UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS
General Certificate of Education
Advanced Subsidiary Level and Advanced Level

CANDIDATE NAME									
CENTRE NUMBER						CANDIDATE NUMBER				

5326129682

PHYSICS **9702/34**

Paper 32 Advanced Practical Skills 2 **May/June 2010**

2 hours

Candidates answer on the Question Paper.

Additional Materials: As listed 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.
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 **both** questions.
You will be allowed to work with the apparatus for a maximum of one hour for each question.
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.
You may lose marks if you do not show your working or if you do not use appropriate units.

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.
All questions in this paper carry equal marks.

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1	
2	
Total	

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You may not need to use all of the materials provided.

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1 In this experiment, you will investigate the length of a loaded spring as the load is varied.

(a) Measure and record the length *L* of the metal rod.

L = ... m

(b) **(i)** Support the rod as shown in Fig. 1.1.

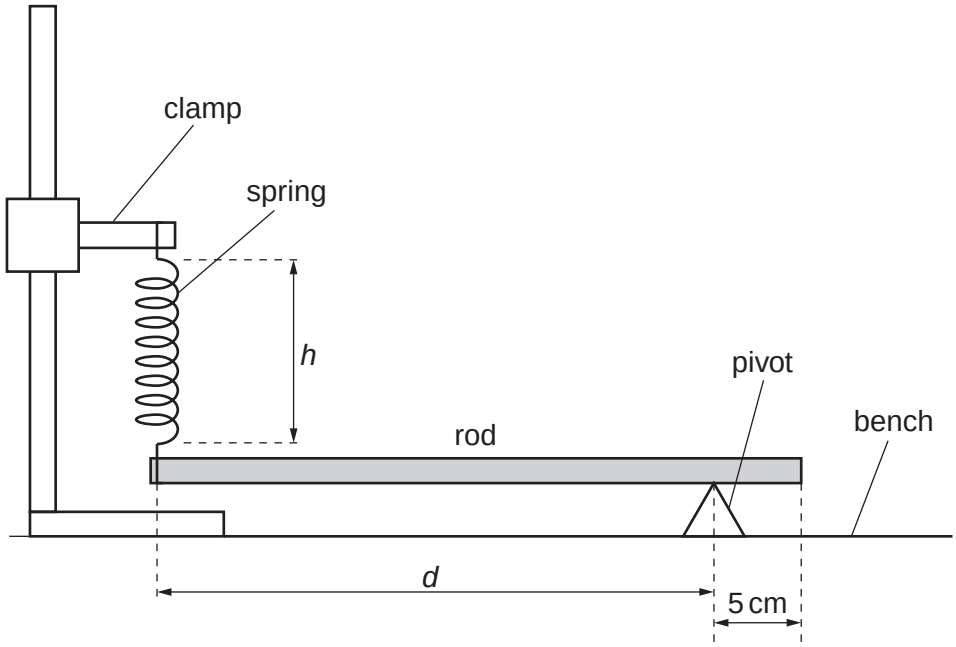


Fig. 1.1

(ii) Adjust the position of the pivot so that it is approximately 5 cm from the free end of the rod.

(iii) Adjust the clamp so that the rod is horizontal and the spring is vertical.

(c) Measure and record the length *h* of the coiled part of the spring and the distance *d* from the pivot to the point where the spring is attached to the rod.

h = ... m

d = ... m

(d) Repeat **(b)(iii)** and **(c)** for different positions of the pivot along the rod until you have six sets of readings of d and h. Include values of $1/d$ in your table of results.

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(e) **(i)** Plot a graph of h on the y-axis against $\frac{1}{d}$ on the x-axis.

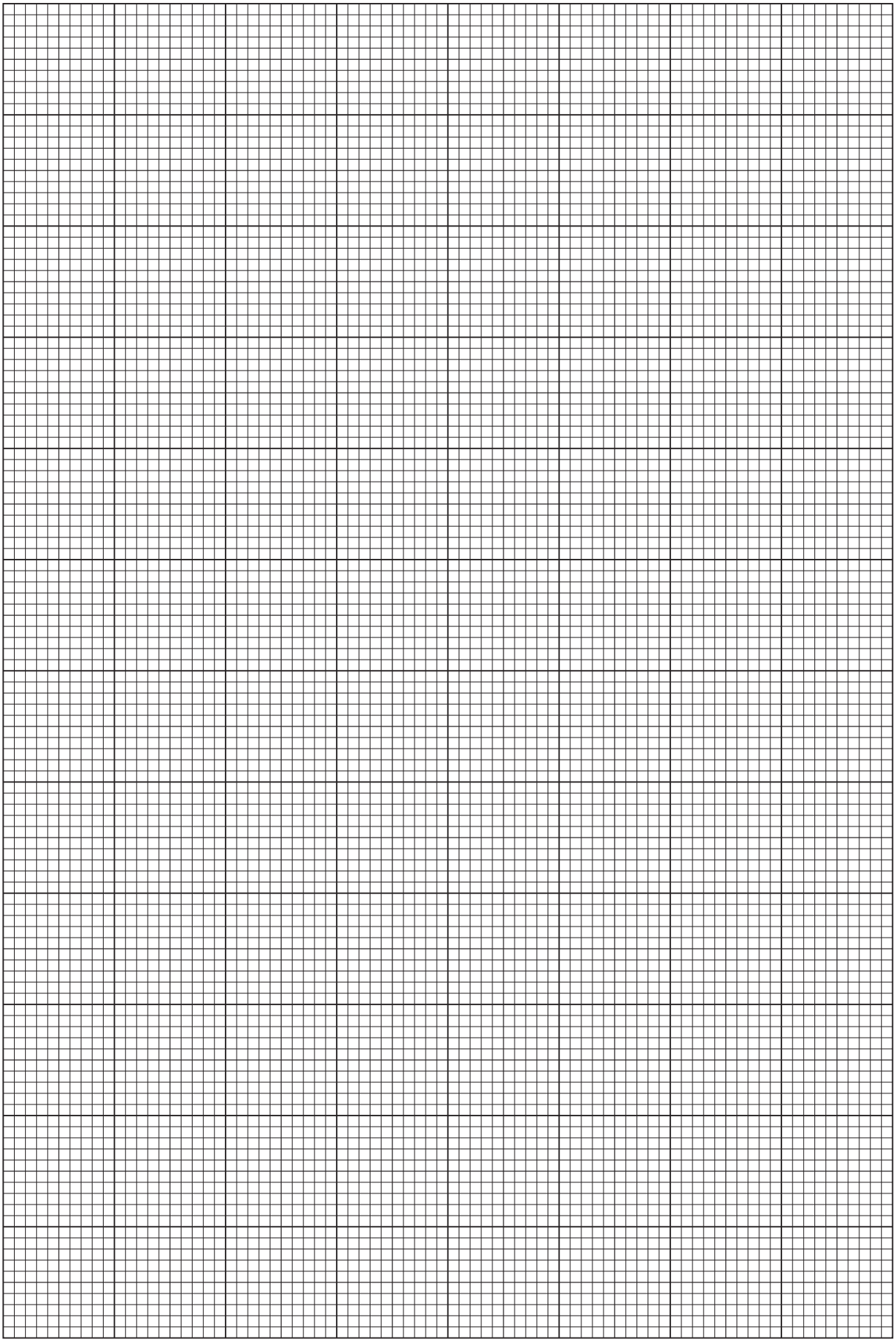
(ii) Draw the line of best fit.

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

gradient = ...

y-intercept = ...

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(f) It is suggested that the relationship between d and h is

$$h = \frac{A}{d} + B$$

where A and B are constants.

The value of A is equal to $\frac{Wz}{k}$

where W is the weight of the rod,
k is the spring constant of the spring
and z is a constant.

The values for W and k are given on the card.

Use your answer from **(e)(iii)** and the values on the card to calculate z.
Give the appropriate unit.

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$z =$ .....

You may not need to use all of the materials provided.

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2 In this experiment, you will investigate the effect of an electric current on a nearby magnet.

(a) A circuit has been set up for you as shown in Fig. 2.1. Do not adjust the position of the stands.

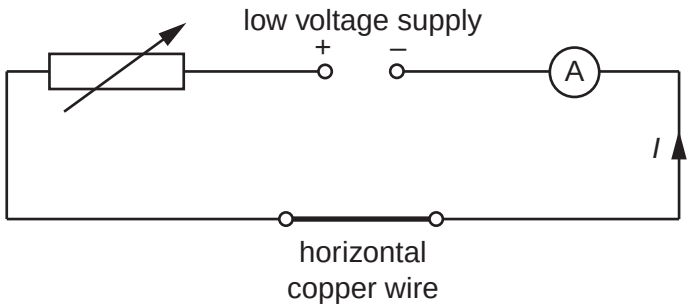


Fig. 2.1

Switch on the current. Use the variable resistor to adjust the current *I* to about 2 A. Record your value of current.

I = ...A

(b) Switch off the current. Place the thread over the horizontal copper wire, so that the magnet hangs as shown in Fig. 2.2.

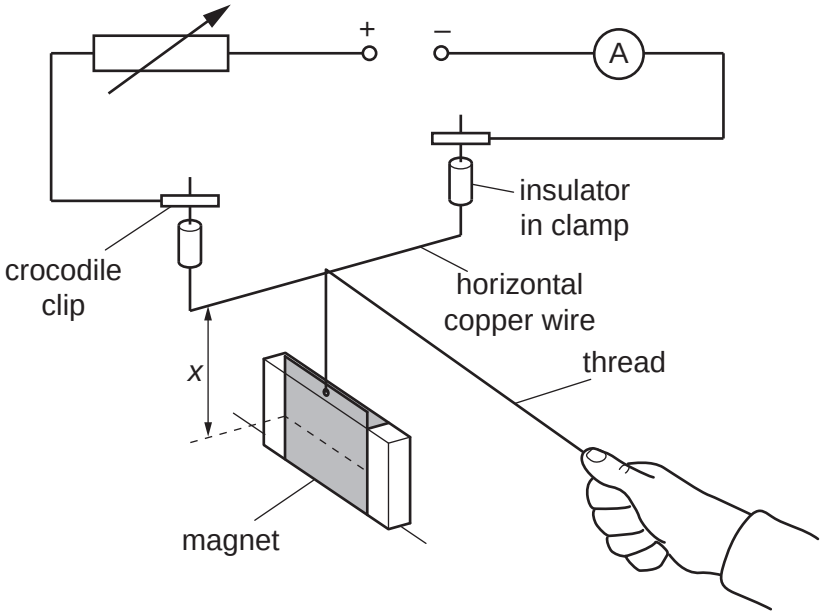


Fig. 2.2

(c) By moving your hand, adjust the distance *x* between the copper wire and the dotted line along the side of the magnet to about 7 cm.
Record your value of *x*.

x = ... cm

(d) Place the protractor on the bench beneath the magnet.
Switch on the current. The magnet will turn through an angle. Wait until the magnet comes to rest.
Measure and record the angle θ turned through by the magnet.
Switch off the current.

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θ = ...°

(e) Estimate the percentage uncertainty in your value of θ.

percentage uncertainty in θ = ...

(f) **(i)** Reverse the direction of the current in the copper wire.
Repeat **(d)** to find a second value of θ.

θ = ...°

(ii) Use your answers to **(d)** and **(f)(i)** to determine an average value of the magnitude of θ.

average value of θ = ...°

(g) Change x to about 4 cm.
Adjust the value of I so that the deflection θ is the same as in **(f)(ii)**.
Record x and I.

x = ... cm

I = ... A

(h) It is suggested that, for a given value of θ, the relationship between I and x is

$$I = kx$$

where k is a constant.

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(i) Using your data, calculate two values of k.

first value of k = ...

second value of k = ...

(ii) Explain whether your results support the suggested relationship.

.....

.....

.....

(iii) Justify the number of significant figures that you have given for your values of k.

.....

.....

.....

(i) **(i)** Describe four sources of uncertainty or limitations of the procedure in this experiment.

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1. .....

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2. .....

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3. .....

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4. .....

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(ii) Describe four improvements that could be made to this experiment. You may suggest the use of other apparatus or different procedures.

1. .....

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2. .....

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3. .....

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4. .....

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