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

CANDIDATE NAME

CENTRE NUMBER

CANDIDATE NUMBER

PHYSICS **9702/34**

Paper 32 Advanced Practical Skills 2 **October/November 2009**

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. The working of the answers is to be handed in.
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.

For Examiner's Use	
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Total	

This document consists of **8** printed pages and **4** blank pages.

UNIVERSITY of CAMBRIDGE
International Examinations

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

1   In this experiment, you will investigate changes in potential difference in a circuit as one of the resistances is varied.
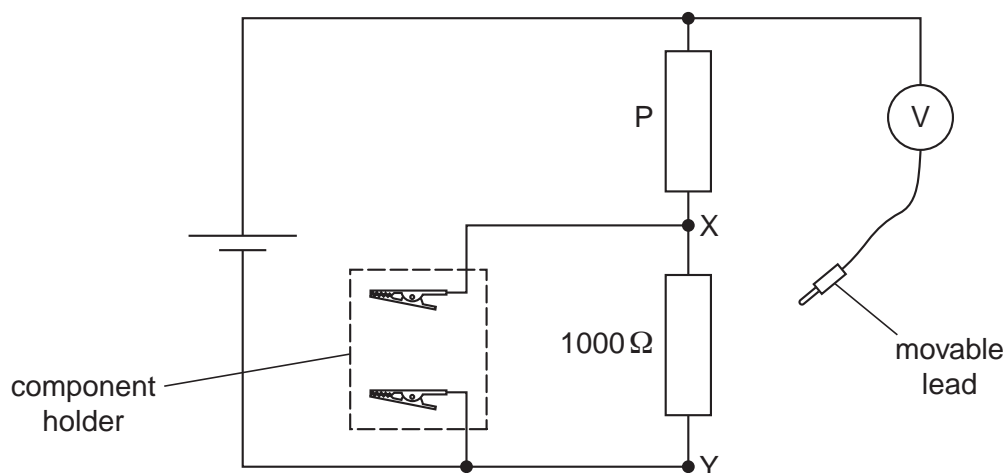
(a) Assemble the circuit of Fig. 1.1.

Fig. 1.1

(b) Connect the movable lead to terminal Y and record the voltmeter reading V_0.

$$V_0 = ...$$

(c) (i)   Connect the movable lead to terminal X and **leave it connected there for the rest of the experiment**.

(ii) Select one of the other labelled resistors provided and connect it between the crocodile clips on the component holder. Record the resistance R of your selected resistor and the voltmeter reading V.

$$R = ... \ \Omega$$

$$V = ...$$

(d) Repeat **(c)(ii)** using a different labelled resistor until you have six sets of read.
R (measured in ohms) and V.

Disconnect the cell when you have finished your measurements.

In your table of results include columns for the values of $\frac{1}{V}$ and the values
of $\frac{R}{(1000 + R)}$.

(e) (i) Plot a graph of $\frac{1}{V}$ on the y-axis against $\frac{R}{(1000 + R)}$ on the x-axis.

(ii) Draw the line of best fit.

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

gradient = ...

y-intercept =
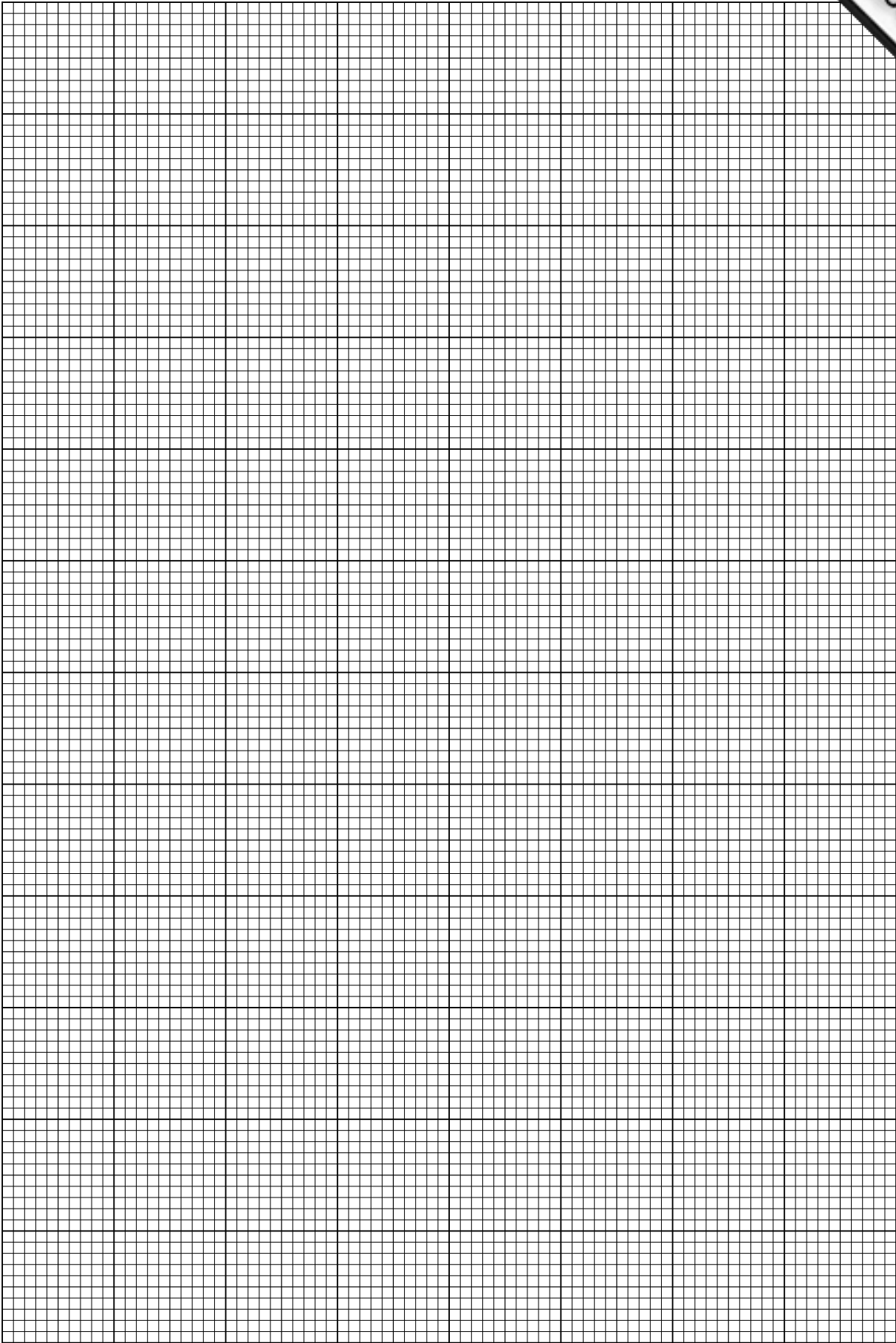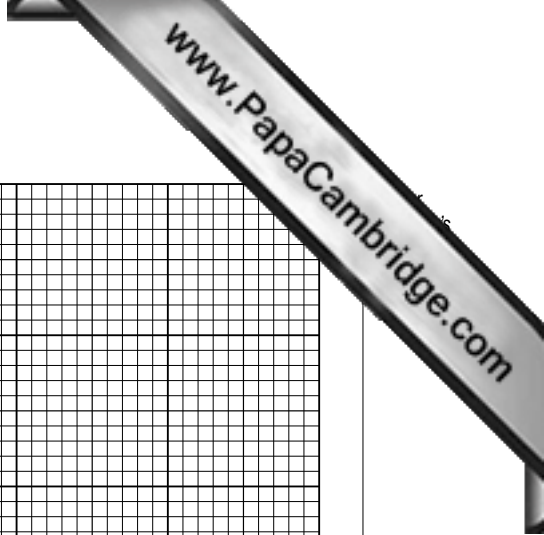
(f) The quantities V and R are related by the equation

$$\frac{1}{V} = \frac{1000\,k}{P}\left(\frac{R}{1000+R}\right) + k$$

where k is a constant and P is the resistance of resistor P.

Using your answers from **(e)(iii)**, determine the value of P.

Give an appropriate unit.

$P =$ ....

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Please turn over for Question 2.

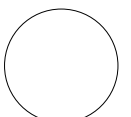**You may not need to use all of the materials provided.**

2 In this experiment, you will investigate how the length of a thread of cotton affects the amount of energy it can absorb before breaking.

(a) Use the boss to clamp the nail to the retort stand at a height of about 50 cm above the bench. Place the apparatus in the tray.

(b) (i) Cut a 45 cm length of thread.

(ii) Tie the ends of the thread together to make a large loop.
Suspend the loop from the nail and slot the 50 g mass into it, securing the mass with sticky tape, as shown in Fig. 2.1.
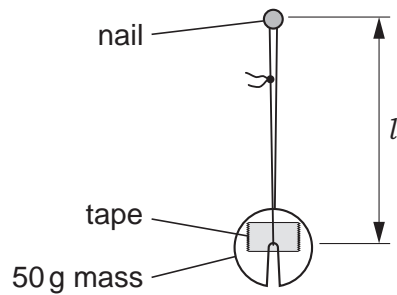
Fig. 2.1

(c) (i) Measure the length l as shown in Fig. 2.1.

$l =$ ....

(ii) Lift the 50 g mass vertically a distance h of 5 cm, as shown in Fig. 2.2.
Release the mass.
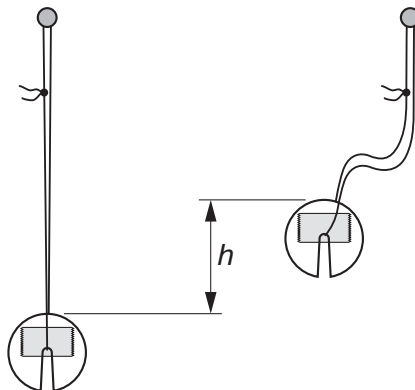
Fig. 2.2

(iii) Keep repeating **(c)(ii)**, each time increasing the value of h, until the thread breaks. Record the value of h at which the thread breaks.

h .... cm
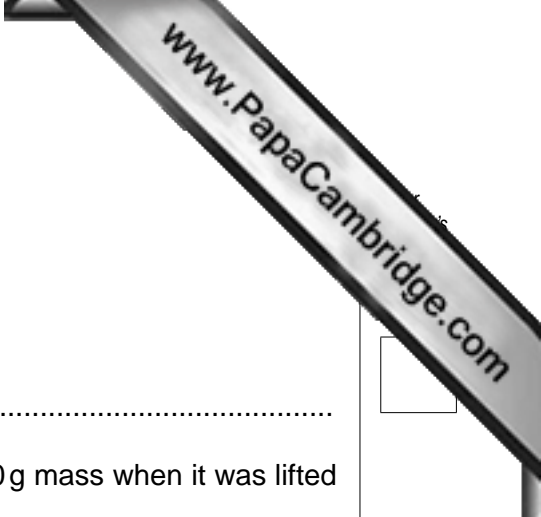
(d) Estimate the percentage uncertainty in your value of h_{final}.

percentage uncertainty = ...

(e) Calculate the gravitational potential energy E_P given to the 50 g mass when it was lifted the distance h_{final}.

($E_P = mgh_{final}$ where $g = 9.81 \, m \, s^{-2}$).

E_P .... J

(f) Cut an 85 cm length of thread. Repeat **(b)(ii)**, **(c)** and **(e)**.

$l =$ ....

$h_{final} =$ .... cm

$E_P =$ .... J

(g) It is suggested that E_P and l are related by the equation

$$E_P = k\sqrt{l}$$

where k is a constant.

By calculating values of k, explain whether your results support this relationship.

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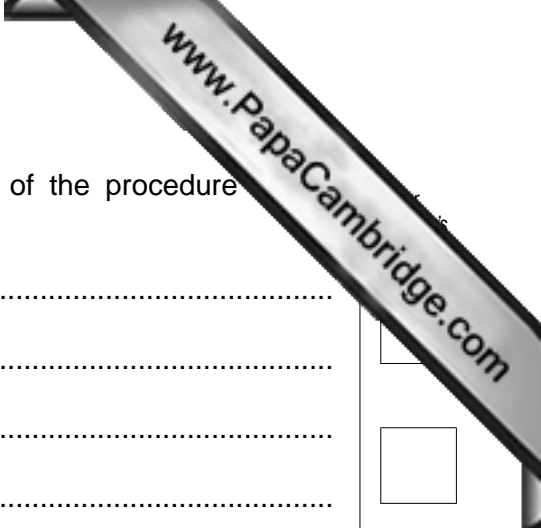
(h) (i) State and explain four sources of error or limitations of the procedure .... experiment.

1. ....

....

2. ....

....

3. ....

....

4. ....

....

(ii) Suggest and explain 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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