Centre Number	Candidate Number	Name

UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS
General Certificate of Education Advanced Level

PHYSICS **9702/05**

Paper 5 Practical Test

October/November 2004

1 hour 30 minutes

Candidates answer on the Question Paper.
Additional Materials: As specified in the Confidential Instructions.

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 in the spaces provided on the Question Paper.
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 **both** questions.
You are expected to record all your observations as soon as they are made, and to plan the presentation of the records so that it is not necessary to make a fair copy of them. The working of the answers is to be handed in.
Marks are mainly given for a clear record of the observations actually made, for their suitability and accuracy, and for the use made of them.
Additional answer paper and graph paper should be submitted only if it becomes necessary to do so.
You are reminded of the need for good English and clear presentation in your answers.
At the end of the examination, fasten all your work securely together.

If you have been given a label, look at the details. If any details are incorrect or missing, please fill in your correct details in the space given at the top of this page.

Stick your personal label here, if provided.

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1	
2	
Total	

This document consists of **10** printed pages and **2** blank pages.

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It is recommended that you spend about 60 minutes on this question

1 In this question you will investigate how the force acting on a bar magnet placed in a current-carrying coil is related to the current in the coil.

(a) Set up the circuit shown in Fig. 1.1.

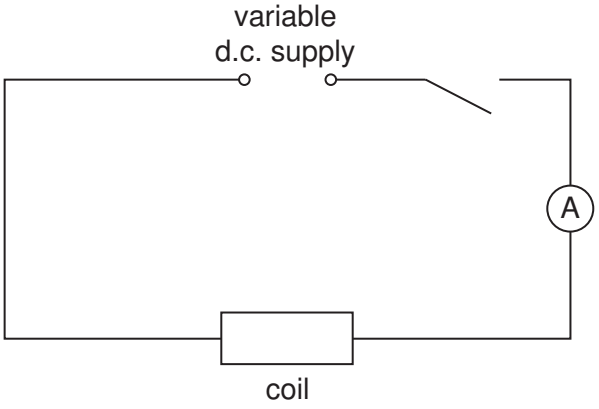

Fig. 1.1

(b) (i) Attach the bar magnet to the newton-meter, using the elastic band on the magnet and the paper clip, so that the magnet is suspended as shown in Fig. 1.2.

(ii) Suspend the newton-meter and the magnet using the stand, boss and clamp. Adjust the position of the clamp so that the magnet is inside the coil and the line at the centre of the magnet coincides with the top of the coil, as shown in Fig. 1.2.

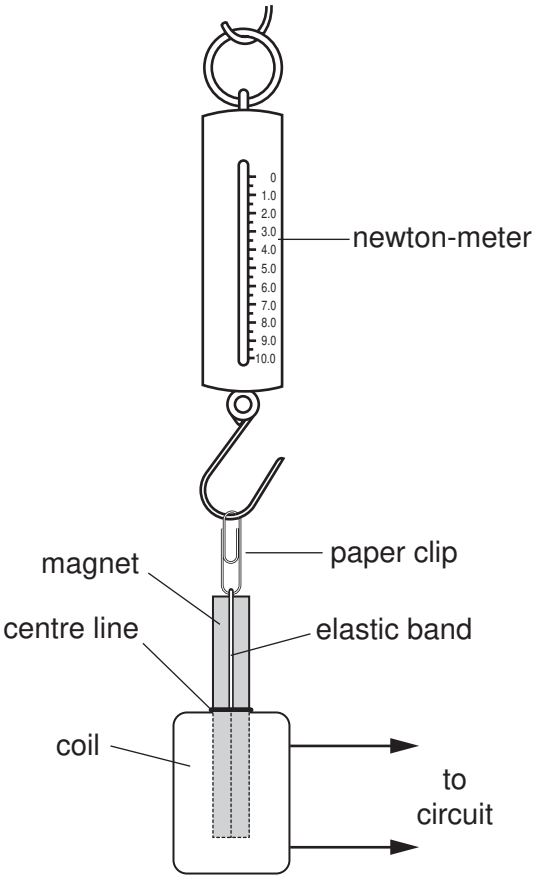

Fig. 1.2

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(iii) Explain how you ensured that the centre of the magnet is located at the top of the coil.

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(iv) Record the reading F from the newton-meter.

F = ...

(c) (i) Close the switch and adjust the output of the power supply to give a value of current in the range 0 to 5 A. Ensure that the reading on the newton-meter **increases**. If it does not, then the connections to the coil will need to be reversed.

(ii) Adjust the position of the newton-meter so that the centre line on the magnet coincides with the top of the coil. Measure and record the new reading F from the newton-meter and the current I in the coil.

F = ...

I = ...

(iii) Open the switch.

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(d) Change the setting on the power supply and repeat **(c)** until you have five more sets of readings for F and I. Include all six values in your table of results.

(e) **(i)** Plot a graph of F (y-axis) against I (x-axis).

(ii) Draw the line of best fit.

(iii) Determine the gradient and y-intercept of this line.

gradient = ...

y-intercept = ...

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(f) It is suggested that the expression relating the current I in the coil to the newton-meter reading F is

$$F = kI + W,$$

where k is a constant and W is the weight of the bar magnet.

Use your answers from **(e)(iii)** to determine values for k and W. You should include appropriate units in each case.

k = ...

W = ...

(g) A student suggests that the force of attraction between the magnet and the coil is directly proportional to the current in the coil. Do the results of your experiment support this suggestion? Justify your answer.

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(h) **(i)** Calculate the current I in the coil that would be required to give a reading of 10 N on the newton-meter.

I = ...

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(ii) Explain why it would be difficult to verify this value of current experimentally.

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It is recommended that you spend about 30 minutes on this question

2 Two students are having a discussion about an experiment in which the air inside a bell jar is gradually removed. The sound of a ringing bell inside the jar is heard to diminish in intensity during this process. One student suggests that the frequency of the sound changes as the pressure changes; the other student thinks that the frequency remains constant as the air is removed.

Design a laboratory experiment to investigate how the frequency of a sound wave depends on the pressure of air. 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 that would be taken,

(c) how the frequency of the sound would be measured using a cathode ray oscilloscope,

(d) the control of variables,

(e) any safety precautions that you would take.

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Diagram

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