| Centre Number | Candidate Number |
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Candidate Name _____

**CAMBRIDGE INTERNATIONAL EXAMINATIONS**

**General Certificate of Education Advanced Level**

# PHYSICS 9702/5

PAPER 5 A2 Practical

**OCTOBER/NOVEMBER SESSION 2002**

1 hour 30 minutes

Candidates answer on the question paper.
Additional materials:
As specified in Instructions to Supervisors
Graph paper

**TIME** 1 hour 30 minutes

## INSTRUCTIONS TO CANDIDATES

Write your name, Centre number and candidate number in the spaces at the top of this page.

Answer **both** questions.

Write your answers in the spaces provided on the question paper.

You are expected to record all your observations as soon as these observations 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.

## INFORMATION FOR CANDIDATES

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.

| FOR EXAMINER'S USE | |
|---|---|
| 1 | |
| 2 | |
| TOTAL | |

**This question paper consists of 7 printed pages, 2 lined pages and 3 blank pages.**

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Local Examinations Syndicate

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

**1** In this experiment you will investigate a simple form of current balance.

You are supplied with a metre rule which has a magnet attached to one end. You should not move the magnet from its position on the rule during the experiment. A pin mounted in a cork supports the rule at its centre, as shown in Fig. 1.1.

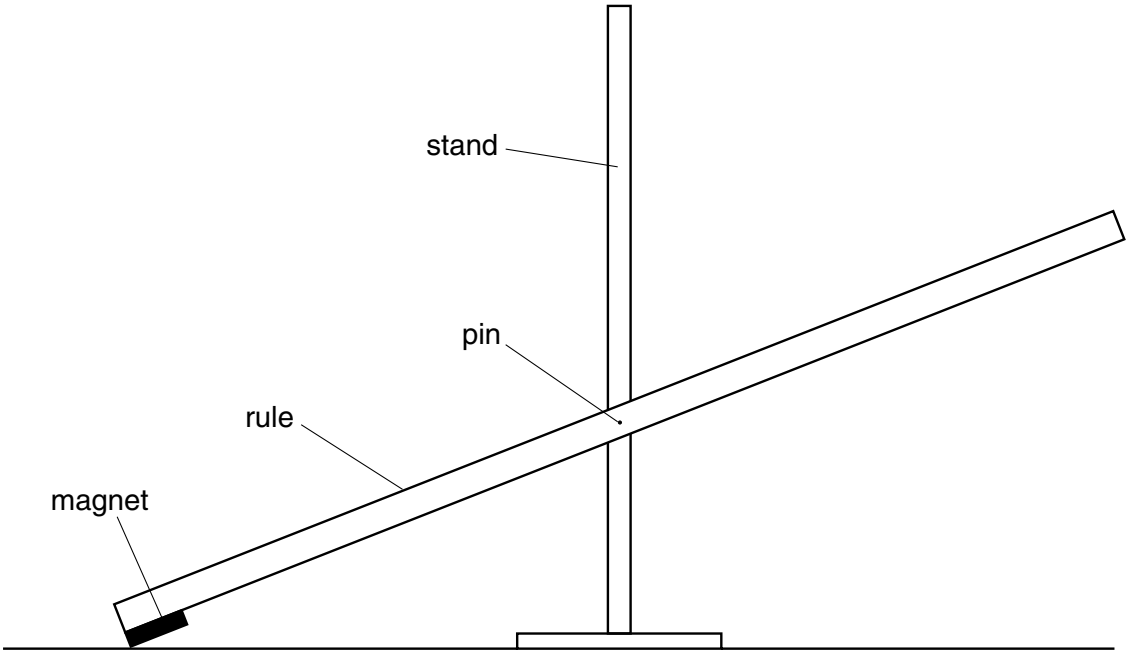


**Fig. 1.1**

**(a)** Position a coil and a block below the magnet. The rule should be horizontal when the magnet is resting on the top of the coil. You may have to adjust the vertical position of the pin and cork in order to achieve this. The arrangement should now be as shown in Fig. 1.2.

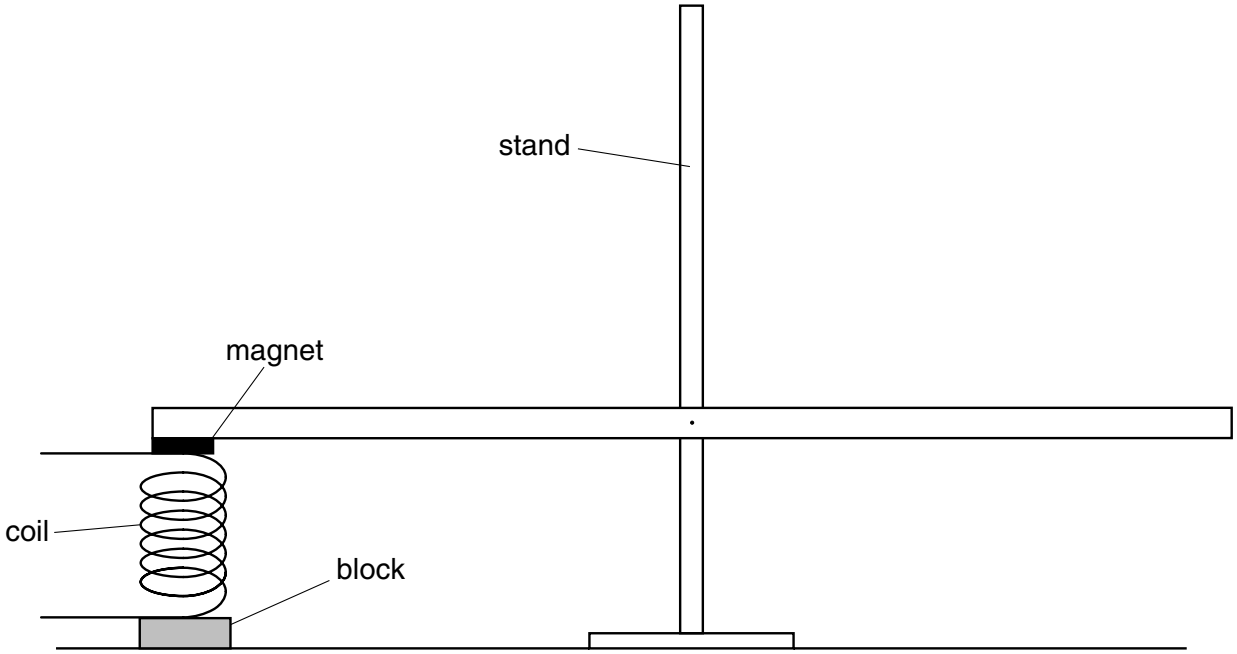


**Fig. 1.2**

**(b) (i)** Connect the coil into the circuit as shown in Fig. 1.3.

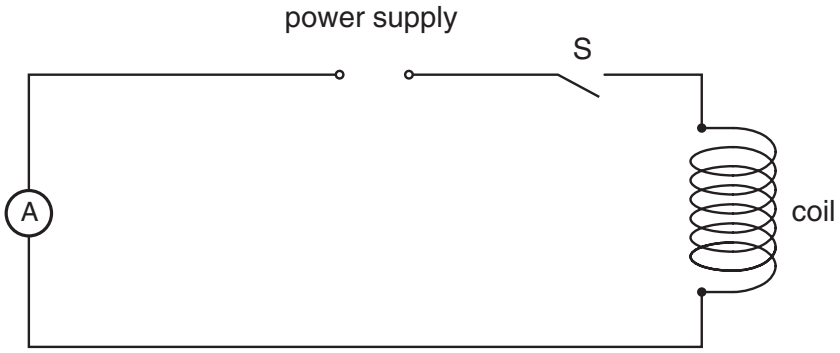


**Fig. 1.3**

**(ii)** Close switch S and check that the coil attracts the magnet. You will need to reverse the current in the coil if it repels the magnet.

**(c)** Suspend a 50 g mass a distance *d* from the end of the rule. The initial value of *d* must be greater than 50 cm and the rule should remain horizontal. The current in the coil may need to be increased to keep the rule horizontal.

The arrangement should now be as shown in Fig. 1.4.

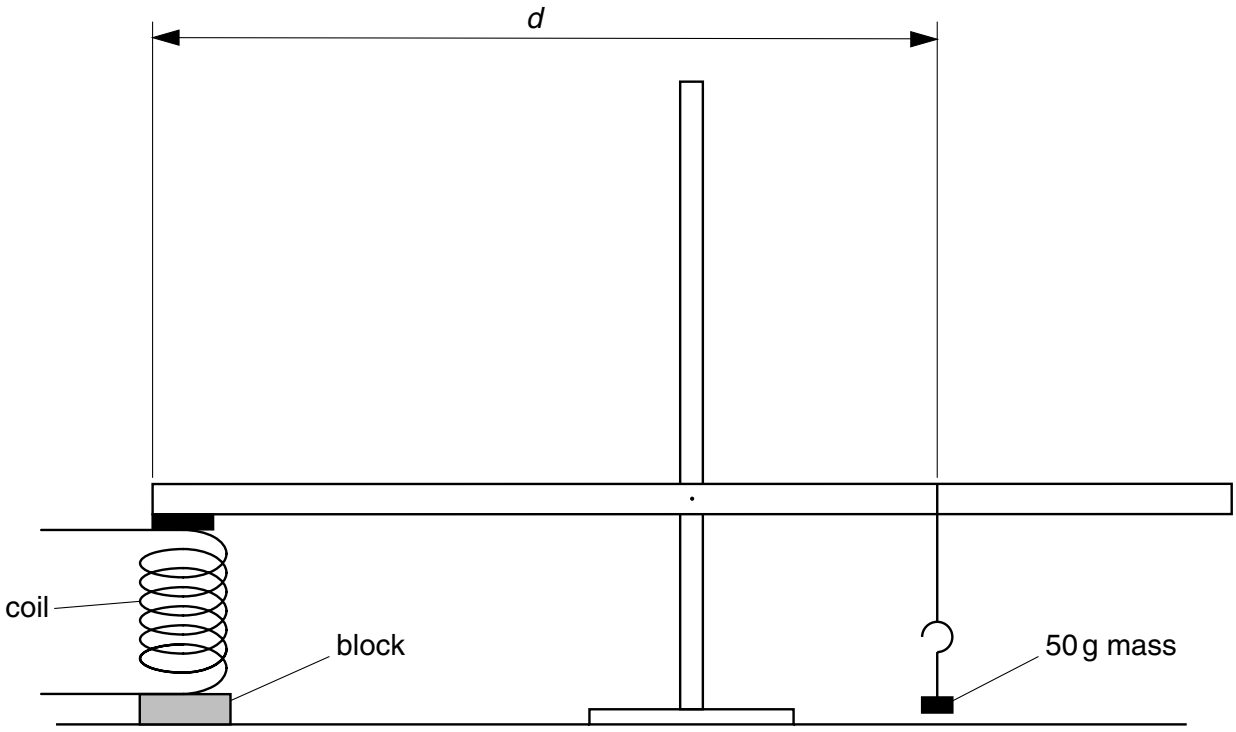


**Fig. 1.4**

**(d) (i)** Gradually reduce the current until the rule just tilts and the 50 g mass moves downwards. Measure and record the value of the current $I$ and the value of $d$.

**(ii)** Change the value of $d$ by sliding the 50 g mass along the rule and repeat **(i)** until you have six sets of values for $I$ and $d$.

**(e)** $I$ and $d$ are related by an expression of the form

$$I = md + c$$

where $m$ and $c$ are constants.

**(i)** Plot a graph of $I$/A ($y$-axis) against $d$/m ($x$-axis).

**(ii)** Determine the gradient and $y$-intercept of the line of best fit.

**(iii)** State the values of $m$ and $c$. Include appropriate units with your values.

**(f)** The ammeter is now removed from the circuit. Suggest how the remaining apparatus may be used to measure an unknown current.

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## Measurements and calculations

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M

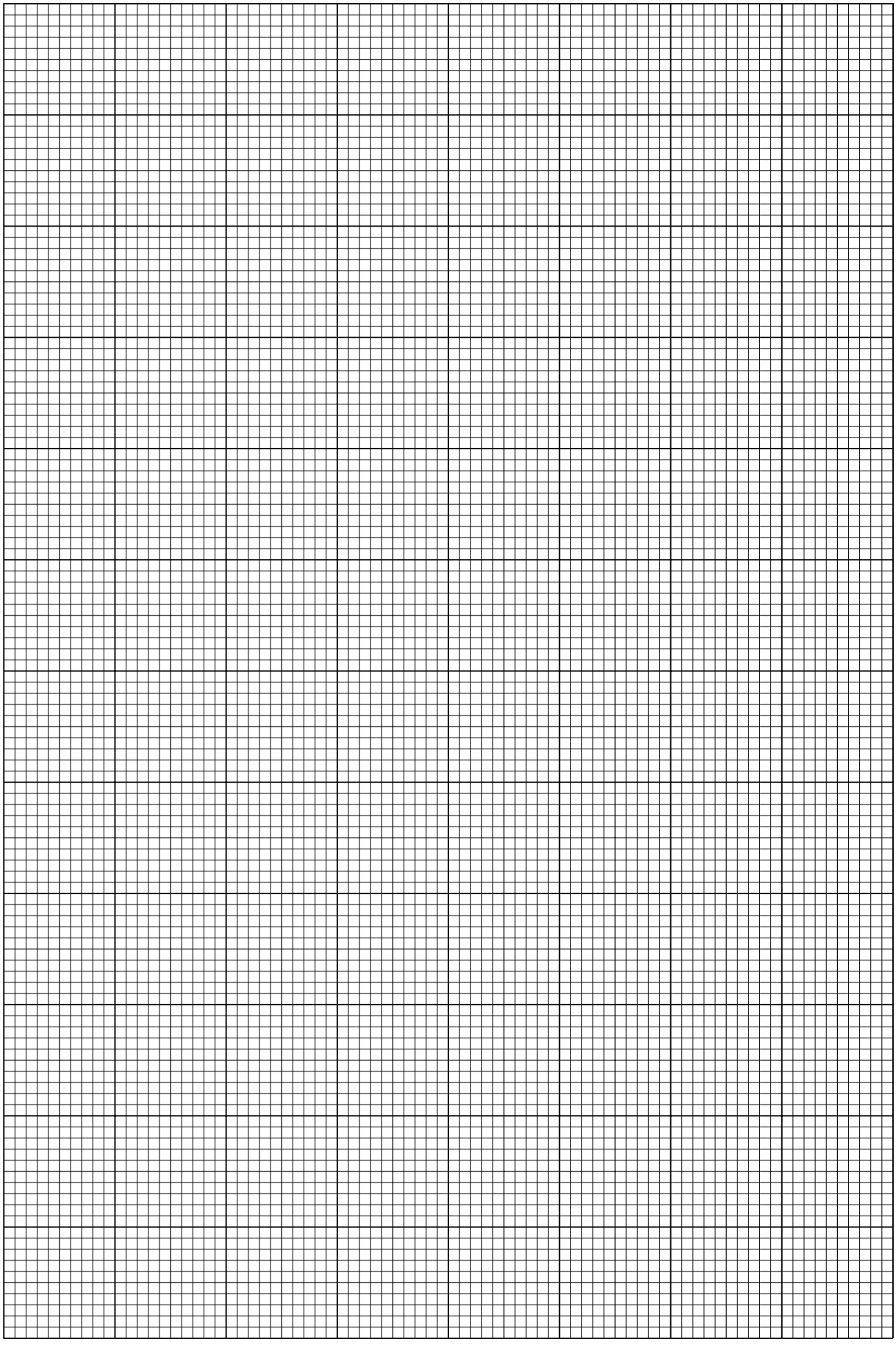
R

A

For Examiner's Use

G

## Graph grid





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

**2** Many musical instruments contain wires which are stretched between two fixed supports. These wires are often made to resonate in their fundamental mode of vibration, as shown in Fig. 2.1.



**Fig. 2.1**

The frequency of the note produced by the wire when it vibrates depends on

**(i)** the length of the wire between the supports,

**(ii)** the tension in the wire,

**(iii)** the mass per unit length of the wire.

Design an experiment to investigate how the resonant frequency of a wire vibrating in its fundamental mode depends on the tension in the wire.

You should draw a diagram showing the arrangement of your equipment. In your account you should pay particular attention to

**(a)** the method by which the wire would be made to vibrate at a known frequency,

**(b)** how the resonant frequency and the tension would be measured,

**(c)** the procedure to be followed,

**(d)** control of variables,

**(e)** any safety precautions which you would take.

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