

# Experimental technique

## Question Paper 3

<b>Level</b>	International A Level
<b>Subject</b>	Physics
<b>Exam Board</b>	Edexcel
<b>Topic</b>	Experimental technique
<b>Sub Topic</b>	
<b>Booklet</b>	Question Paper 3

<b>Time Allowed:</b>	<b>74 minutes</b>
<b>Score:</b>	<b>/61</b>
<b>Percentage:</b>	<b>/100</b>

**Grade Boundaries:**

A*	A	B	C	D	E	U
>85%	'77.5%	70%	62.5%	57.5%	45%	<45%

1 A student has been asked to carry out an experiment to determine the internal resistance of a 1.5 V cell. The circuit will contain the following components: the cell, a switch, a variable resistor, an ammeter and a voltmeter.

(a) Draw a circuit diagram of the circuit.

(1)

(b) State why this experiment is considered to be low risk.

(1)

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(c) The teacher says that the resistance of the variable resistor should **not** be reduced to zero.

Suggest why.

(1)

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(Total for Question 1 = 3 marks)

- 2 In an investigation of the inverse square law for light, a student measured the radiation flux  $I$  of the light at different distances  $d$  from a light bulb.

Her results table is shown below.

$d/\text{m}$	$I/\text{W m}^{-2}$	$\frac{1}{d^2} /$
0.125	996	64.0
0.25	276	16.0
0.375	109.3	7.1
0.5	48	4.0
0.75	18	
1	3.3	

- (a) Add a unit for  $\frac{1}{d^2}$  to the table.

(1)

- (b) Criticise the results table.

(2)

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- (c) Complete the table.

(2)

- (d) The relationship between  $I$  and  $d$  is given by

$$I = \frac{k}{d^2}$$

where  $k$  is a constant.

Explain why a graph of  $I$  on the  $y$ -axis against  $\frac{1}{d^2}$  on the  $x$ -axis should be a straight line through the origin.

(2)

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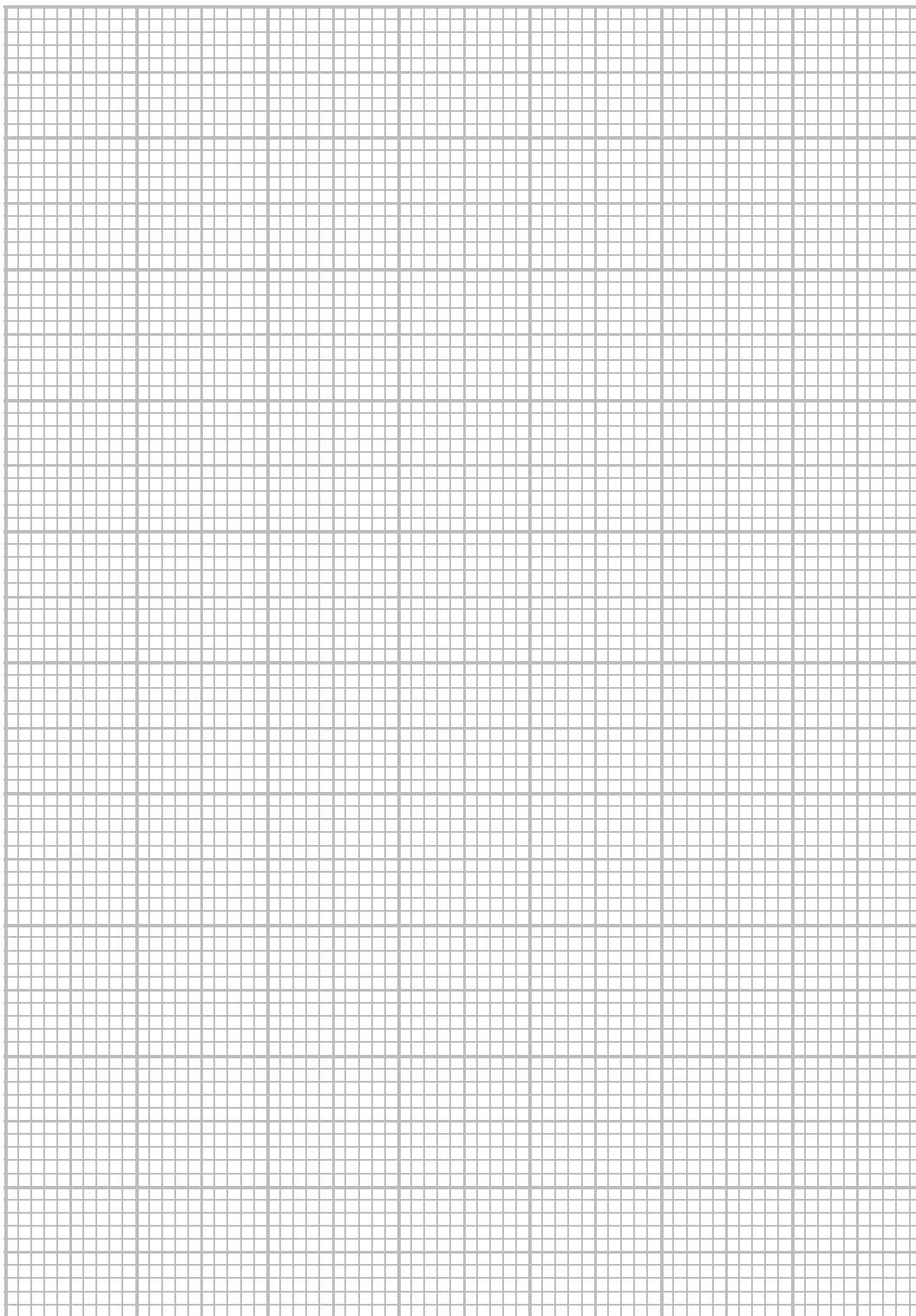
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- (e) Plot a graph of  $I$  on the  $y$ -axis against  $\frac{1}{d^2}$  on the  $x$ -axis on the grid provided and draw a line of best fit.

(5)



(f) Use your graph to determine  $I$  when  $d = 20$  cm.

(2)

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$I = \dots\dots\dots$  W m<sup>-2</sup>

**(Total for Question 2 = 14 marks)**

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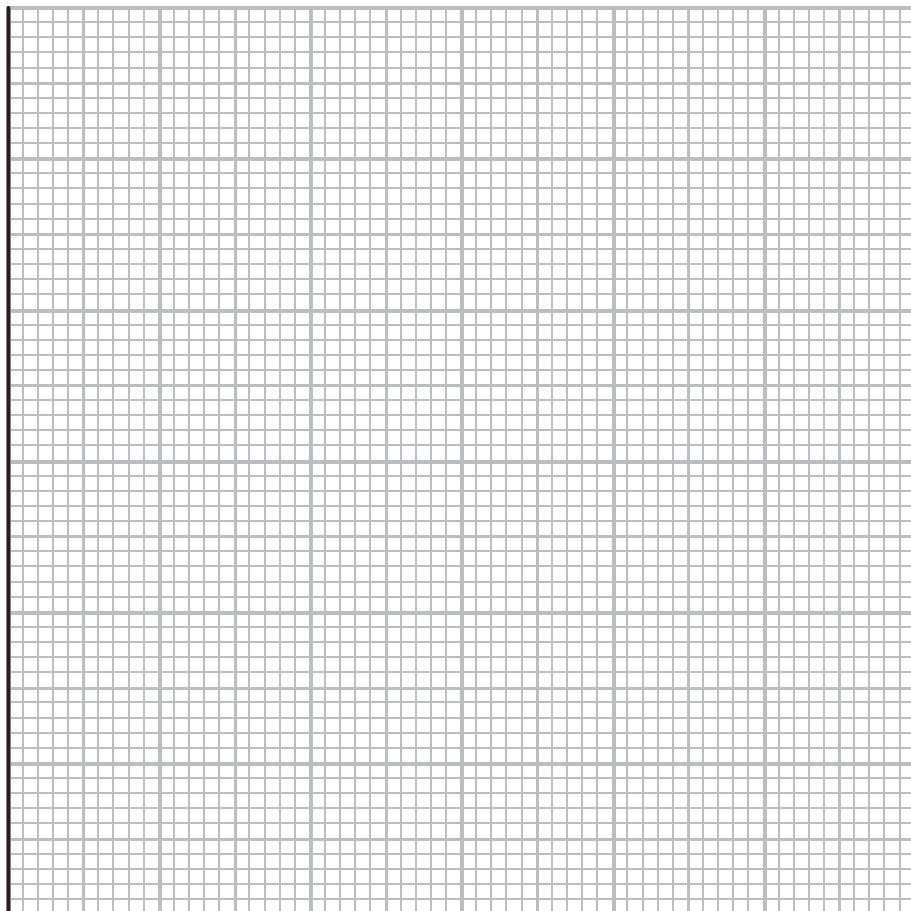






(c) Plot the graph on the grid provided and draw a line of best fit.

(5)





(e) The accepted value for  $h$  is  $6.63 \times 10^{-34}$  J s.

Assuming your calculations are correct, suggest why there is a difference between your value for  $h$  and the accepted value.

(1)

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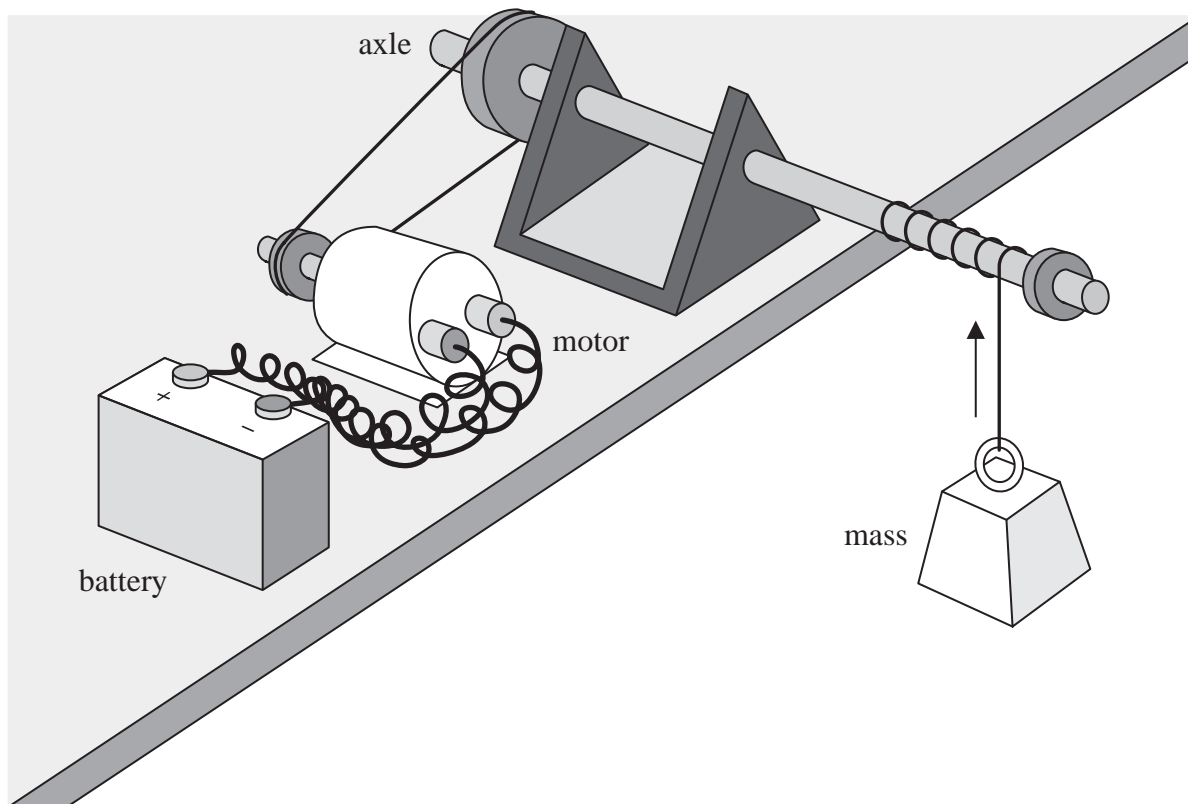
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**(Total for Question 4 = 18 marks)**

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- 5 A student is asked to determine the efficiency of a 9 V electric motor when it is used to lift a 1 kg mass at a steady speed. The diagram below shows the apparatus to be used.



Write a plan for an experiment to do this.

You should:

- (a) state the quantities to be measured, (2)
- (b) explain your choice of measuring instrument for **two** of these quantities, (4)
- (c) comment on whether repeat readings are appropriate in this case, (1)
- (d) explain how the data collected will be used to calculate the efficiency of the motor, (3)
- (e) identify the main sources of uncertainty and/or systematic error, (2)
- (f) comment on safety. (1)



