Cambridge International AS & A Level

Cambridge International Examinations
Cambridge International Advanced Subsidiary and Advanced Level

CANDIDATE NAME

CENTRE NUMBER | | | | | |

CANDIDATE NUMBER | | | | |

4967887368

PHYSICS **9702/34**

Paper 3 Advanced Practical Skills 2 **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	

This document consists of **11** printed pages and **1** blank page.

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[Turn over

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

1 In this experiment, you will investigate the motion of a pendulum.

(a) Assemble the apparatus as shown in Fig. 1.1 with the total mass *m* of the mass hanger and mass equal to 150 g.

The distance between the bottom of the split cork and the bottom of the mass hanger should be 64 cm. It may be necessary for the mass to hang over the edge of the bench.

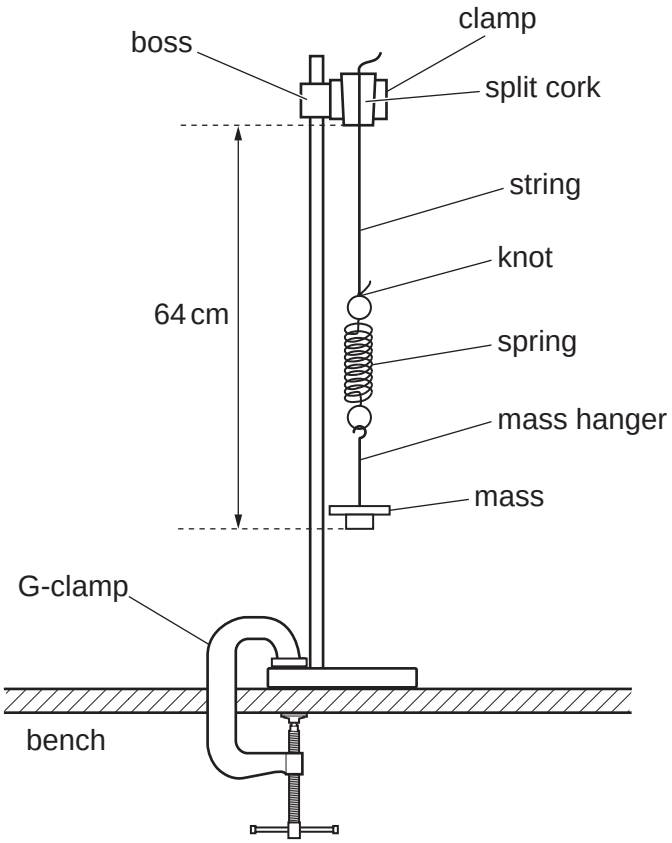


Fig. 1.1

(b) (i) Move the mass a short distance to one side and then carefully release it so that it swings with as little bouncing as possible, as shown in Fig. 1.2.

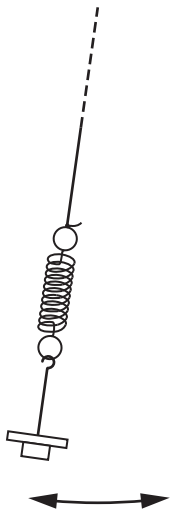


Fig. 1.2

(ii) Take measurements to determine the period T of the pendulum.

T = ... [2]

(c) Change m and repeat **(b)** until you have six sets of values of m and T. **Do not adjust the string in the split cork**.
Record your results in a table. Include values of T^2 in your table.

[10]

(d) **(i)** Plot a graph of T^2 on the y-axis against m on the x-axis. [3]

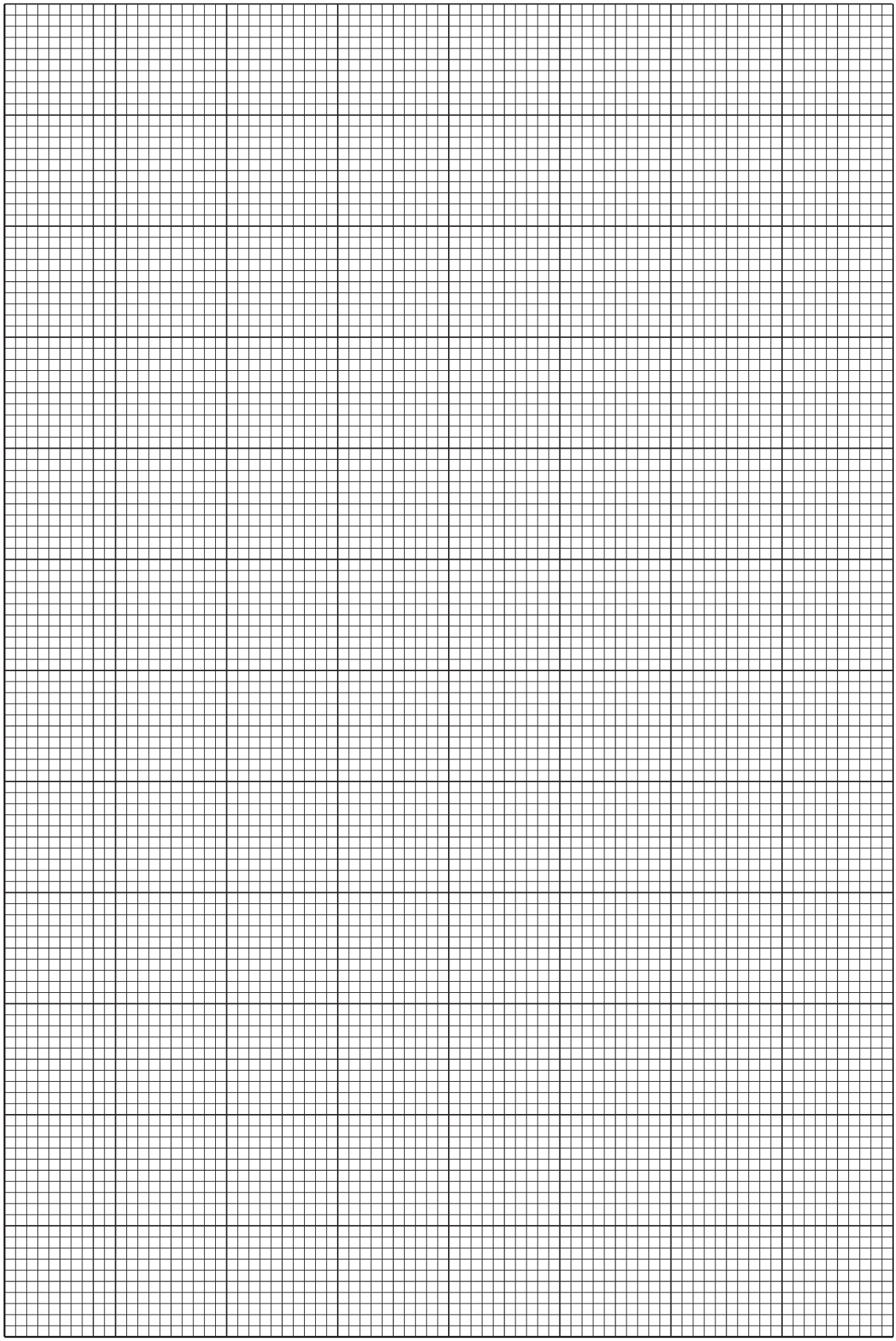
(ii) Draw the straight line of best fit. [1]

(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 T and m are related by the equation

$$T^2 = am + b$$

where a and b are constants.

Use your answers from **(d)(iii)** to determine the values of 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 an optical system.

(a) (i) Use a small piece of Plasticine to fix the torch horizontally on one of the wooden blocks.

(ii) Put the remaining Plasticine inside the transparent container and push the lens into it so that the lens is held vertically and parallel to two opposite sides of the container.

(b) (i) Position the apparatus as shown in Fig. 2.1, with the front of the torch approximately 32 cm from the lens.

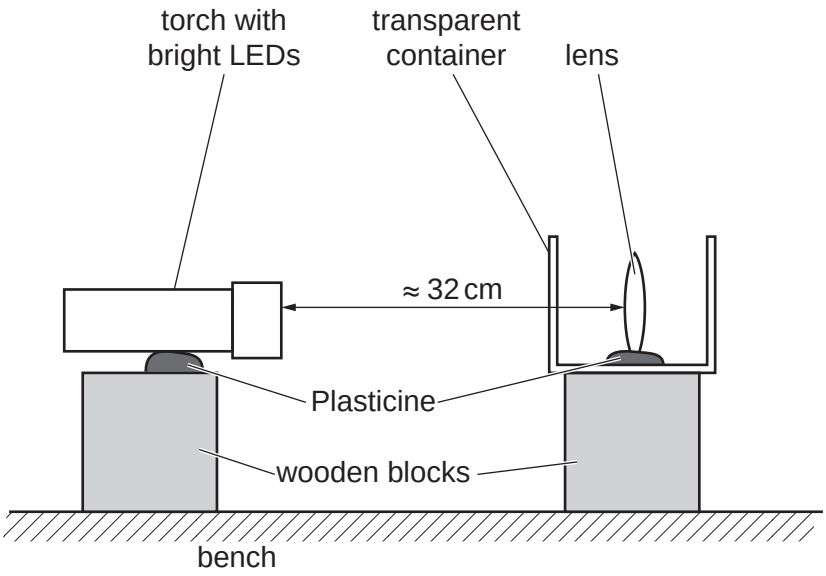


Fig. 2.1 (not to scale)

(ii) Switch on the torch.

(iii) Measure the distance u from the front of the torch to the centre of the lens, as shown in Fig. 2.2.

u = ... [1]

(iv) Place the white screen as shown in Fig. 2.2. Keeping the screen vertical, move it until it shows a sharp image of the LEDs in the torch.

(v) Measure the distance v from the centre of the lens to the screen, as shown in Fig. 2.2.

v = ... [1]

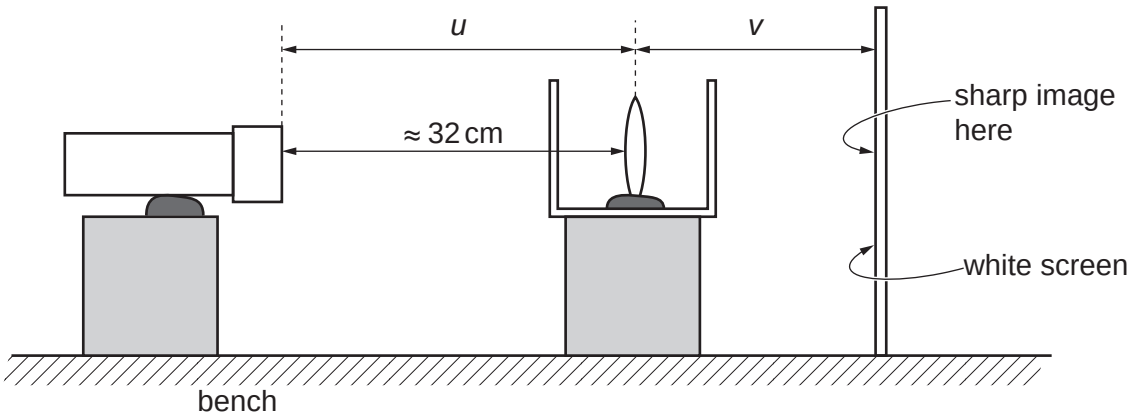


Fig. 2.2 (not to scale)

(c) Estimate the percentage uncertainty in your value of v.

percentage uncertainty = ... [1]

(d) Calculate the value of f using the expression $f = \frac{uv}{(u + v)}$.

f = ... [1]

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(e) **(i)** Without moving the container and the torch, pour water into the container to submerge the lens.

(ii) Reposition the screen so that it shows a sharp image of the LEDs.

(iii) Measure the new distance v_w from the lens to the screen.

v_w = ... [2]

(iv) Calculate f_w using $f_w = \frac{uv_w}{(u + v_w)}$.

f_w = ...

(v) Switch off the torch.

(f) Justify the number of significant figures you have given for your value of f_w.

.....

.....

.....[1]

(g) **(i)** Pour the water from the container back into the beaker, making sure that the lens remains fixed in the container.

(ii) Repeat **(b)**, **(d)** and **(e)** but with the front of the torch approximately 22 cm from the lens.

u = ...

v = ...

f = ...

v_w = ...

f_w = ...
[3]

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(h) It is suggested that the relationship between f_w and f is

$$f_w = kf$$

where k is a constant.

(i) Using your data from **(d)** and **(e)(iv)** and your data from **(g)**, calculate two values of k.

first value of k = ...

second value of k = ...

[1]

(ii) Explain whether your results support the suggested relationship.

.....

.....

.....

.....[1]

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(i) **(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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