



Cambridge International AS & A Level

CANDIDATE
NAME

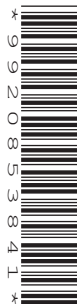


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PHYSICS

9702/35

Paper 3 Advanced Practical Skills 1

May/June 2025

2 hours

You must answer on the question paper.

You will need: The materials and apparatus listed in the confidential instructions

INSTRUCTIONS

- Answer **all** questions.
- Use a black or dark blue pen. You may use an HB pencil for any diagrams or graphs.
- Write your name, centre number and candidate number in the boxes at the top of the page.
- Write your answer to each question in the space provided.
- Do **not** use an erasable pen or correction fluid.
- Do **not** write on any bar codes.
- You will be allowed to work with the apparatus for a maximum of 1 hour for each question.
- You should record all your observations in the spaces provided in the question paper as soon as these observations are made.
- You may use a calculator.
- You should show all your working and use appropriate units.

INFORMATION

- The total mark for this paper is 40.
- The number of marks for each question or part question is shown in brackets [].

For Examiner's Use	
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2	
Total	

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

- 1 In this experiment, you will investigate the oscillations of a magnet.

You have been provided with a small magnet attached to a string. You have also been provided with a bar magnet, a plotting compass and a sheet of paper.

- (a) • Draw a straight line of approximate length 20 cm on the sheet of paper.
- Mark point X at the centre of this line as shown in Fig. 1.1.

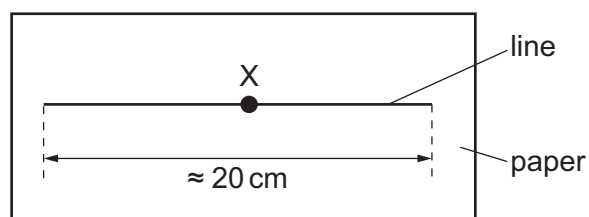


Fig. 1.1

- Rotate the paper so that the straight line on the paper is aligned with the N–S direction shown by the plotting compass, as shown in Fig. 1.2.
- Keep the magnets away from the plotting compass while you are doing this.**

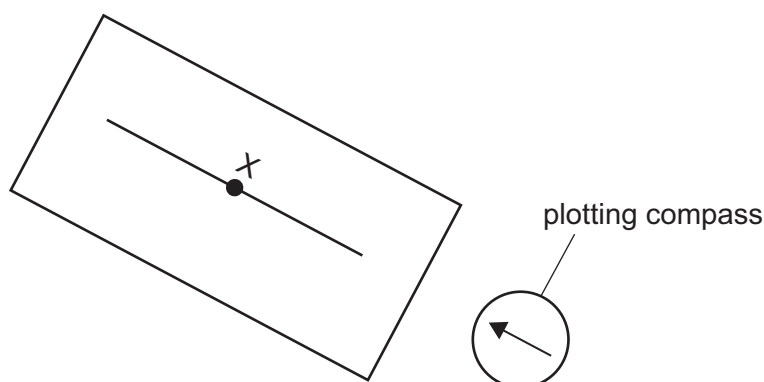


Fig. 1.2

- Fix the paper to the bench in this position using adhesive putty.
- The paper should stay in this position throughout the experiment.**



- Set up the apparatus as shown in Fig. 1.3.

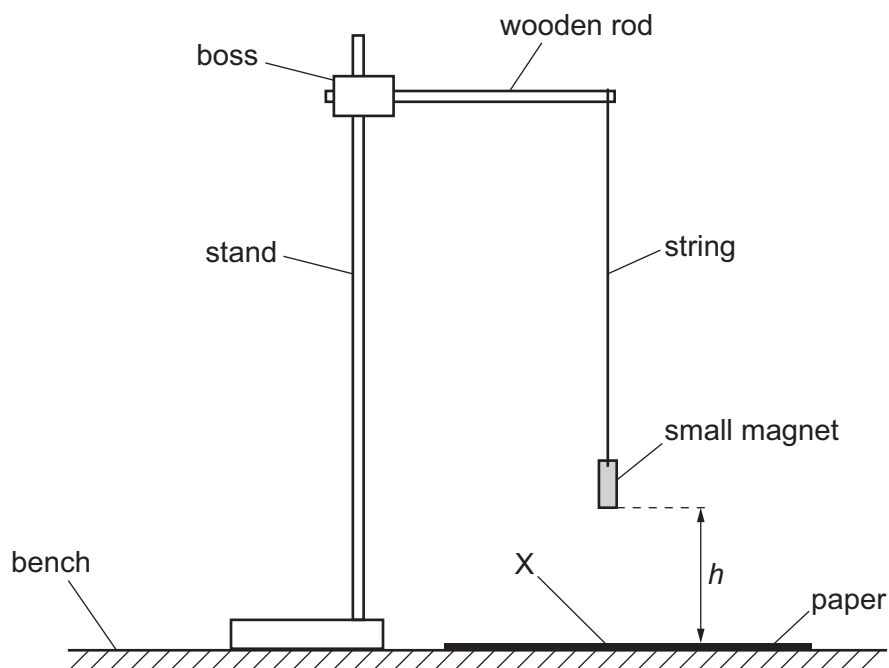


Fig. 1.3

- Adjust the position of the stand until the small magnet is directly over point X on the paper.
- The distance between the bottom of the small magnet and the paper is h .

Adjust the height of the boss until h is 3.0 cm.

- Displace the small magnet through a short distance **in the direction of the line on the paper**.
- Release the small magnet. The small magnet will oscillate.
- The period of the oscillations of the small magnet is T_0 .

Take measurements to determine T_0 .

$$T_0 = \dots\dots\dots [2]$$



- (b) • Place the bar magnet on the sheet of paper at the position shown in Fig. 1.4.

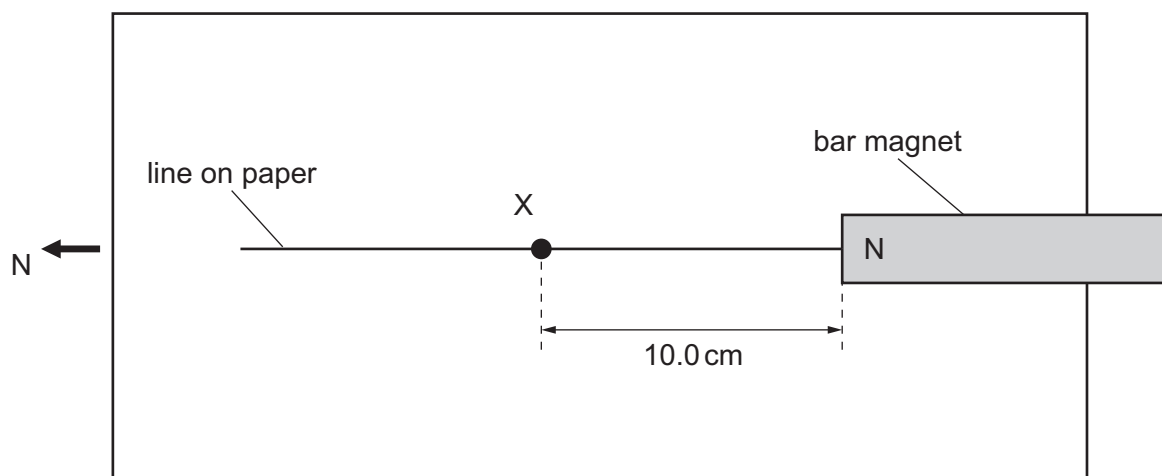


Fig. 1.4

- Draw around the bar magnet. **Do not move it from this position.**
- Displace the small magnet through a short distance in the direction of the line on the paper. Release the small magnet. The small magnet will oscillate.
- The period of the oscillations of the small magnet is T .

Record h and determine T .

$h =$

$T =$

[1]





(c) Write down your value of T_0 from (a).

$T_0 =$

Change the height of the boss such that h is in the range $3.0 \text{ cm} \leq h \leq 9.0 \text{ cm}$.

For each value of h , determine T .

Repeat until you have six sets of values of h and T . Include your values from (b).

Record your results in a table. Include values of $\frac{T}{T_0}$ in your table.

[9]

(d) (i) Plot a graph of $\frac{T}{T_0}$ on the y-axis against h 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 h are related by the equation

$$\frac{T}{T_0} = Ph + Q$$

where P and Q are constants.

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

$P =$

$Q =$

[2]

[Total: 20]



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

2 In this experiment, you will investigate the behaviour of suspended cardboard sheets.

You have been provided with two cardboard sheets labelled A and B.

- (a) • The thickness of sheet A is t . Use the micrometer to measure t .
- Record t .

$t = \dots\dots\dots$ mm [1]

- (b) (i) • Use the nail to make holes in two corners of sheet A as shown in Fig. 2.1.

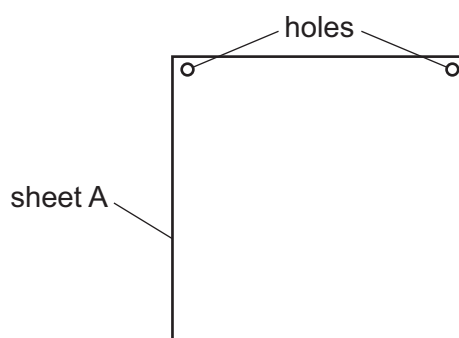


Fig. 2.1

- Ensure that the sheet is able to swing freely on the nail when the nail is placed in either hole.
- Set up the apparatus as shown in Fig. 2.2.

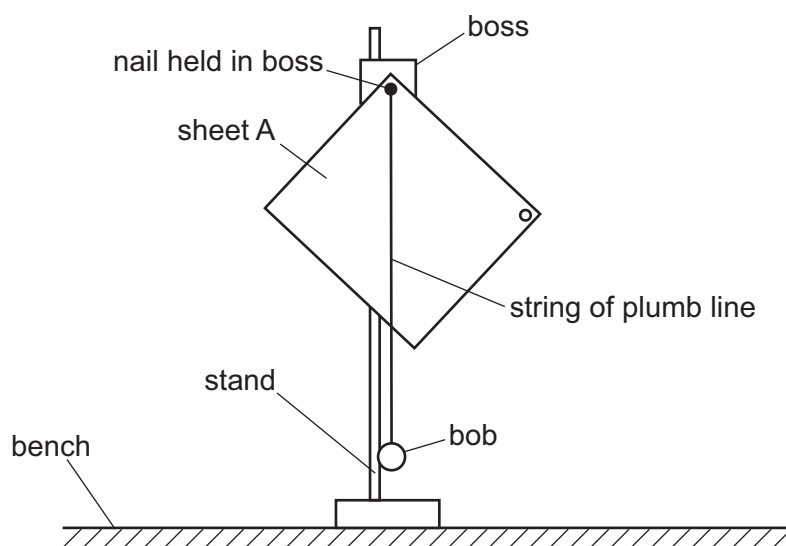


Fig. 2.2

- Place the nail through one of the holes in A and place the string loop of the plumb line over the nail.



- Draw a line on A along the length of the string of the plumb line.
- Place the nail through the other hole in A and draw a line on A along the length of the string of the plumb line.
- The two lines will cross at a point called the centre of gravity. Label this point P as shown in Fig. 2.3.

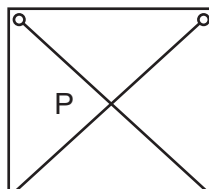


Fig. 2.3

- Use adhesive putty to attach the two 10g masses to A at the edge of the sheet as shown in Fig. 2.4.

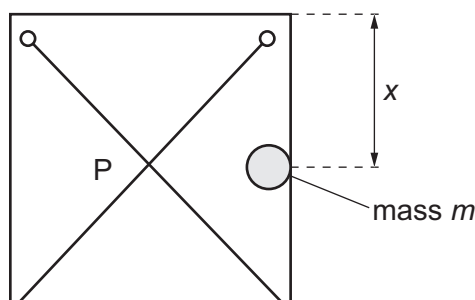


Fig. 2.4

- The distance between the top edge of the sheet and the centre of the masses is x , as shown in Fig. 2.4.

The total mass attached to the sheet is m .

Adjust the position of the masses until x is approximately 10 cm.

- Record m and x .

$m = \dots\dots\dots$ g

$x = \dots\dots\dots$ cm
[1]



- (ii) • Repeat the same process to determine the new centre of gravity of A. Label this point Q.
- The distance between P and Q is y , as shown in Fig. 2.5.

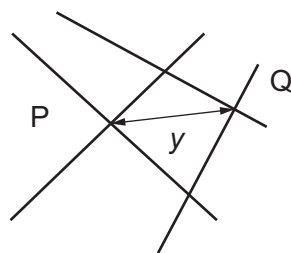


Fig. 2.5

Measure and record y .

$y = \dots\dots\dots$ cm [2]

- (iii) Estimate the percentage uncertainty in your value of y . Show your working.

percentage uncertainty = $\dots\dots\dots$ % [1]

- (iv) Calculate $\frac{y^2}{m^2}$.

$\frac{y^2}{m^2} = \dots\dots\dots$ cm^2g^{-2} [1]

- (v) Justify the number of significant figures that you have given for your value of $\frac{y^2}{m^2}$.

.....

.....

..... [1]





- (c) Using sheet B, repeat (a), (b)(i), (b)(ii) and (b)(iv) with a value of m of 10 g and a value of x of approximately 5 cm.

$$t = \dots\dots\dots \text{ mm}$$

$$m = \dots\dots\dots \text{ g}$$

$$x = \dots\dots\dots \text{ cm}$$

$$y = \dots\dots\dots \text{ cm}$$

$$\frac{y^2}{m^2} = \dots\dots\dots \text{ cm}^2\text{g}^{-2} \quad [3]$$





(d) It is suggested that the relationship between y , m , x and t is

$$\frac{y^2}{m^2} = \frac{k}{xt}$$

where k is a constant.

Using your data, calculate **two** values of k .

first value of k =

second value of k =

[1]

(e) It is suggested that the percentage uncertainty in the values of k is 20%.

Using this uncertainty, explain whether your results support the relationship in (d).

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.....

.....

..... [1]



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

For any uncertainties in measurement that you describe, you should state the quantity being measured and a reason for the uncertainty.

1

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2

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3

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4

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[4]

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

1

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2

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3

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4

.....

[4]

[Total: 20]





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