UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS
General Certificate of Education Advanced Level

CANDIDATE NAME	

CENTRE NUMBER		CANDIDATE NUMBER	

2434125478

PHYSICS **9702/05**

Paper 5 Planning, Analysis and Evaluation **May/June 2009**

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.

UNIVERSITY of CAMBRIDGE International Examinations

1 A student wishes to determine the Young modulus E of wood from the period of oscillation of a loaded wooden rule, as shown in Fig. 1.1.

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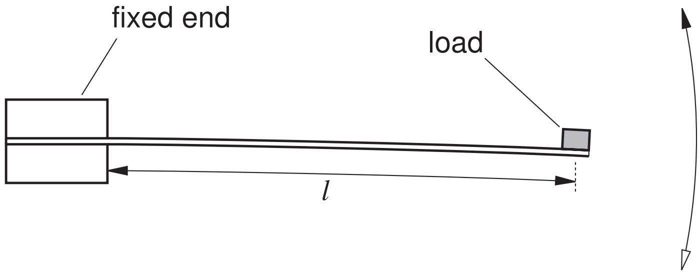

Fig. 1.1

An equation relating the period of oscillation T to the overhanging length l of the rule is

$$T^2 = \frac{kl^3}{E}.$$

The constant k is given by

$$k = \frac{16\pi^2 M}{wd^3}$$

where M is the mass of the load, w is the width of the rule and d is the thickness of the rule.

Design a laboratory experiment to determine the Young modulus of wood. 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 to be taken,

(c) the control of variables,

(d) how to analyse the data,

(e) how to determine E,

(f) the safety precautions to be taken.

[15]

Diagram

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2 An experiment is carried out to investigate how the current I required to melt a wire varies with the diameter d of the wire.

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

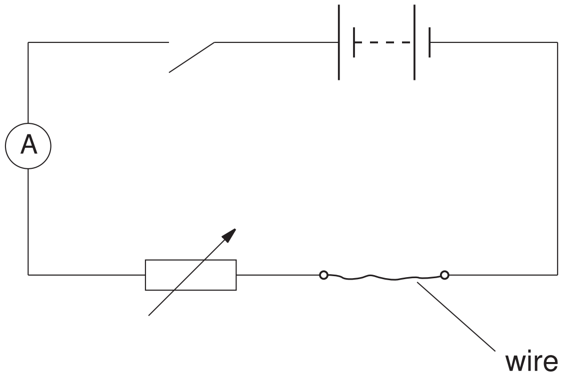


Fig. 2.1

Question 2 continues on the next page.

It is suggested that I and d are related by the equation

$$I = pd^q$$

where p and q are constants.

(a) A graph is plotted with lg I on the y-axis and lg d on the x-axis. Express the gradient and y-intercept in terms of p and q.

gradient = ...

y-intercept = ...
[1]

(b) Values of d and I are given in Fig. 2.2.

d / 10^{-5} m	I / A	lg (d / 10^{-5} m)	lg (I / A)
15	2.6 ± 0.1		
19	3.5 ± 0.1		
23	4.4 ± 0.1		
27	5.4 ± 0.1		
31	6.4 ± 0.1		

Fig. 2.2

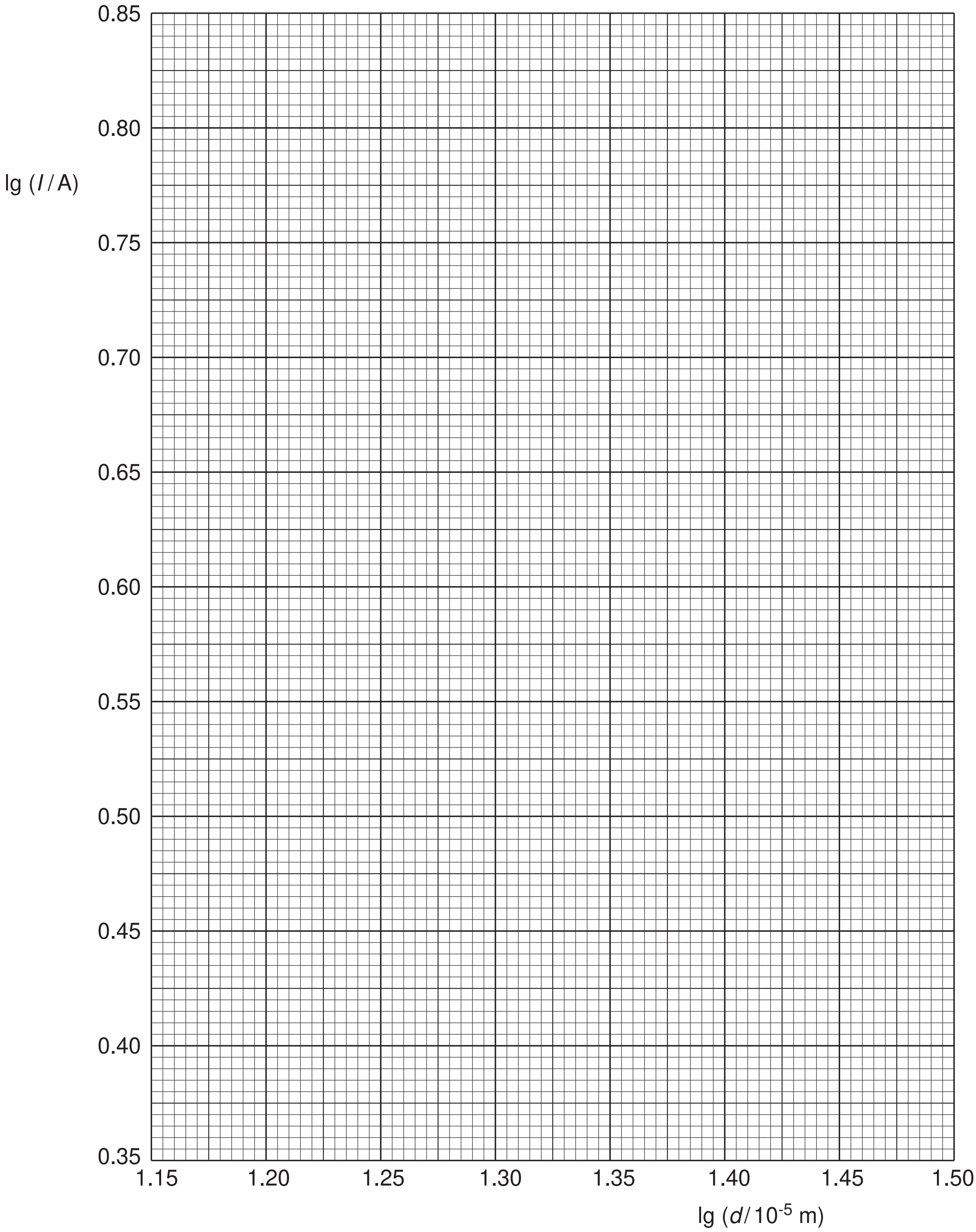
Calculate and record values of lg (d / 10^{-5} m) and lg (I / A) in Fig. 2.2. Include in the table the absolute errors in lg (I / A). [3]

(c) **(i)** Plot a graph of lg (I / A) against lg (d / 10^{-5} m). Include error bars for lg (I / A). [2]

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

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

gradient = ... [2]



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(iv) Determine the *y*-intercept of the line of best fit. Include the error in your answer.

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y-intercept = ... [2]

(d) Using your answers to **(c)(iii)** and **(c)(iv)**, determine the values of *p* and *q*. Include the error in your values. You need not give the units of *p* and *q*.

p = ...

q = ...
[3]