UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS
General Certificate of Education Advanced Level

CANDIDATE NAME

CENTRE NUMBER

CANDIDATE NUMBER

* 1 2 2 7 2 3 0 3 4 7 *

PHYSICS **9702/05**

Paper 5 Planning, Analysis and Evaluation **October/November 2008**

1 hour 15 minutes

Candidates answer on the Question Paper.

No Additional Materials are required.

READ THESE INSTRUCTIONS FIRST

Write your Centre number, candidate number and name on all the work you hand in.
Write in dark blue or black pen.
You may use a soft pencil for any diagrams, graphs or rough working.
Do not use staples, paper clips, highlighters, glue or correction fluid.
DO **NOT** WRITE IN ANY BARCODES.

Answer **all** questions.
You may lose marks if you do not show your working or if you do not use appropriate units.

At the end of the examination, fasten all your work securely together.
The number of marks is given in brackets [ ] at the end of each question or part question.

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1	
2	
Total	

This document consists of **8** printed pages.

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1 A student wishes to investigate how the resistance R of a light-dependent resistor varies with the distance d from an intense light source.

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It is believed that the relationship between R and d is

$$R = kd^n$$

where k and n are constants.

Design a laboratory experiment to test the above relationship. The light-dependent resistor has a resistance of 100 Ω when it is in bright light and a resistance of 500 kΩ when no light falls on it.

You should draw a diagram showing the arrangement of your equipment. In your account you should pay particular attention to

(a) the procedure to be followed,

(b) the measurements that would be taken,

(c) the control of variables,

(d) how the data would be analysed,

(e) any safety precautions that you would take.

[15]

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Diagram

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2 An experiment was carried out to investigate how the diameter d of the path of a beam of electrons varied with the accelerating voltage V when a magnetic field of flux density B was applied at right angles to the electron beam.

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The equipment was set up as shown in Fig. 2.1.

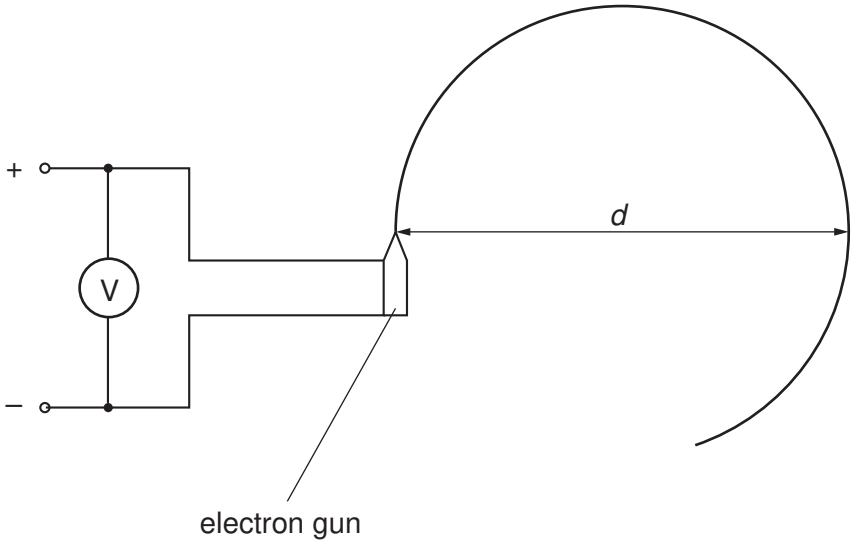

Fig. 2.1

The diameter d was recorded for different voltages V.

Values of V and d are given in Fig. 2.2.

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V/V	$d/10^{-2}$ m	$d^2/10^{-4}$ m^2
500	2.1 ± 0.1	
1000	2.8 ± 0.1	
1500	3.4 ± 0.1	
2000	3.9 ± 0.1	
2500	4.3 ± 0.1	
3000	4.7 ± 0.1	

Fig. 2.2

It is suggested that V and d are related by the formula

$$\frac{e}{m} = \frac{8V}{B^2d^2}$$

where e is the charge on the electron and m is the electron mass.

(a) A graph of d^2 on the y-axis against V on the x-axis is to be plotted. Write down an expression for the gradient in terms of e, m and B.

..... [1]

(b) Calculate and record values of (d^2 / 10^{-4} m^2) in Fig. 2.2. Include in the table the absolute errors in d^2. [3]

(c) **(i)** Plot a graph of d^2 on the y-axis against V on the x-axis. Include error bars for d^2. [2]

(ii) Draw the best-fit straight line and a worst acceptable straight line on your graph. Both lines should be clearly labelled. [2]

(iii) Determine the gradient of the best-fit line. Include the error in your answer.

gradient = ... [2]

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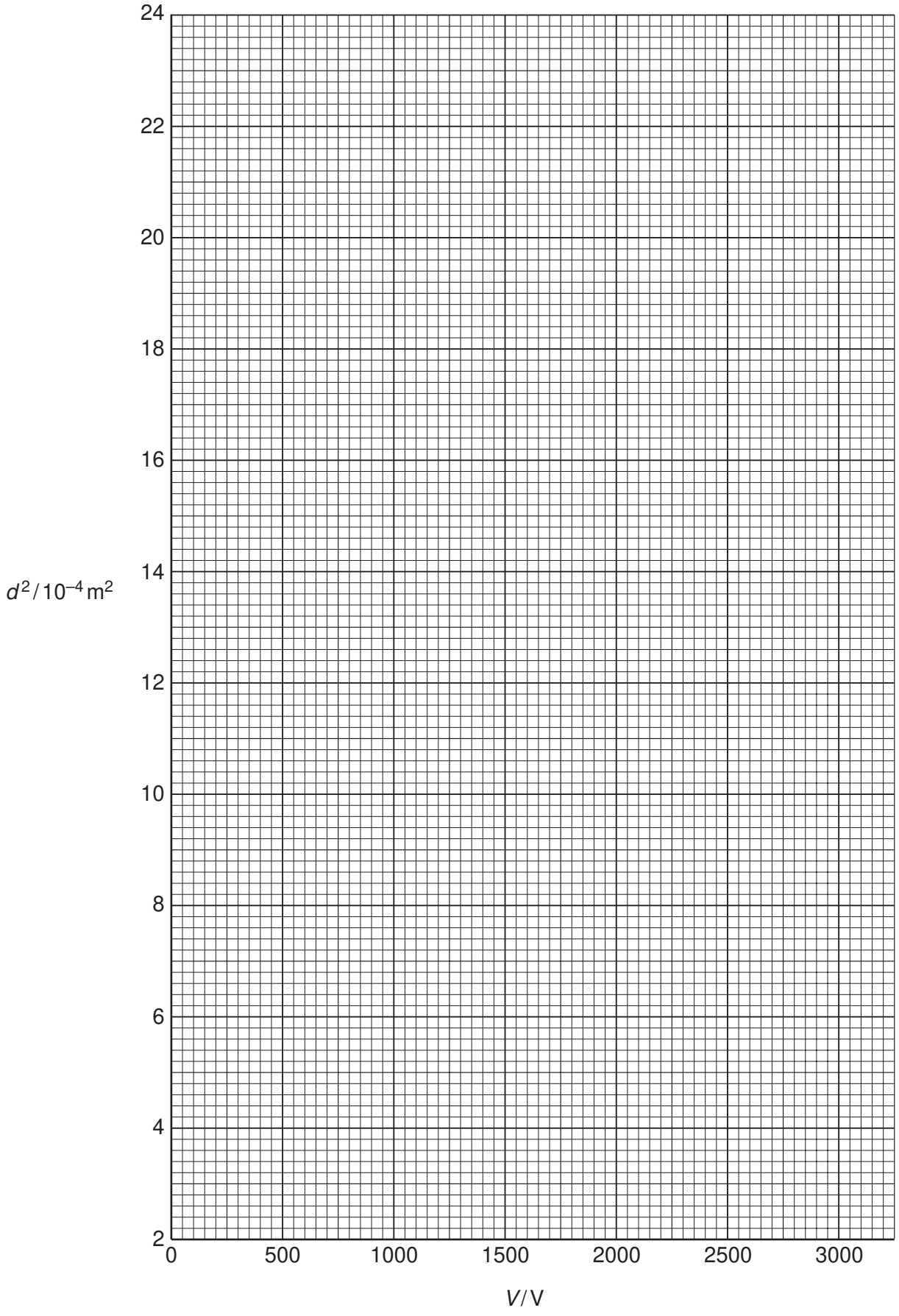

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(d) The magnetic flux density B of the magnetic field is 7.9×10^{-3} T. Using the answer to **(c)(iii)**, determine the value of $\frac{e}{m}$. Include the error in your value and an appropriate unit.

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$\frac{e}{m}$ = ... [3]

(e) The experiment is repeated with a different magnetic flux density. When V is 500 V, the measured value of d is $(3.8 \pm 0.1) \times 10^{-2}$ m. Using your answer to **(d)**, determine a value for the new magnetic flux density, B. Include the error in your value.

B = ... T [2]

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