Cambridge International AS & A Level

Cambridge International Examinations
Cambridge International Advanced Subsidiary and Advanced Level

CANDIDATE NAME

CENTRE NUMBER

CANDIDATE NUMBER

1447792141

PHYSICS **9702/35**

Paper 3 Advanced Practical Skills 1 **October/November 2017**

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	

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[Turn over

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

1 In this experiment, you will investigate an electrical circuit.

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

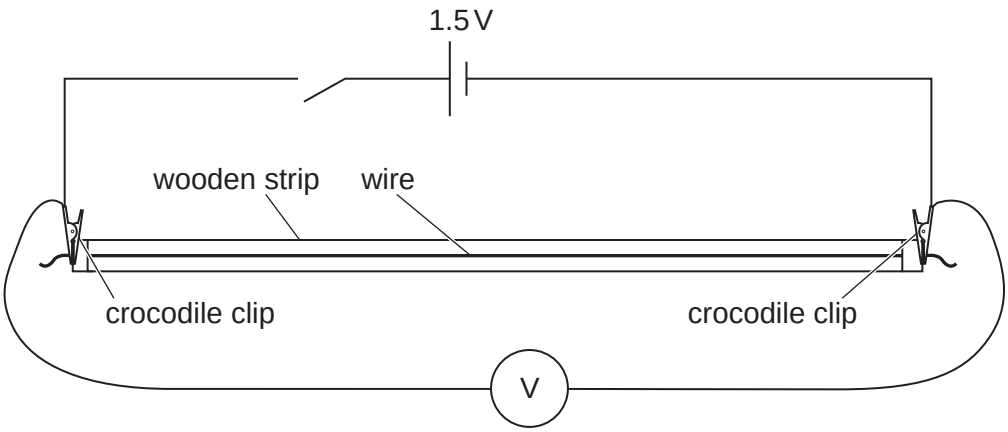


Fig. 1.1

(ii) Close the switch.

(iii) Record the voltmeter reading V.

V = ...[1]

(iv) Open the switch.

(v) Calculate $\frac{V}{2}$.

$\frac{V}{2}$ = ...

(b) (i) Set up the circuit shown in Fig. 1.2, using a resistor of resistance R equal to 10 Ω.

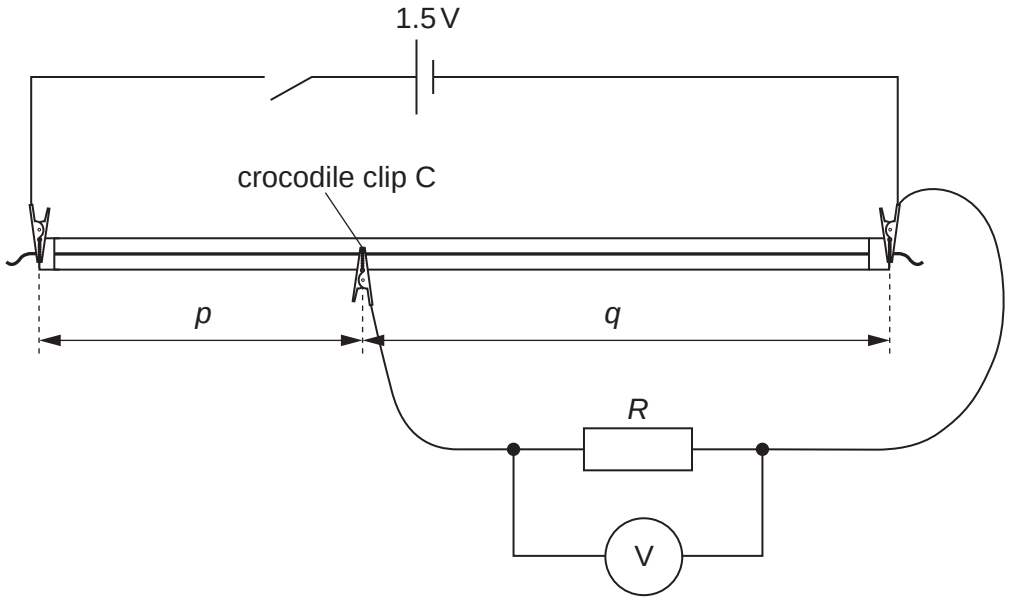


Fig. 1.2

(ii) Close the switch.

(iii) Move crocodile clip C along the wire until the voltmeter reading is equal to your value for $\frac{V}{2}$ in **(a)(v)**.

(iv) Measure and record the distances p and q as shown in Fig. 1.2.

p = ...

q = ... [1]

(v) Open the switch.

(c) Using one resistor at a time, vary R and repeat **(b)(ii)**, **(b)(iii)**, **(b)(iv)** and **(b)(v)** until you have six sets of readings of p, q and R. You may include your results from **(b)**.

Record your results in a table. Include values of $\frac{q}{R}$ and $\frac{q}{p}$ in your table.

[10]

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

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

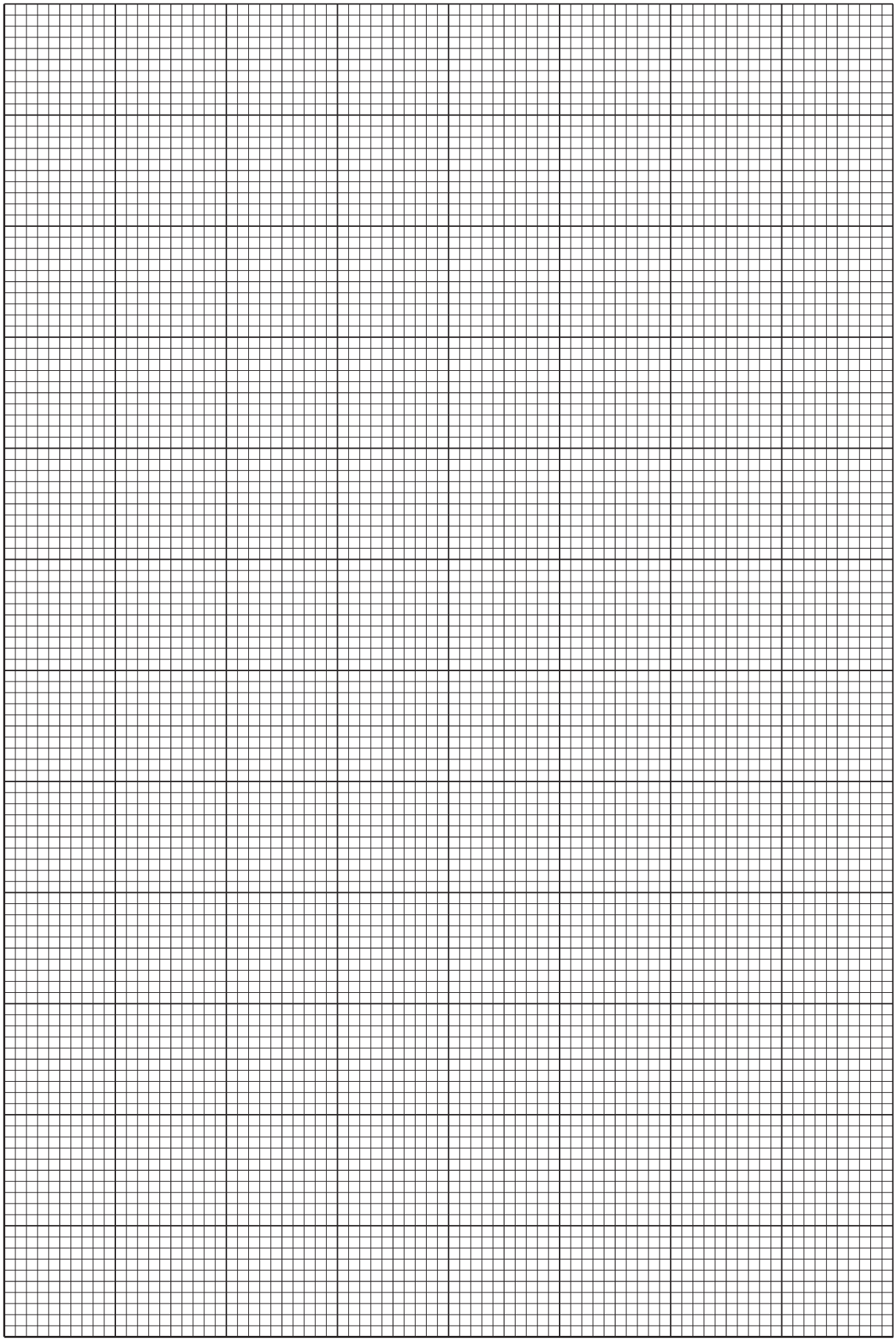
(iii) Determine the gradient and y-intercept of this line.

gradient = ...

y-intercept = ...

[2]

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(e) It is suggested that the quantities p, q and R are related by the equation

$$\frac{q}{p} = \frac{aq}{R} + b$$

where a and b are constants.

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

a = ...

b = ...

[2]

[Total: 20]

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

2 In this experiment, you will investigate the motion of a Y-shaped pendulum.

(a) You have been provided with two loops of string.

Stretch one of the loops as shown in Fig. 2.1.

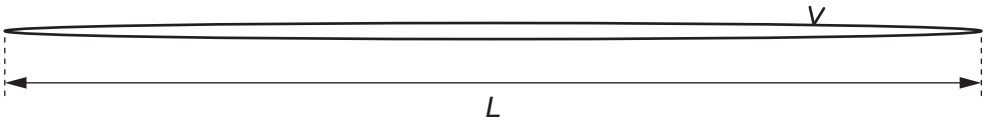


Fig. 2.1

Measure and record the length *L* as shown in Fig. 2.1.

L = ... [1]

(b) **(i)** Set up the apparatus as shown in Fig. 2.2. Move the stands so that the distance between the centres of the rods of the clamps is 25.0 cm.

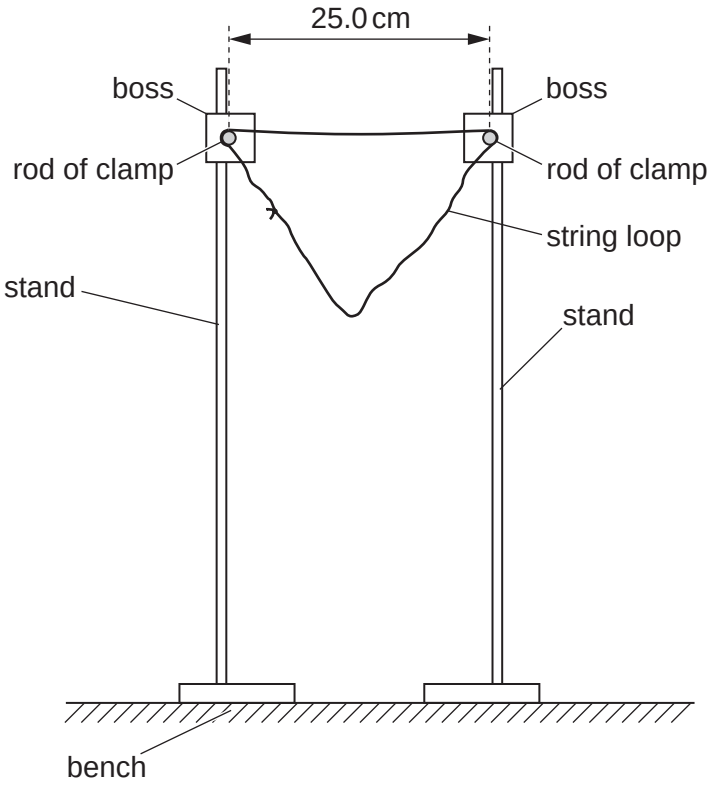


Fig. 2.2

(ii) Pull down on the bottom of the loop until it is fully stretched as shown in Fig. 2.3.

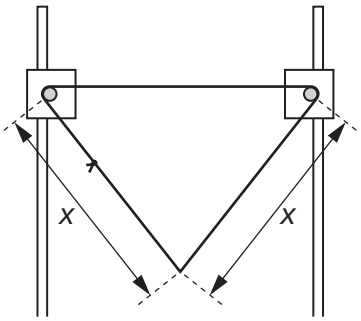


Fig. 2.3

The distance between the bottom of the loop and the centre of a rod is x.

Measure and record x.

x = ... [2]

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

percentage uncertainty = ... [1]

(iv) Calculate G where

$$G = \sqrt{L(2x - L)}\ .$$

G = ... [1]

(v) Justify the number of significant figures that you have given for your value of G.

.....

.....

..... [1]

(c) (i) You have been provided with two pendulum bobs tied to strings.

Tie the string attached to one of the bobs to the string loop so that the distance between the knot and the centre of the bob is equal to x, as shown in Fig. 2.4.

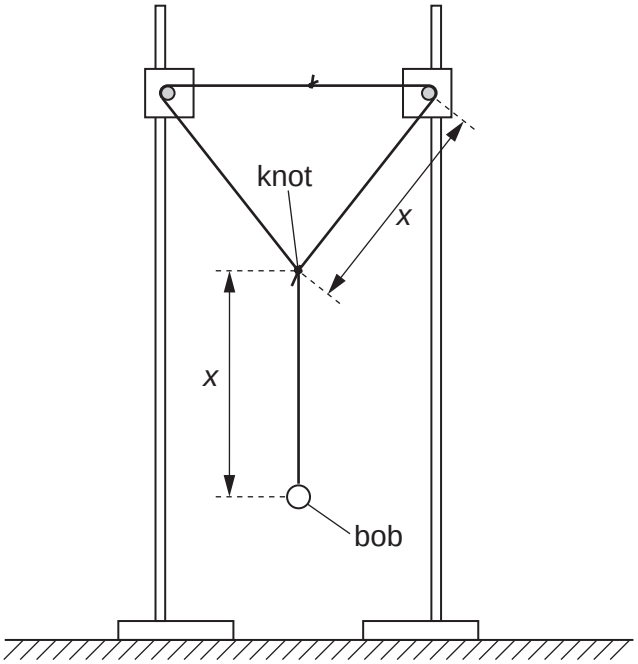


Fig. 2.4

(ii) Pull the bob a short distance towards you. Release the bob. The bob will oscillate.

Determine the period T of these oscillations.

T = ... [1]

(d) Move one of the stands until the distance between the centres of the rods of the clamps is 30.0 cm.

Using the second loop and bob, repeat **(a)**, **(b)(ii)**, **(b)(iv)** and **(c)**.

L = ...

x = ...

G = ...

T = ...

[3]

(e) It is suggested that the relationship between T, G and x is

$$T^2 = k(G + x)$$

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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