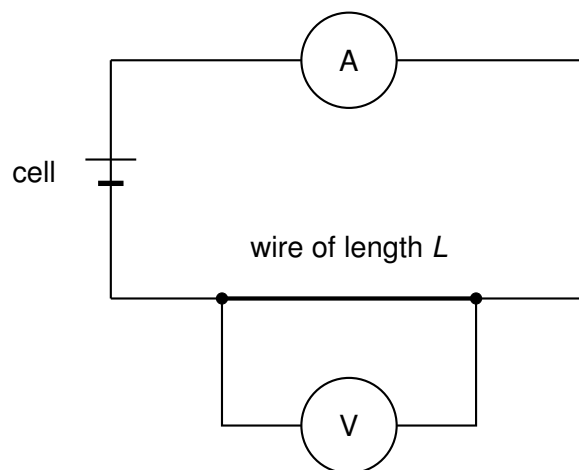
Question 2 / 9

Total / 20

Answer **all** questions. Answers must be written within the answer boxes provided.

1. A student determines the resistivity of the metal of a uniform wire.

A length L of the wire is connected into the circuit shown. The current in the wire and the potential difference across it are measured, and the resistance R of that length is calculated.



- (a) The diameter d of the wire is measured at five different places along its length using a micrometer screw gauge. The readings are

0.38 mm	0.39 mm	0.37 mm	0.38 mm	0.38 mm
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Determine the mean diameter of the wire and its absolute uncertainty.

[2]

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(This question continues on the following page)

(Question 1 continued)

- (b) Calculate the cross-sectional area of the wire and the percentage uncertainty in this area. [2]

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The student obtains the following results.

L/m	R/Ω
0.200	2.3
0.400	4.3
0.600	6.2
0.800	8.2
1.000	10.1

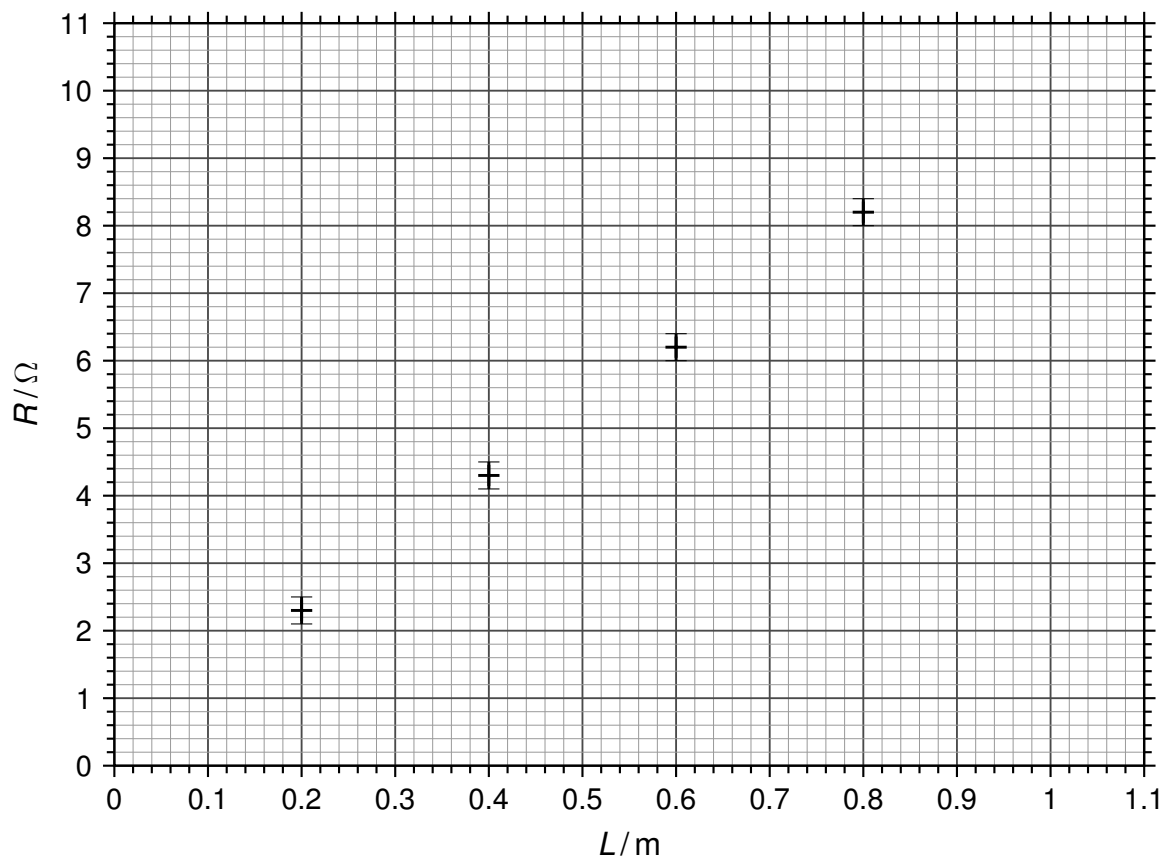
The uncertainty in each value of R is ± 0.2 . The uncertainty in L is negligible.

The first four data points are plotted on the graph on the following page.

- (i) Plot the data point for $L = 1.000$ m on the graph, including its error bar. [1]
- (ii) Draw the line of best fit for these data, extrapolating your line to the R -axis. [1]

(This question continues on the following page)

(Question 1 continued)



- (d) Determine the gradient of your line of best fit. State an appropriate unit for your answer.
[2]

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(This question continues on the following page)

(Question 1 continued)

- (e) The resistance of a uniform wire of length L and cross-sectional area A is given by

$$R = \frac{\rho L}{A},$$

where ρ is the resistivity of the metal.

Determine the resistivity of the metal of the wire.

[2]

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- (f) Your line of best fit does not pass through the origin. Suggest a reason for this.

[1]

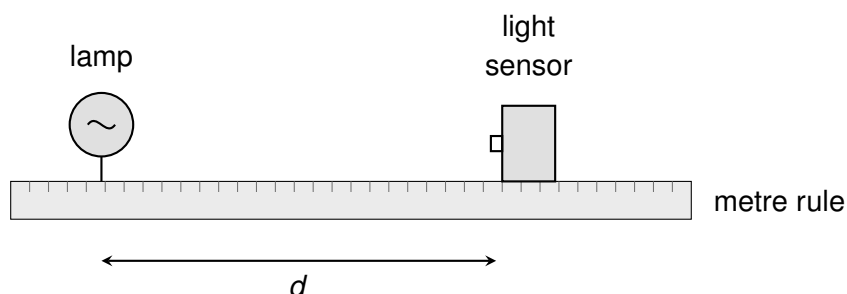
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2. A student investigates how the intensity I of the light from a small lamp varies with the distance d from the lamp.

A light sensor is moved along a metre rule and the intensity is recorded at several distances from the centre of the lamp.



- (a) State one reason why the readings should be taken in a darkened room.

[1]

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The results are shown in the table.

d / m	$I / \text{W m}^{-2}$	$\frac{1}{d^2} / \text{m}^{-2}$
0.20	118	25.0
0.25	77	16.0
0.30	53	
0.40	30	6.25
0.50	19	
0.60	13	2.78

(This question continues on the following page)

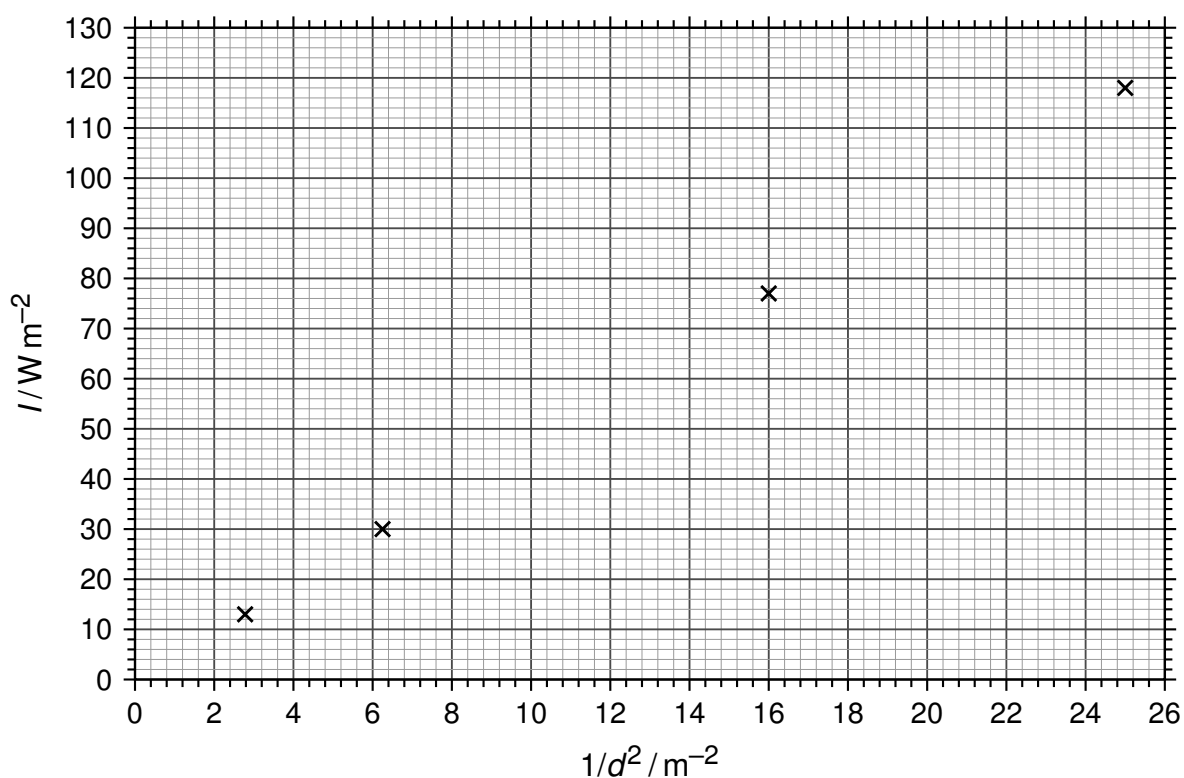
(Question 2 continued)

(b) Complete the table.

[2]

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Four of the data points are plotted on the graph below.



(i) Plot the two missing data points on the graph.

[1]

(ii) Draw the line of best fit for these data.

[1]

(This question continues on the following page)

(Question 2 continued)

- (d) Explain how your graph supports the suggestion that I is inversely proportional to d^2 .
[1]

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- (e) The lamp is assumed to emit light uniformly in all directions, so that

$$I = \frac{P}{4\pi d^2},$$

where P is the power emitted by the lamp.

Determine, using the gradient of your line of best fit, the power emitted by the lamp.

[3]

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End of examination.

Total: **20 marks**