Centre Number	Candidate Number	Name

UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS
General Certificate of Education Ordinary Level

PHYSICS **5054/04**

Paper 4 Alternative to Practical

May/June 2006

1 hour

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.

Answer **all** questions.
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.

For Examiner's Use	
1	
2	
3	
4	
Total	

This document consists of **9** printed pages and **3** blank pages.

1 Fig. 1.1 shows a spring hanging from a wooden rod with a load attached to the lower end of the spring.

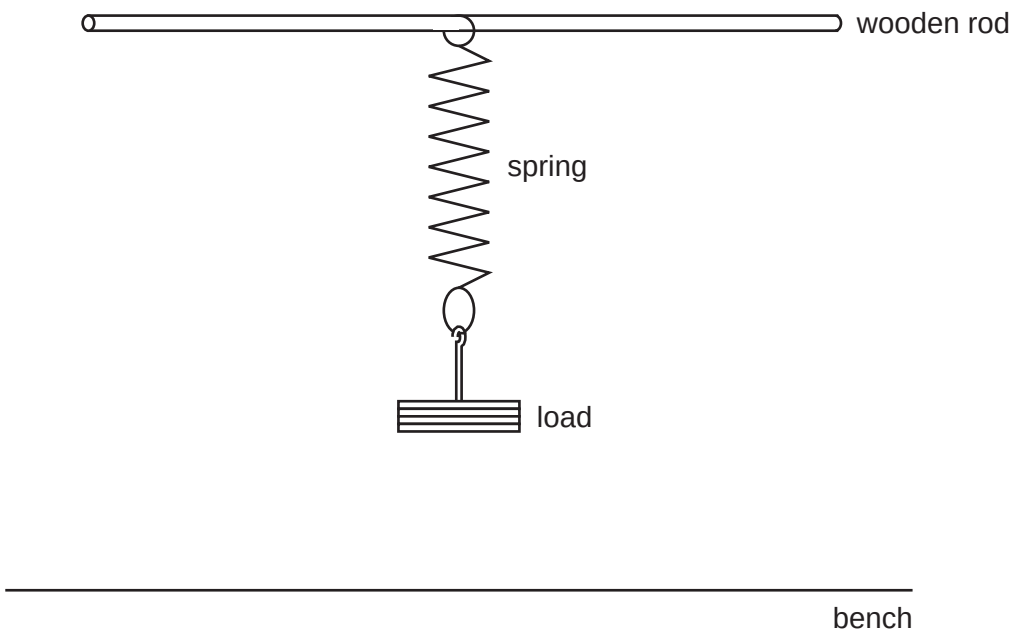

Fig. 1.1

(a) On Fig. 1.1, mark

(i) the length l of the spring, [1]

(ii) the position of the ruler used to measure the length l, [1]

(iii) where you would position your eye to determine the reading for the bottom of the spring. [1]

(b) The load is varied and a series of readings of l and the load F are taken. The readings are recorded in the table of Fig. 1.2.

l / cm	F / N
7.5	1.0
22.6	5.0
15.2	3.0
18.6	4.0
11.6	2.0
26.7	6.0

Fig. 1.2

State one way in which the table of results could be improved.

..... [1]

(c) On Fig. 1.3, plot the graph of l on the y-axis against F on the x-axis. Draw the line of best fit. [4]

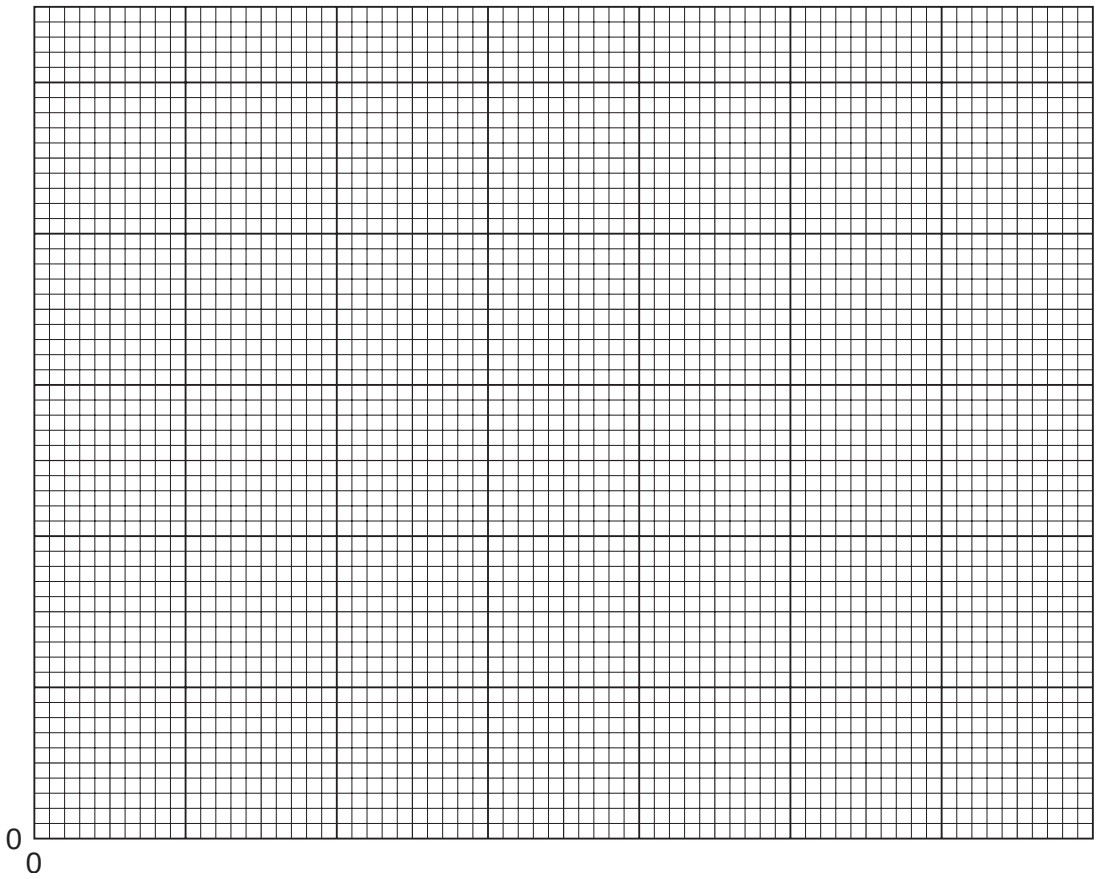

Fig. 1.3

(d) **(i)** Explain why the line does not pass through the origin.

.....

..... [1]

(ii) State and explain whether l is directly proportional to F.

.....

..... [1]

Question 1 continues on page 4

[Turn over

(e) The student then plots a graph of the extension *e* of the spring against *F*.

(i) Explain what is meant by the *extension* of the spring.

.....

..... [1]

(ii) Use your graph to find the value of *e* for a load of 5.5 N.

.....

..... [2]

(iii) On the axes below, sketch a graph of *e* against *F*.

[1]

2 Two students perform an investigation into how the strength of an electromagnet depends on the number of coils of wire.

Fig. 2.1 shows the apparatus used.

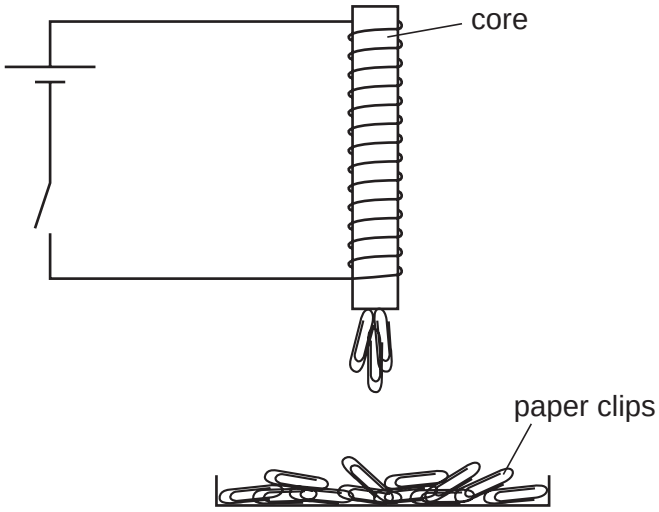

Fig. 2.1

(a) Suggest a suitable material for the core of the electromagnet.

..... [1]

(b) Outline one way of using the apparatus to estimate the strength of the electromagnet.

.....

.....

..... [1]

(c) The students have different plans.

Student A uses the same long piece of wire for the coils every time, and increases the number of coils by winding more of the wire round the core.

Student B cuts several wires of different lengths and uses a longer piece of wire to increase the number of coils.

State and explain which is the better plan.

.....

.....

..... [1]

[Turn over

3 Fig. 3.1 shows a 'puzzle box' containing a single electrical component connected between the terminals A and B. The box is sealed and the component inside is hidden.

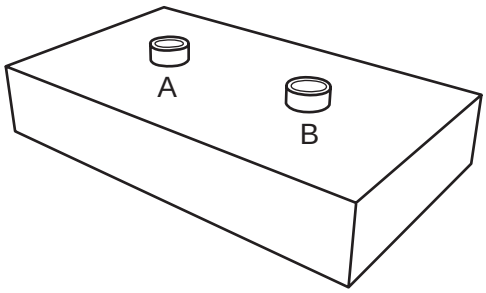

Fig. 3.1

The box contains **one** of the following:

a broken wire,
a connecting lead,
a diode,
a 20 Ω resistor.

You are to find out what is inside the box. You are provided with a 6 V battery, a lamp rated as 6 V 0.3 A and connecting leads.

(a) Draw a diagram of the circuit you would use.

[1]

(b) Describe the procedure to be followed.

.....

..... [2]

(c) State what you would expect to observe for each of the possible components in the box.

broken wire: .....

.....

connecting lead: .....

.....

diode: .....

.....

20 Ω resistor: .....

..... [4]

4 A student performs an experiment to find the volume of glass in a convex lens.

Fig. 4.1 shows two full-size diagrams of the lens.

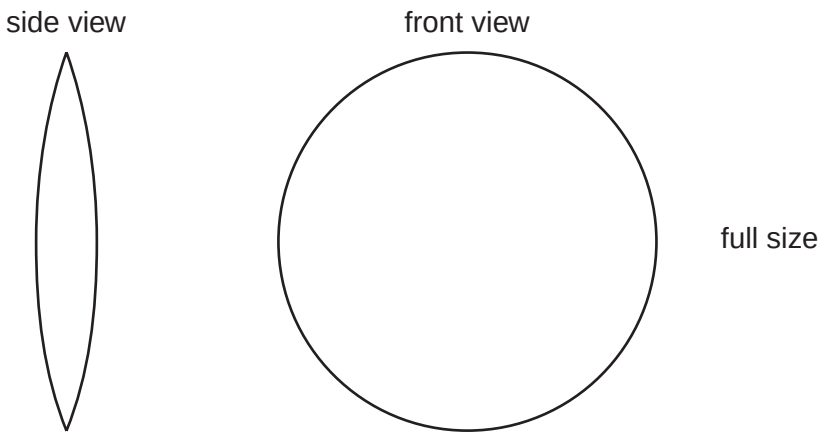

Fig. 4.1

(a) **(i)** Take measurements from Fig. 4.1 to obtain values for the thickness *t* and diameter *d* of the lens.

t = ...

d = ... [1]

(ii) Describe how you made your value for the diameter as accurate as possible.

.....

..... [1]

(b) Theory shows that an approximate value for the volume *V* of glass is given by the equation

$$V = \frac{\pi d^2 t}{8}.$$

Calculate *V* giving your answer to an appropriate number of significant figures.

V = ... [1]

(c) Explain why it would be more difficult to measure the thickness of a real lens than to take measurements from Fig. 4.1.

.....

..... [1]

(d) **(i)** Suggest an alternative method of measuring the volume of glass in a real lens.

.....

.....

..... [1]

(ii) Give one reason why your method in **(i)** may be inaccurate.

.....

..... [1]

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