

Centre Number	Candidate Number	Name
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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.

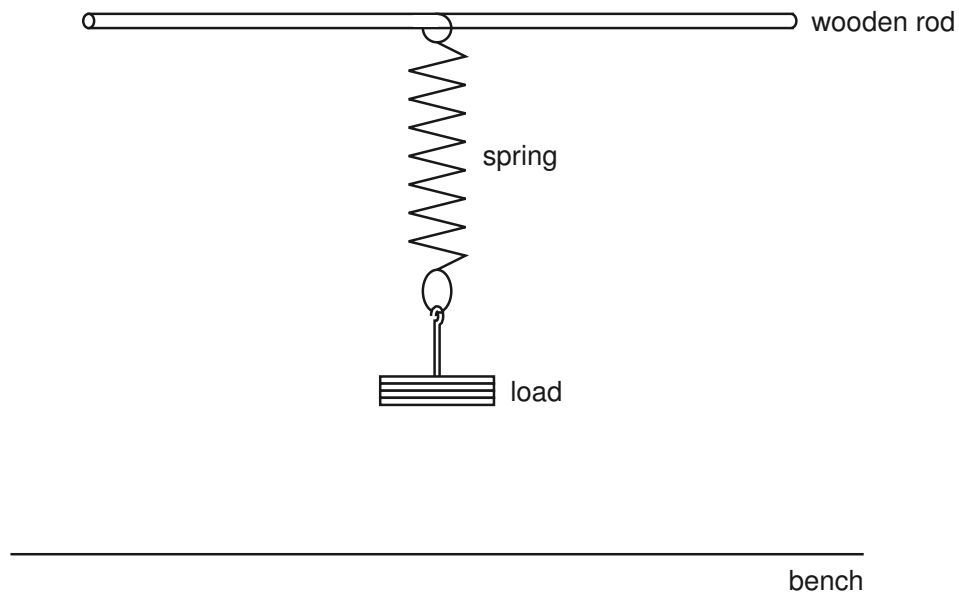
The number of marks is given in brackets [ ] at the end of each question or part question.

For Examiner's Use	
<b>1</b>	
<b>2</b>	
<b>3</b>	
<b>4</b>	
<b>Total</b>	

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]

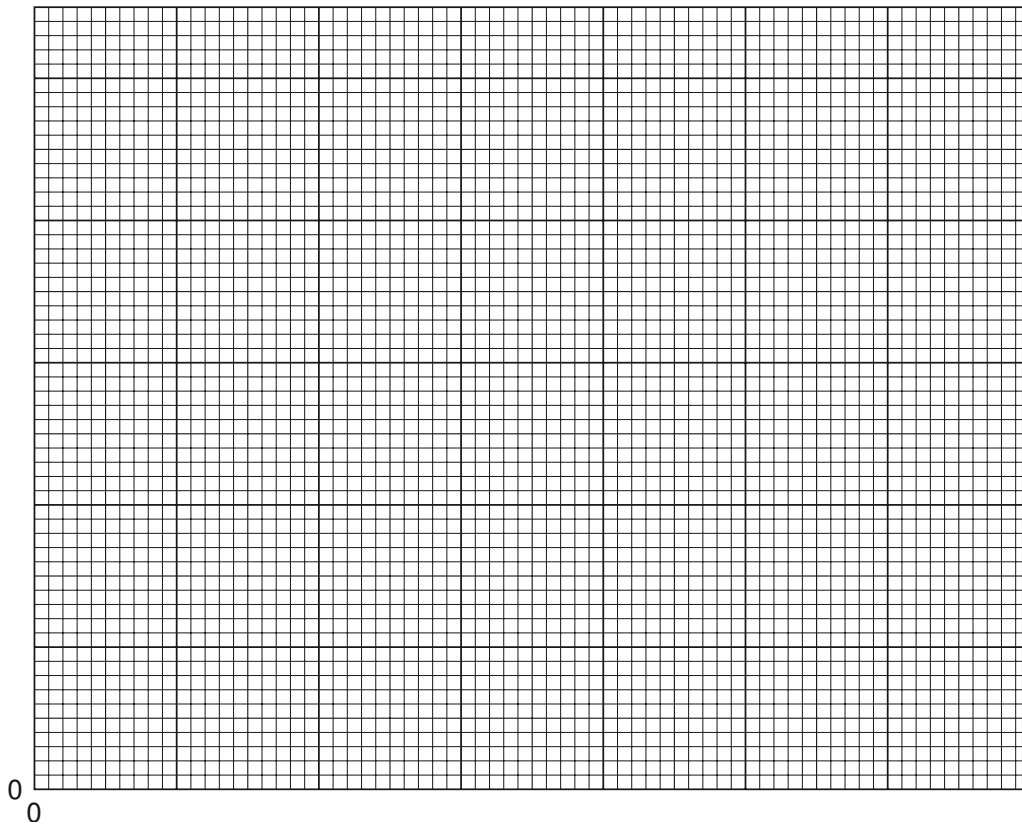


Fig. 1.3

(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

(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]

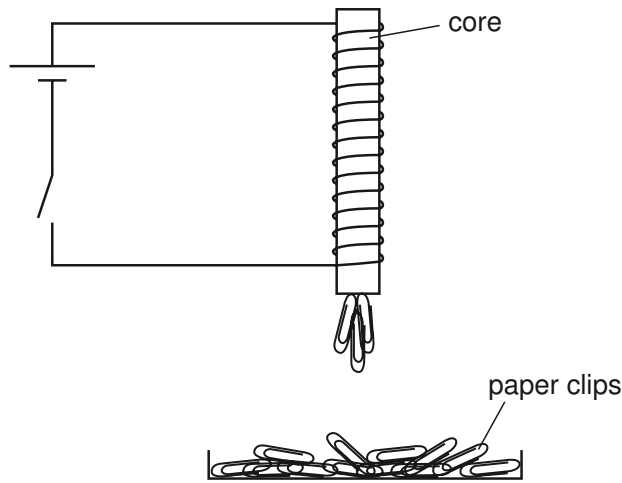
(iii) On the axes below, sketch a graph of  $e$  against  $F$ .



[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]

- 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.

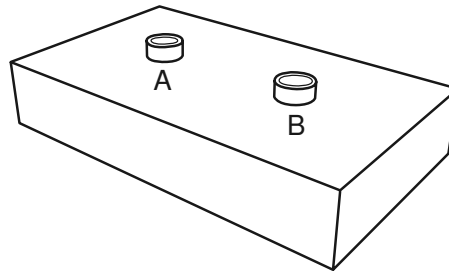


Fig. 3.1

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

- a broken wire,
- a connecting lead,
- a diode,
- a  $20\ \Omega$  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: .....

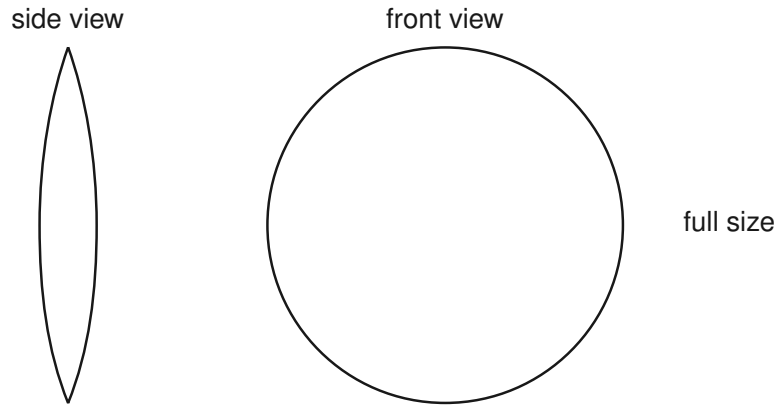
diode: .....

20  $\Omega$  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.

$t = \dots\dots\dots$

$d = \dots\dots\dots$  [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.

$V = \dots\dots\dots$  [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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