UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS
General Certificate of Education Advanced Level

CANDIDATE NAME

CENTRE NUMBER

CANDIDATE NUMBER

9679180360

PHYSICS **9702/05**

Paper 5 Planning, Analysis and Evaluation **May/June 2007**

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 **both** 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 two questions in this paper carry equal marks.

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1	
2	
Total	

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1 It is useful to know how the speed of an object is affected by its size when it moves through liquid in a confined space. In a laboratory this can be modelled by dropping small steel balls through oil.

It is suggested that the terminal velocity v is related to the radius r of a steel ball by the equation

$$v = kr^2$$

where k is a constant.

Design a laboratory experiment to investigate whether v is related to r as indicated in the above equation. 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) how the radius of the steel ball would be measured,

(c) how the terminal velocity of the steel ball in oil would be measured,

(d) the control of variables,

(e) how the data would be analysed,

(f) any safety precautions that you would take.

[15]

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Diagram

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2 Conducting putty is a soft material which can easily be made into different shapes. It conducts electricity. An experiment was carried out to investigate how the resistance of a fixed volume of conducting putty varied with its length.

The resistance of the conducting putty was measured using an ohmmeter, as shown in Fig. 2.1.

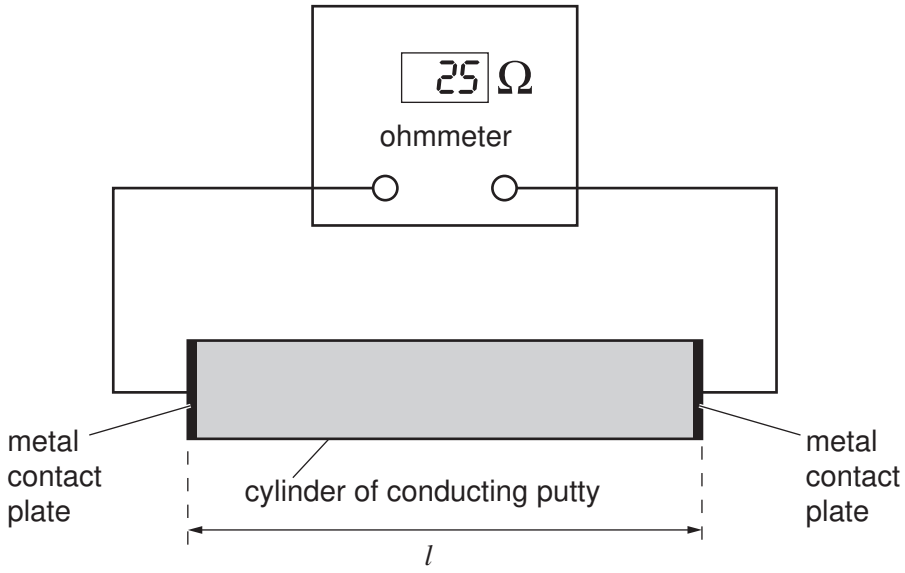

Fig. 2.1

Values of the length l of the conducting putty and the resistance R as measured by the ohmmeter are given in Fig. 2.2.

l / cm	R / Ω	
6.0 ± 0.4	25	
10.0 ± 0.4	60	
14.0 ± 0.4	115	
18.0 ± 0.4	185	
22.0 ± 0.4	275	
26.0 ± 0.4	380	

Fig. 2.2

It is suggested that the resistivity ρ of the conducting putty is given by the formula

$$\rho = \frac{(R - R_0)V}{l^2}$$

where R_0 is the resistance of the connecting wires and V is the volume of the conducting putty.

(a) Explain why plotting a graph of R against l^2 would enable you to confirm the relationship between R and l.

.....

.....

.....[1]

(b) Calculate and record values of l^2, in cm^2, in the table. Include in the table the absolute errors in l^2. [3]

(c) **(i)** Plot a graph of R (y-axis) against l^2 (x-axis). Include error bars for l^2. [2]

(ii) Draw a 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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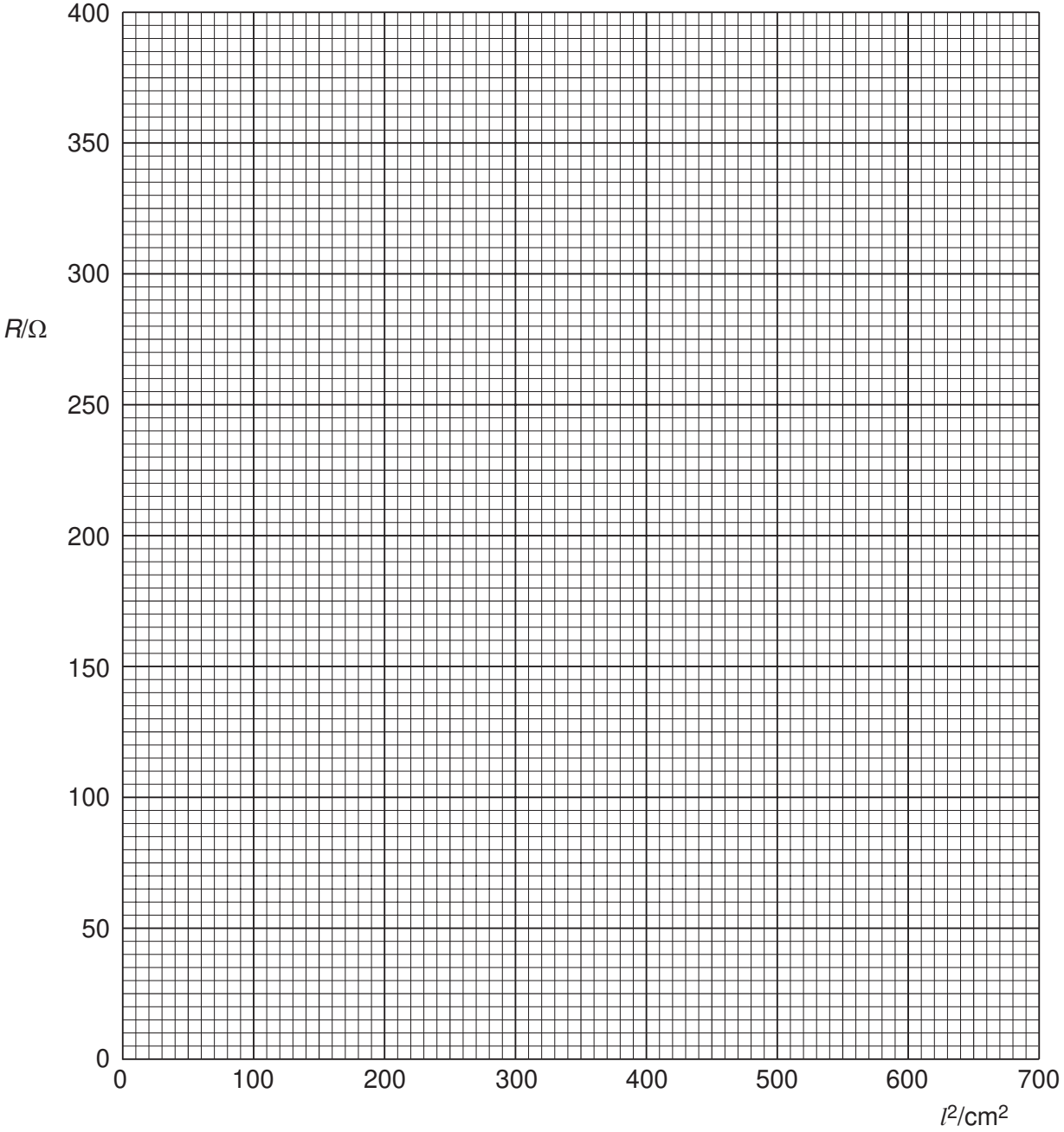

Question 2 continues over the page.

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(d) The volume of conducting putty used is 18.8 cm^3. Determine the value of ρ. Include the error and the unit in your answer.

ρ = ... [5]

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