Cambridge International AS & A Level

Cambridge International Examinations
Cambridge International Advanced Subsidiary and Advanced Level

CANDIDATE NAME									
CENTRE NUMBER						CANDIDATE NUMBER				

7613722796

PHYSICS **9702/35**

Paper 3 Advanced Practical Skills 1 **May/June 2016**

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 how the current in a circuit changes as the resistance of the circuit is changed.

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

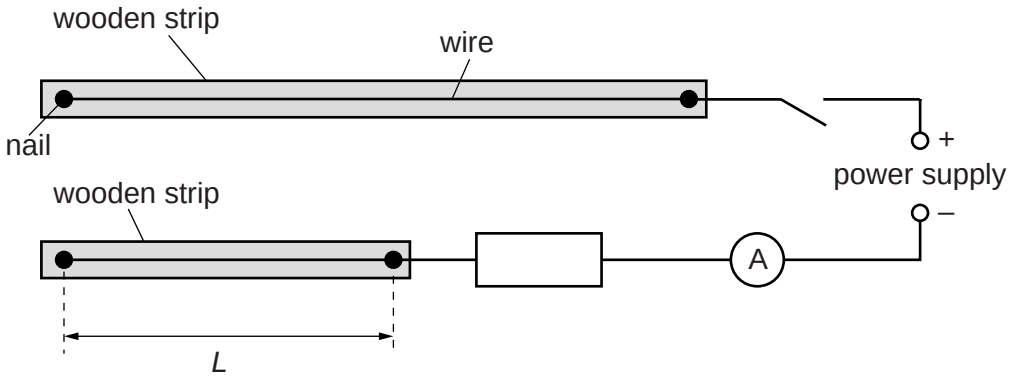


Fig. 1.1

(ii) Measure and record the length *L* of the shorter wire.

L = ...[1]

(b) (i) Complete the circuit as shown in Fig. 1.2.

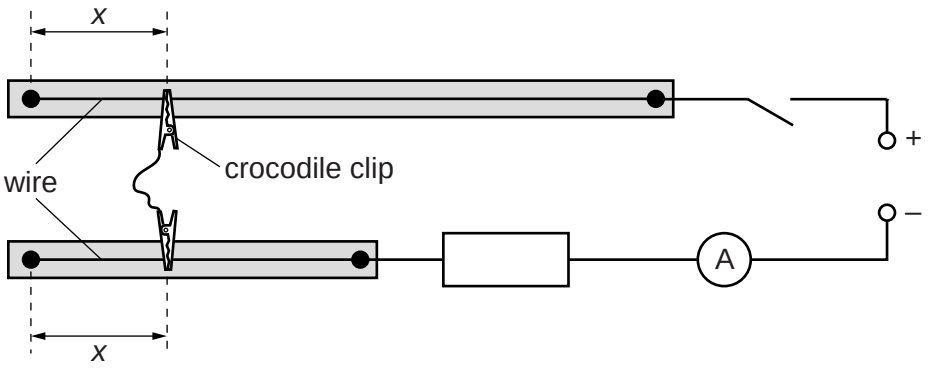


Fig. 1.2

Each crocodile clip should be attached to a wire at the **same distance** *x* from the end of the wire, as shown in Fig. 1.2.

(ii) Measure and record the distance *x.*

x = ...

(iii) Close the switch.

(iv) Record the ammeter reading *I*.

I = ...[1]

(v) Open the switch.

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

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

[9]

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

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

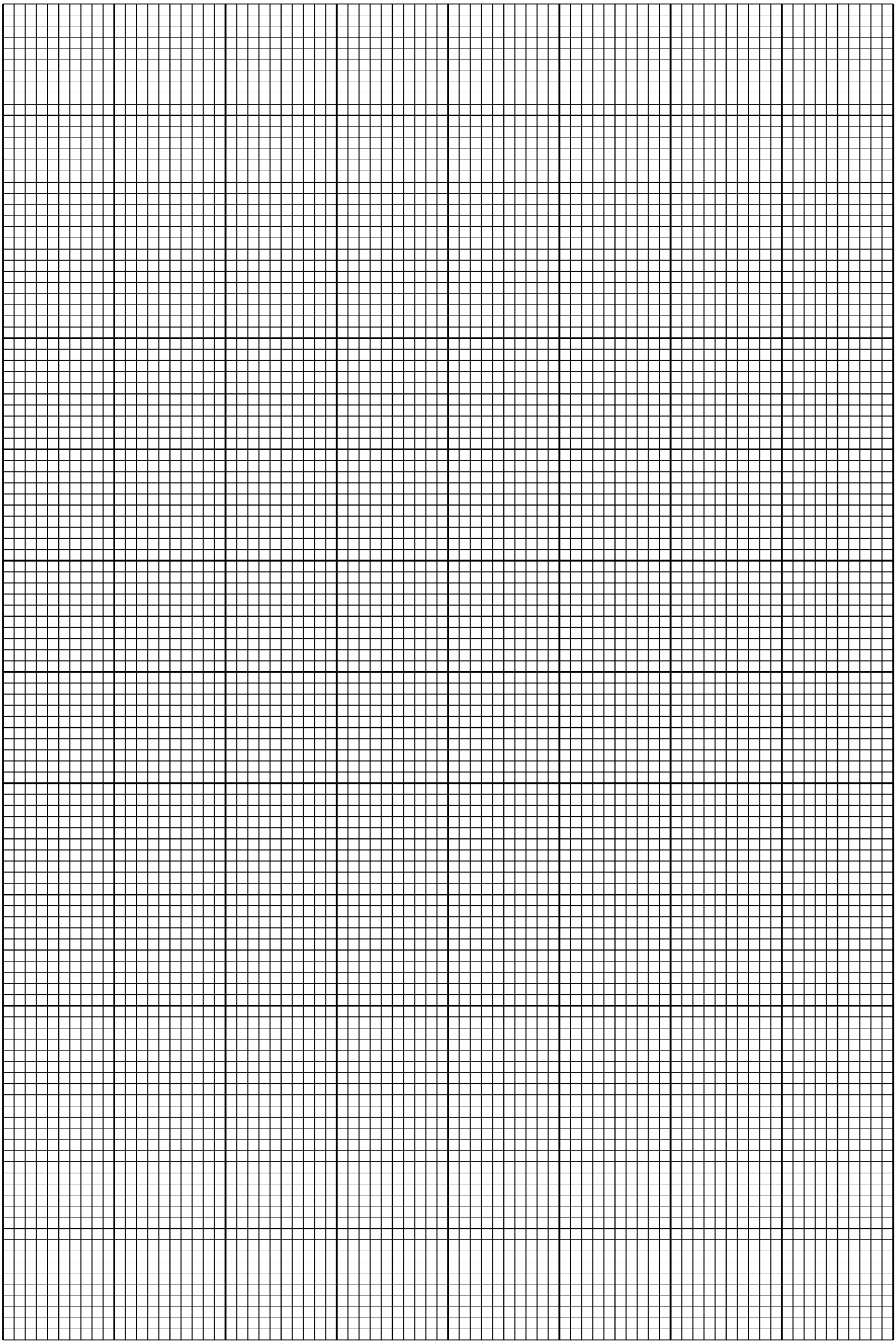
(iii) Determine the gradient and y-intercept of this line.

gradient = ...

y-intercept = ...

[2]

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

$$\frac{1}{I} = -Px + Q$$

where P and Q are constants.

Using your answers in **(d)(iii)**, determine values for P and Q.
Give appropriate units.

P = ...

Q = ...

[2]

(f) **(i)** The e.m.f. E of the d.c. power supply is given on the card.
Record E.

E = ... V

(ii) Theory suggests that

$$Q = \frac{R}{E} + \frac{3PL}{2}$$

where R is the resistance of the resistor.

Use values in **(a)(ii)**, **(e)** and **(f)(i)** to determine the value of R.

R = ...Ω [1]

[Total: 20]

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

2 In this experiment, you will investigate the position of a wooden strip with several forces acting on it.

(a) (i) Balance the wooden strip on the pivot as shown in Fig. 2.1.

The distance between one end of the wooden strip and the pivot is *C* when the wooden strip is balanced.

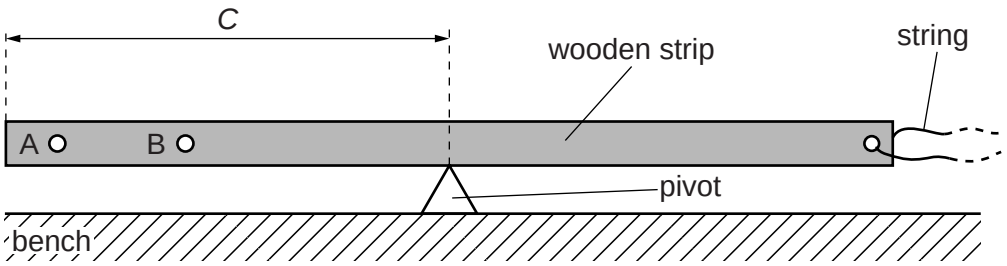


Fig. 2.1

(ii) Measure and record *C*.

C = ...[1]

(iii) Measure and record the distance *d* between the end of the wooden strip and the centre of hole A as shown in Fig. 2.2.



Fig. 2.2

d = ...[1]

(iv) Calculate (*C* – *d*).

(*C* – *d*) = ...[1]

(b) (i) Set up the apparatus as shown in Fig. 2.3 with the nail through hole A.

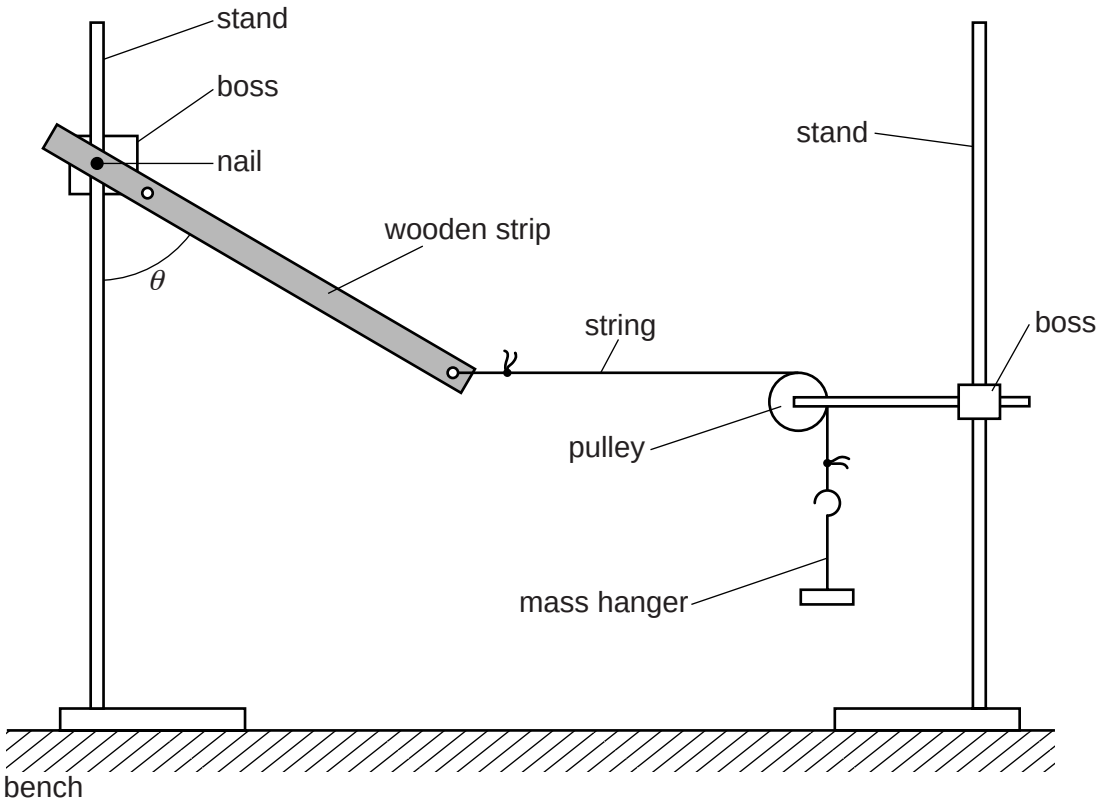


Fig. 2.3

Adjust the apparatus so that the string is parallel to the bench. The angle θ is the angle between the wooden strip and the stand.

(ii) Measure and record θ.

θ = ...[1]

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

percentage uncertainty = ...[1]

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(c) Calculate $(\tan\theta - 1)$.

Give your answer to a suitable number of significant figures.

$(\tan\theta - 1)$ = ...[2]

(d) Using hole B, repeat **(a)(iii)**, **(a)(iv)**, **(b)(i)**, **(b)(ii)** and **(c)**.

d = ...

$(C - d)$ = ...

θ = ...

$(\tan\theta - 1)$ = ...
[3]

(e) It is suggested that the relationship between θ and d is

$$(\tan\theta - 1) = \frac{k}{(C - d)}$$

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 support the suggested relationship.

.....

.....

.....

..... [1]

(f) **(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]

[Total: 20]

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