UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS
General Certificate of Education Advanced Level

CANDIDATE NAME	

CENTRE NUMBER		CANDIDATE NUMBER	

0043403827

PHYSICS **9702/52**

Paper 5 Planning, Analysis and Evaluation **May/June 2010**

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 current in a flat circular coil produces a magnetic field.

A student suggests that the strength B of the magnetic field is related to the distance x from the centre of the coil (see Fig. 1.1) by the equation

$$B = B_0 e^{-px}$$

where B_0 is the strength of the magnetic field for $x = 0$, and p is a constant.

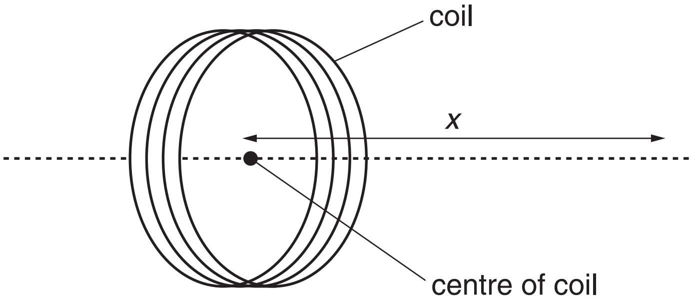

Fig. 1.1

Design a laboratory experiment that uses a Hall probe to investigate the relationship between B and x. 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) the analysis of the data,

(e) the safety precautions to be taken.

[15]

Diagram

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For Examiner's Use	Defining the problem	Methods of data collection	Method of analysis	Safety considerations	Additional detail

2 A student is investigating how the period T of a simple pendulum depends on its length l as shown in Fig. 2.1.

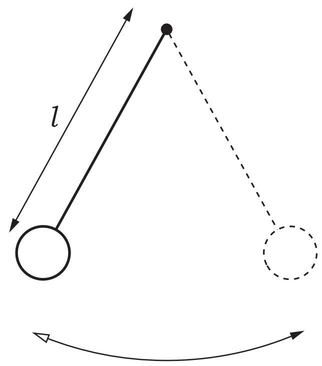


Fig. 2.1

The time t for 10 oscillations is recorded for a pendulum of length l. The period T of the pendulum is determined. The procedure is then repeated for different lengths.

Question 2 continues on the next page.

It is suggested that T and l are related by the equation

$$T = 2\pi\sqrt{\frac{l}{g}}$$

where g is the acceleration of free fall.

(a) A graph is plotted of T^2 on the y-axis against l on the x-axis. Express the gradient in terms of g.

gradient = ... [1]

(b) Values of l and t are given in Fig. 2.2.

l / cm	t / s		
90.0	18.9 ± 0.1		
80.0	17.9 ± 0.1		
70.0	16.7 ± 0.1		
60.0	15.5 ± 0.1		
50.0	14.1 ± 0.1		
40.0	12.6 ± 0.1		

Fig. 2.2

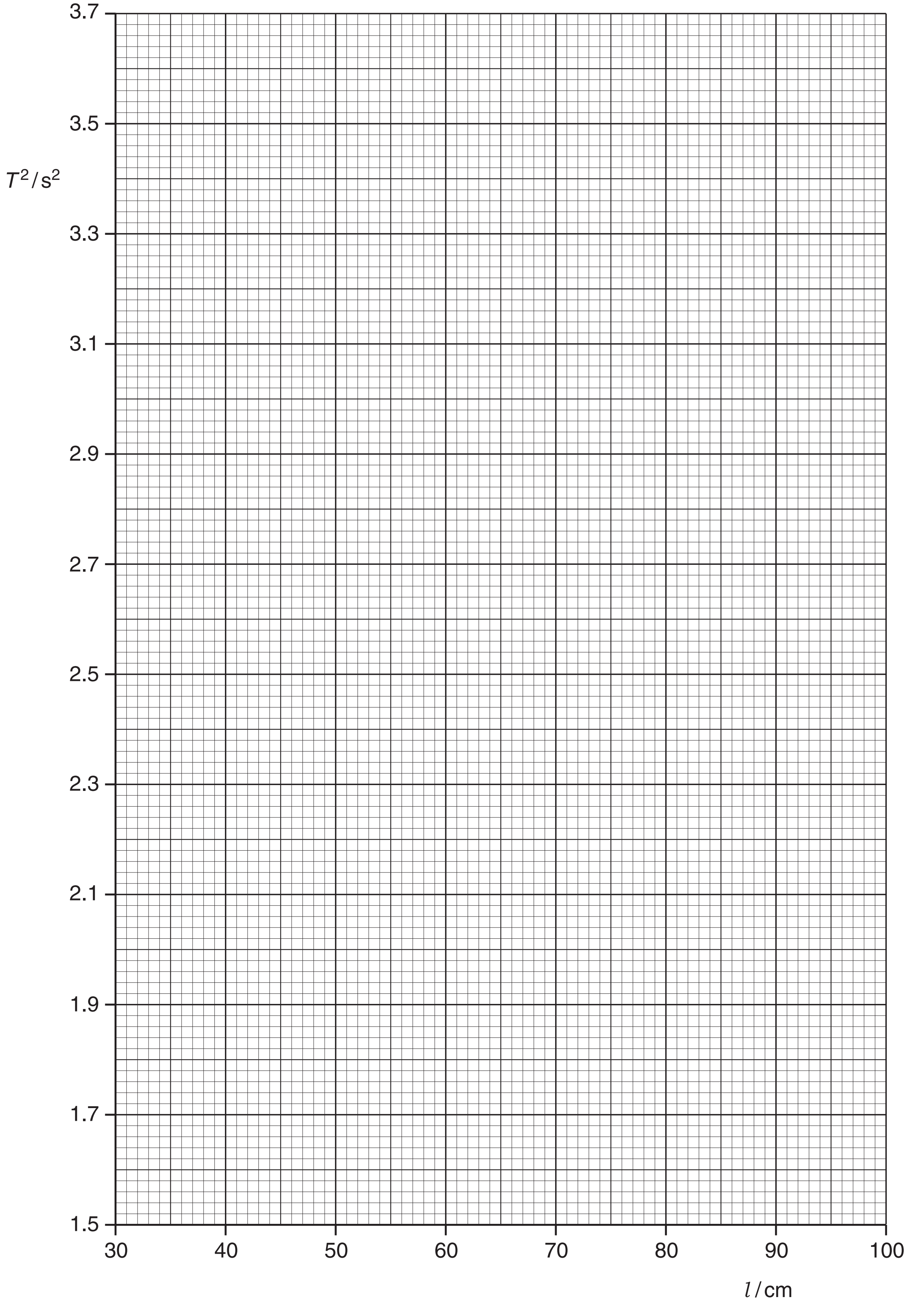
Calculate and record values of T and T^2 in Fig. 2.2. Include the absolute uncertainties in T^2. [3]

(c) **(i)** Plot a graph of T^2 / s^2 against l / cm. Include error bars for T^2. [2]

(ii) Draw the straight 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 uncertainty in your answer.

gradient = ... [2]



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(d) Using your answer to **(c)(iii)**, determine the value of *g*. Include the absolute uncertainty in your value and an appropriate unit.

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g = ... [3]

(e) **(i)** Using your answer to **(d)**, determine the value of l that is required to give a period of 1.0 s.

l = ... cm [1]

(ii) Determine the percentage uncertainty in your value of l.

percentage uncertainty = ... % [1]

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