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

CANDIDATE NAME									
CENTRE NUMBER						CANDIDATE NUMBER				

9004650324

PHYSICS **9702/35**

Paper 3 Advanced Practical Skills 1 **October/November 2012**

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.
The number of marks is given in brackets [ ] at the end of each question or part question.

For Examiner's Use	
1	
2	
Total	

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

© UCLES 2012

BLANK PAGE

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

For Examiner's Use

1 In this experiment, you will measure the currents at two different points in the same circuit and investigate how the currents depend on the total resistance of the circuit.

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

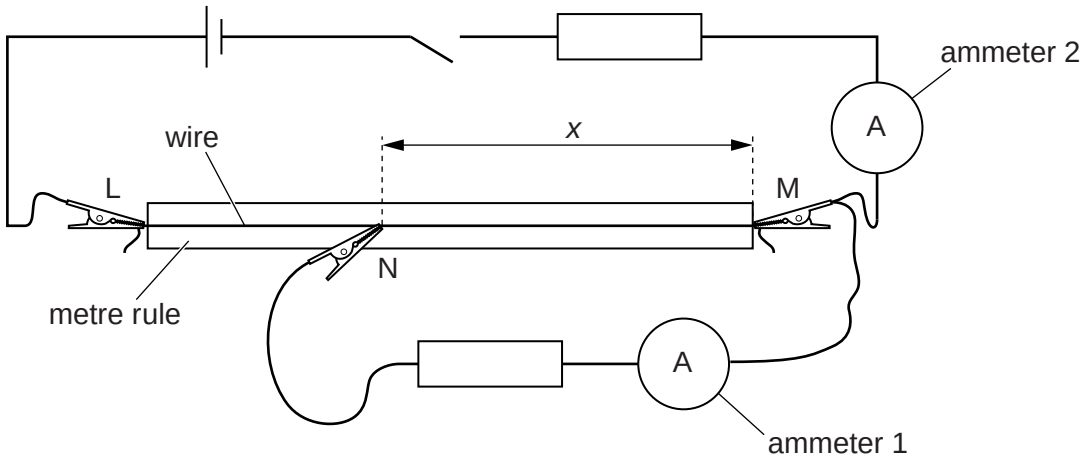


Fig. 1.1

There are crocodile clips at L, M and N.

Place the crocodile clip at N so that the length x from N to M is approximately 60 cm.

(ii) Measure and record the value of x.

x = ...

(iii) Close the switch.

(iv) Record the current I_1 given by ammeter 1.

I_1 = ... [1]

(v) Record the current I_2 given by ammeter 2.

I_2 = ... [2]

(vi) Open the switch.

(b) Change x and repeat **(a)** until you have six sets of readings of x, I_1 and I_2 where x is in the range $0.200\,\text{m} \leqslant x \leqslant 0.800\,\text{m}$.

Include values of $\frac{I_2}{I_1}$ and $\frac{1}{x}$ in your table.

For Examiner's Use

[9]

(c) **(i)** Plot a graph of $\frac{I_2}{I_1}$ on the y-axis against $\frac{1}{x}$ on the x-axis. [3]

(ii) Draw the straight line of best fit. [1]

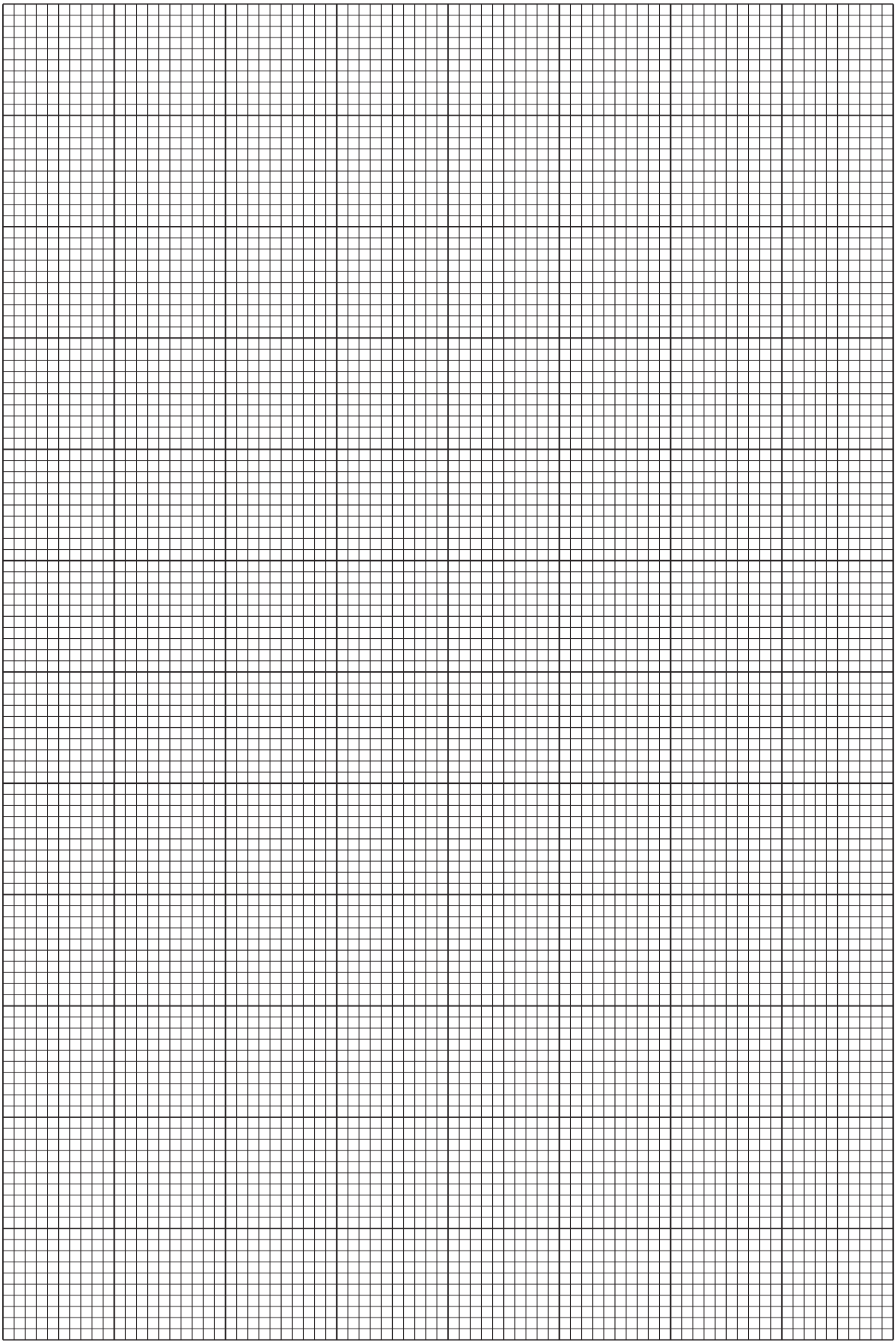
(iii) Determine the gradient and y-intercept of this line.

gradient = ...

y-intercept = ...

[2]

© UCLES 2012



For Examiner's Use

(d) The quantities I_1, I_2 and x are related by the equation

$$\frac{I_2}{I_1} = \frac{P}{x} + Q$$

where P and Q are constants.

Using your answers from **(c)(iii)**, determine the values of P and Q.
Give appropriate units.

For Examiner's Use

P = ...

Q = ...

[2]

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

For Examiner's Use

2 In this experiment, you will investigate how the motion of a spring depends on its length.

(a) (i) Measure and record the diameter D of the coiled part of the spring as shown in Fig. 2.1.

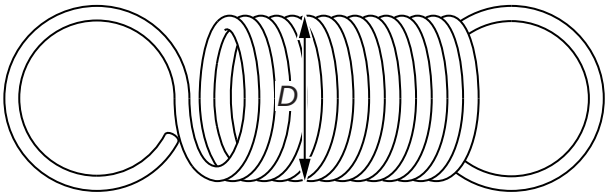


Fig. 2.1

D = ... [1]

(ii) Estimate the percentage uncertainty in your value of D.

percentage uncertainty = ... [1]

(b) (i) Place the metal strip through the spring as shown in Fig. 2.2.

The length x of the coiled part of the spring below the metal strip should be approximately 1.5 cm.

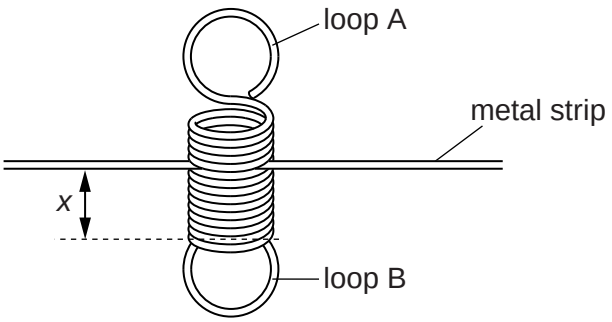


Fig. 2.2

(ii) Measure and record x.

x = ... [1]

(iii) Calculate the volume V inside the coiled part of the spring below the metal strip using

$$V = \frac{\pi D^2 x}{4}.$$

For Examiner's Use

$V =$ ..... [1]

(c) (i) Clamp the metal strip so that it is horizontal with loop A of the spring at the top. Gently hang a mass of 300 g from loop B, as shown in Fig. 2.3.
Ensure that the base of the mass hangs approximately 20 cm above the bench.

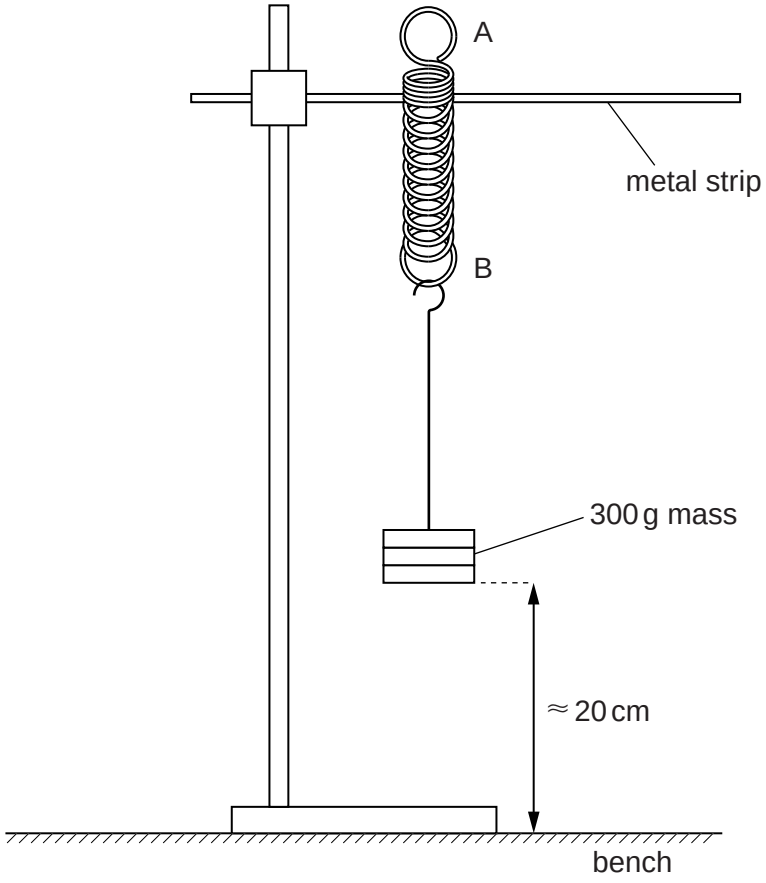


Fig. 2.3

(ii) Slowly and gently pull the mass towards the bench by approximately 1 cm.

(iii) Release the mass and watch its movement.
The mass will move up and then down, completing a cycle, as shown in Fig. 2.4.

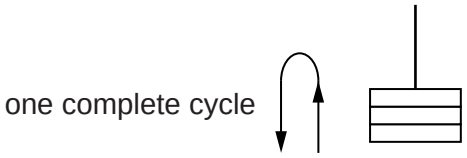


Fig. 2.4

(iv) Measure and record the time for at least 10 cycles.
Record enough readings to determine an accurate value for the time T taken for one complete cycle.

T = ... s [2]

(d) (i) Remove the mass from the spring.

(ii) Remove the spring from the metal strip.

(iii) Repeat **(b)(i)** making x approximately 1.0 cm.

(iv) Measure and record x.

x = ... [1]

For Examiner's Use

(e) Repeat **(b)(iii)** and **(c)**.

For Examiner's Use

V = ...

T = ...

[2]

(f) It is suggested that the relationship between T and V is

$$T^2 = kV$$

where k is a constant.

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

first value of k = ...

second value of k = ...

[1]

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

.....

.....

..... [1]

© UCLES 2012

(iii) Explain whether your results in **(f)(i)** support the suggested relationship.

For Examiner's Use

.....

.....

.....

..... [1]

(g) (i) Describe four sources of uncertainty or limitations of the procedure for this experiment.

1. .....

.....

2. .....

.....

3. .....

.....

4. .....

..... [4]

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

1. .....

.....

2. .....

.....

3. .....

.....

4. .....

..... [4]

© UCLES 2012

BLANK PAGE

Permission to reproduce items where third-party owned material protected by copyright is included has been sought and cleared where possible. Every reasonable effort has been made by the publisher (UCLES) to trace copyright holders, but if any items requiring clearance have unwittingly been included, the publisher will be pleased to make amends at the earliest possible opportunity.

University of Cambridge International Examinations is part of the Cambridge Assessment Group. Cambridge Assessment is the brand name of University of Cambridge Local Examinations Syndicate (UCLES), which is itself a department of the University of Cambridge.

© UCLES 2012