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

CANDIDATE NAME	
CENTRE NUMBER	
CANDIDATE NUMBER	

4471498678

PHYSICS **9702/35**

Advanced Practical Skills 1 **October/November 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 used 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	

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

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1 In this experiment, you will determine the resistivity of a metal in the form of a wire.

(a) (i) Measure and record the diameter d of the short sample of wire that is attached to the card. You may remove the wire from the card.

d = ...

(ii) Calculate the cross-sectional area A of the wire using the formula

$$A = \frac{\pi d^2}{4}.$$

A = ...

(b) (i) Set up the circuit shown in Fig. 1.1 and close the switch.

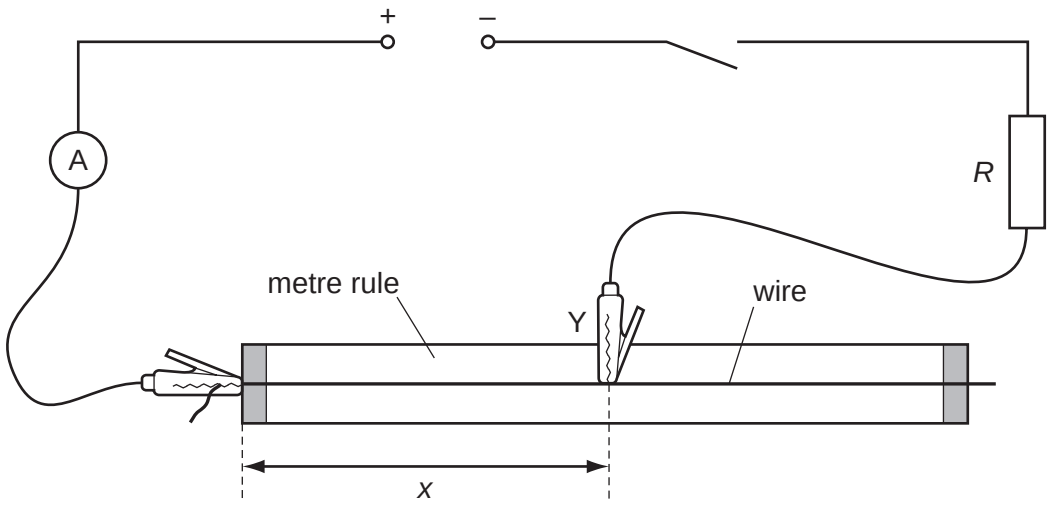

Fig. 1.1

(ii) Position the crocodile clip labelled 'Y' half-way along the wire.

(iii) Measure and record the distance x of wire between the two crocodile clips, and the ammeter reading I.

x = ...

I = ...

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(c) Change x and repeat **(b)(iii)** until you have six sets of readings of x and I.

Include values of $\frac{1}{I}$ in your table.

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

(ii) Draw the straight line of best fit.

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

gradient = ...

y-intercept = ...

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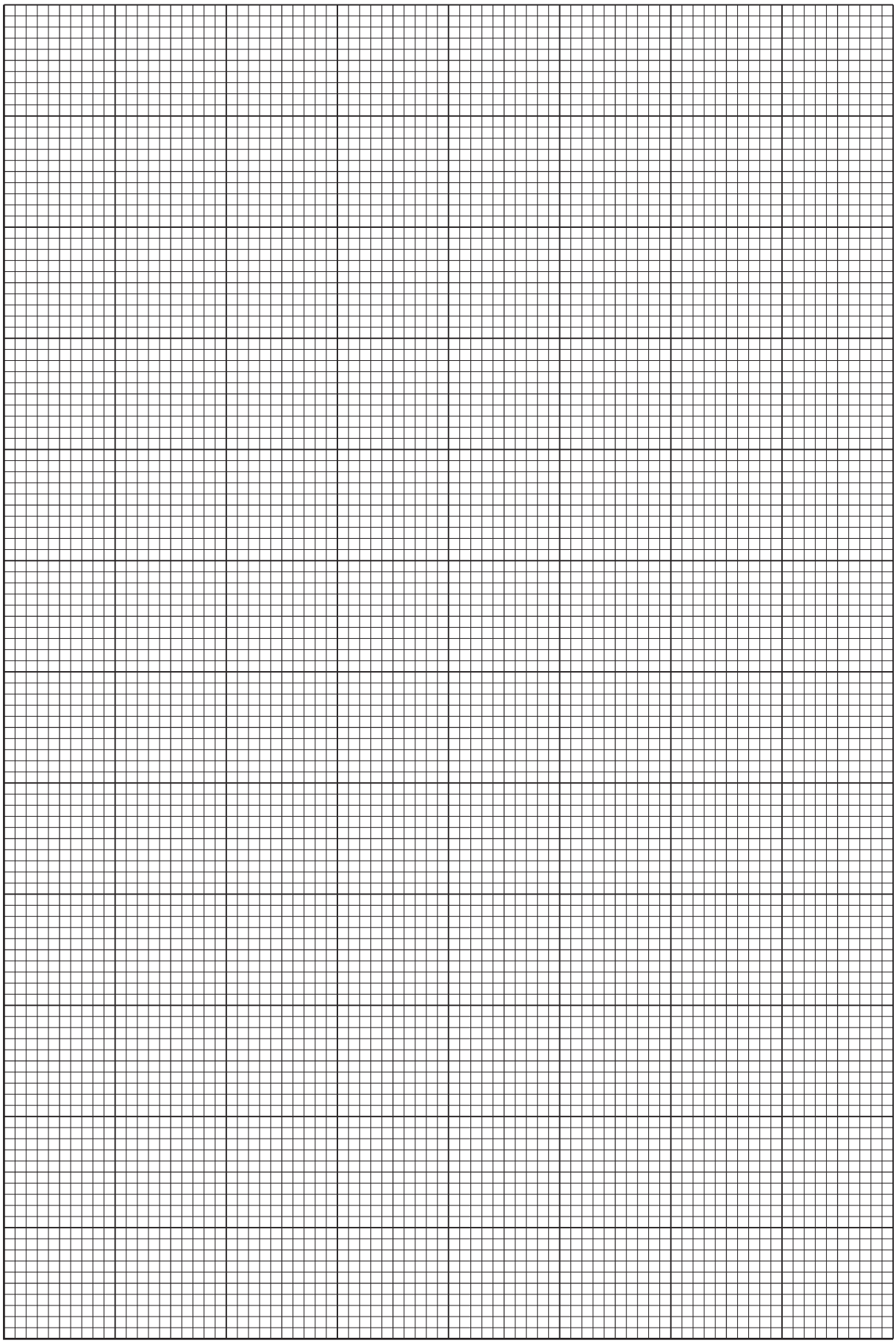

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(e) The quantities I and x are related by the equation

$$\frac{1}{I} = Mx + N$$

where M and N are constants and

$$\frac{M}{N} = \frac{\rho}{AR}$$

where ρ is the resistivity of the material of the wire and the resistance R of the fixed resistor is given on a card.

Use your answers in **(a)(ii)** and **(d)(iii)** to determine a value for ρ.

ρ = ...

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

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2 In this experiment, you will investigate the equilibrium of a wooden strip.

(a) (i) Attach masses to the apparatus as shown in Fig. 2.1.

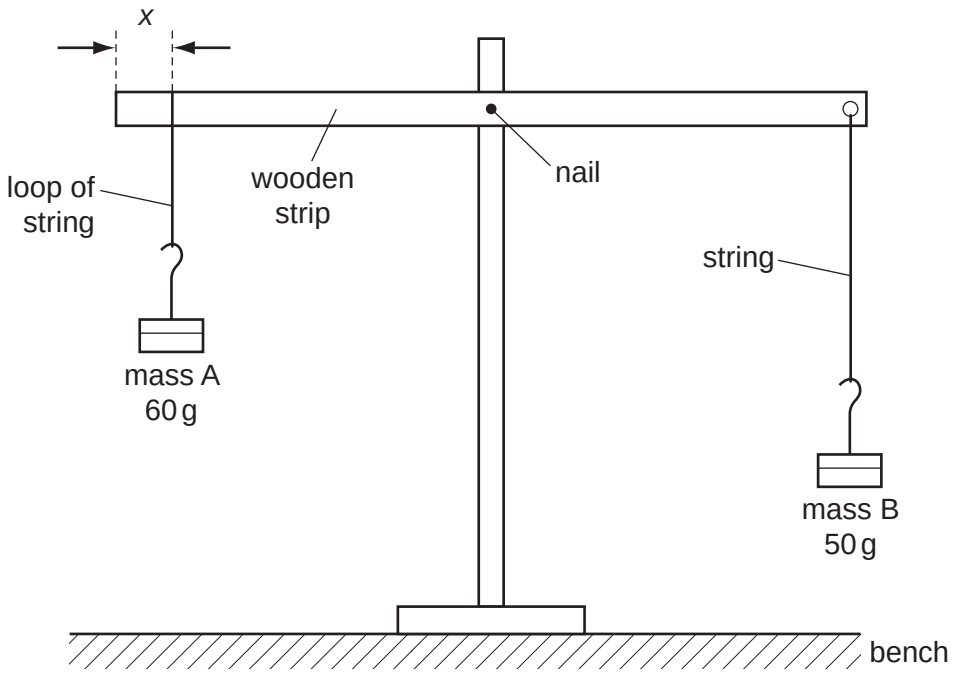

Fig. 2.1

Mass A is suspended from the wooden strip using the loop of string. The distance between this loop and the nearest end of the wooden strip is *x*.

(ii) Change *x* until the wooden strip is balanced and approximately parallel to the bench. Measure and record *x*.

x = ...

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(b) (i) Remove both masses. Thread the string for mass B over the pulley, and then attach the masses again, as shown in Fig. 2.2.

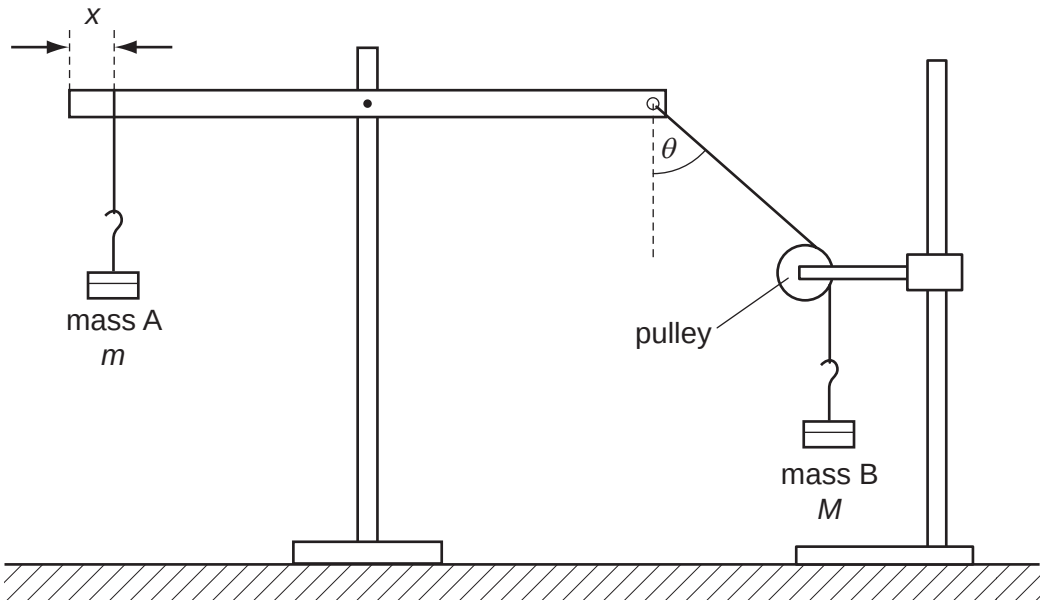

Fig. 2.2

(ii) Transfer 10 g from mass A to mass B.

(iii) With x at the same value as in **(a)(ii)**, adjust the position of the pulley until the wooden strip is parallel to the bench.
Measure and record the angle θ that the string for mass B makes with the vertical, as shown in Fig. 2.2.

θ = ...

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

percentage uncertainty = ...

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(v) Record the mass m of mass A and the mass M of mass B.

m = ...

M = ...

(vi) Calculate $\frac{m}{M}$.

$\frac{m}{M}$ = ...

(c) Transfer another 10 g from mass A to mass B. Repeat **(b)(iii)**, **(b)(v)** and **(b)(vi)**.

θ = ...

m = ...

M = ...

$\frac{m}{M}$ = ...

(d) It is suggested that the relationship between m, M and θ is

$$\cos\theta = k\frac{m}{M}$$

where k is a constant.

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

first value of k = = ...

second value of k = = ...

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

.....

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.....

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

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

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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