Cambridge International AS & A Level

Cambridge International Examinations
Cambridge International Advanced Subsidiary and Advanced Level

CANDIDATE NAME									
CENTRE NUMBER						CANDIDATE NUMBER				

7086083758

PHYSICS **9702/34**

Paper 3 Advanced Practical Skills 2 **October/November 2015**

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 an HB pencil for any diagrams or graphs.
Do not use staples, paper clips, 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 are reminded of the need for good English and clear presentation in your answers.

Electronic calculators may be used.
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.

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.

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

1 In this experiment, you will investigate forces in equilibrium.

(a) Assemble the apparatus as shown in Fig. 1.1.
The angle θ should be approximately 150°. String AB should be parallel to the bench, and the bottom of mass M should be approximately 10 cm above the bench.

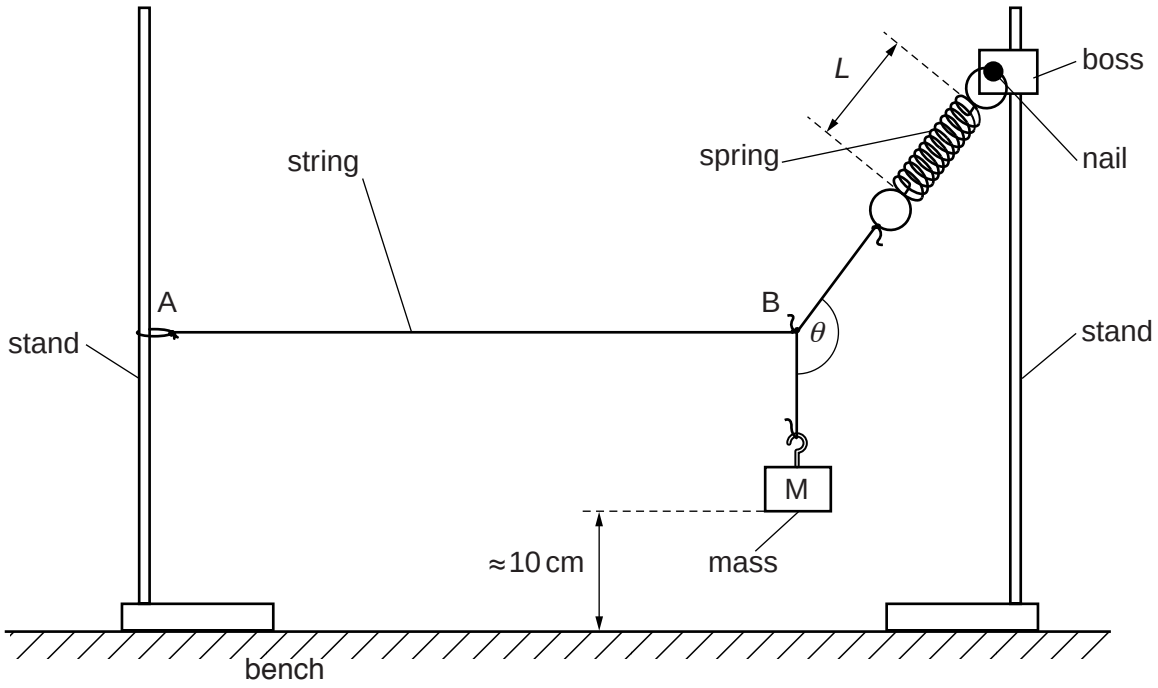


Fig. 1.1

(b) (i) Measure and record the angle θ between the string attached to mass M and the string attached to the spring, as shown in Fig. 1.1.

θ = ...° [1]

(ii) Measure and record the length L of the coiled part of the spring, as shown in Fig. 1.1.

L = ... [1]

(c) (i) Change the distance between the stands.

Adjust the height of A until string AB is parallel to the bench. If the apparatus is unstable, you may need to use the G-clamp to secure one of the stands to the bench.

(ii) Measure and record θ and L.

θ = ...°

L = ...

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(d) Repeat **(c)** until you have six sets of values of θ and L.
Include your values from **(b)** and **(c)**.

Also include values of $\frac{1}{\sin(\theta - 90°)}$ in your table.

[10]

(e) **(i)** Plot a graph of $\frac{1}{\sin(\theta - 90°)}$ on the y-axis against L on the x-axis. [3]

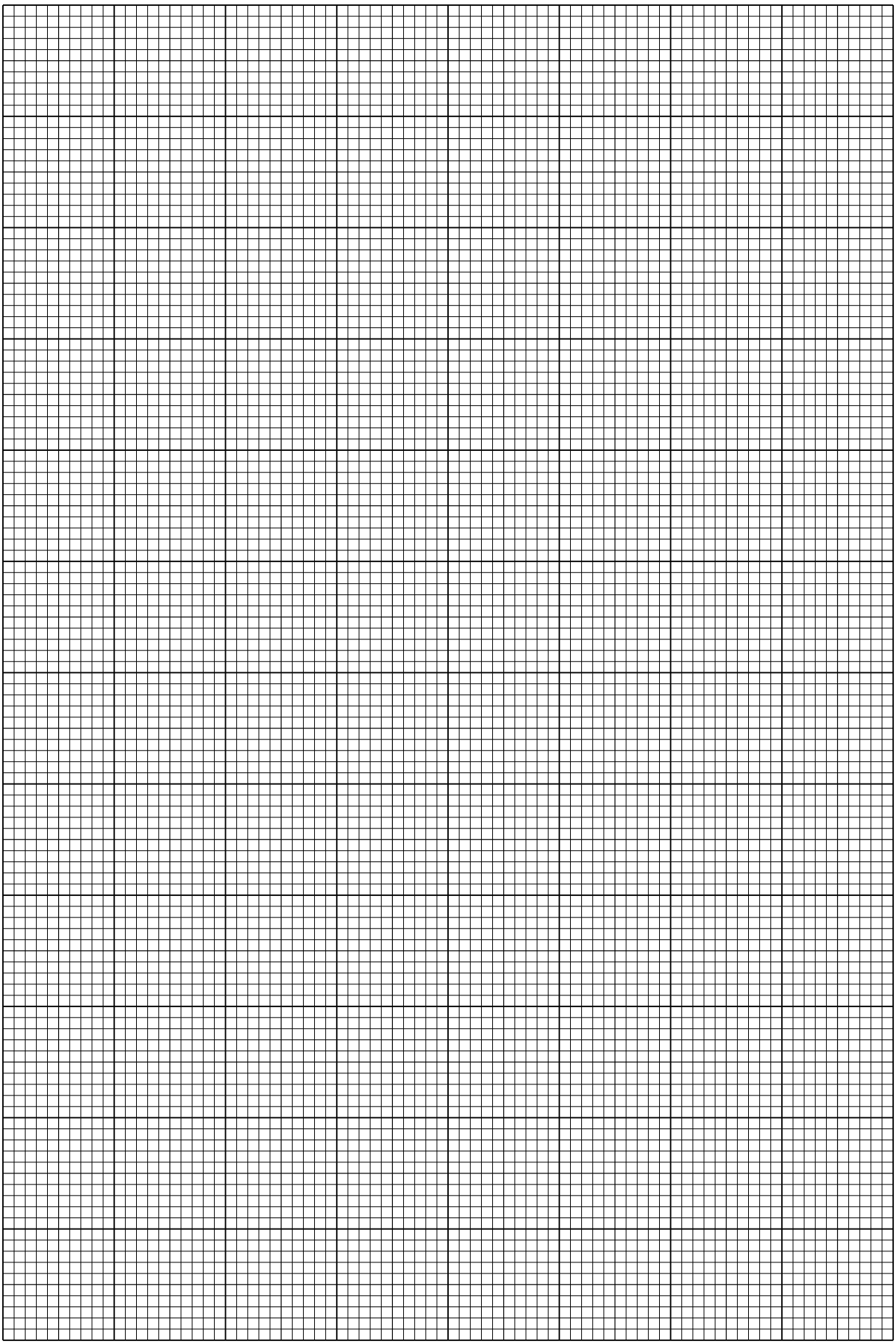
(ii) Draw the straight line of best fit. [1]

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

gradient = ...

y-intercept = ...

[2]



(f) The quantities θ and L are related by the equation

$$\frac{1}{\sin(\theta - 90°)} = aL + b$$

where a and b are constants.

Using your answers in **(e)(iii)**, determine the values of a and b.
Give appropriate units.

a = ...

b = ...

[2]

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

2 In this experiment, you will investigate the relationship between the performance of an electrical component and its volume.

(a) You are provided with two cylindrical components.

(i) Measure and record the diameter d and the length l of the larger cylindrical component, as shown in Fig. 2.1.

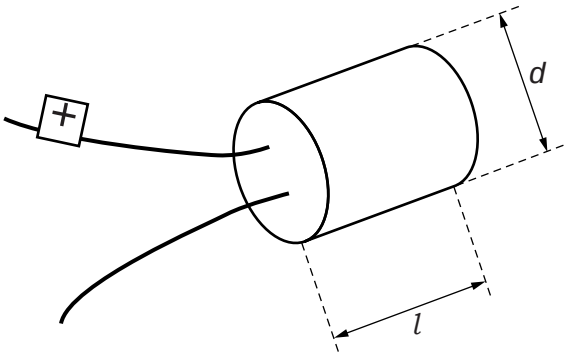


Fig. 2.1

d = ...

l = ...

[2]

(ii) Calculate the volume V of the component using $V = \frac{\pi d^2 l}{4}$.

V = ... [1]

(b) Justify the number of significant figures you have given for your value of V.

.....

.....

.....

..... [1]

(c) (i) Assemble the circuit shown in Fig. 2.2, using the larger cylindrical component. Ensure that the positive terminals are all connected as shown.

Switch on the power supply.

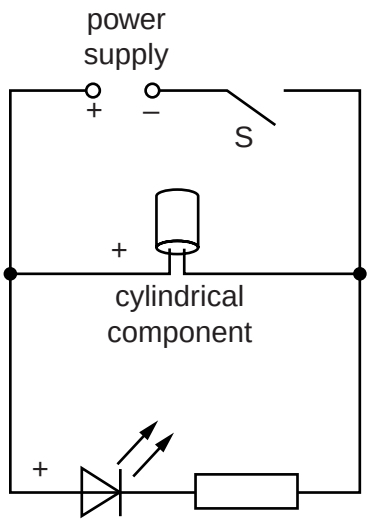


Fig. 2.2

(ii) Close switch S and watch the LED light up. Open switch S and watch the LED **gradually** go out.

(iii) Take measurements to find the time *t* between opening the switch S and the LED going out.

t = ... [2]

(d) Estimate the percentage uncertainty in your value of *t*.

percentage uncertainty = ... [1]

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(e) Using the smaller cylindrical component, repeat **(a)** and **(c)**.

d = ...

l = ...

V = ...

t = ...

[3]

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

$$t = kV$$

where k is a constant.

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

first value of k = ...

second value of k = ...

[1]

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

.....

.....

.....

.....[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]

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