



Cambridge International AS & A Level

CANDIDATE
NAMECENTRE
NUMBER

--	--	--	--	--

CANDIDATE
NUMBER

--	--	--	--

PHYSICS

9702/34

Paper 3 Advanced Practical Skills 2

May/June 2026

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. Do **not** use correction fluid or tape.
- 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

1	
2	
Total	

This document has **12** pages.

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

1 In this experiment, you will investigate the equilibrium of forces.

- (a)**
- Assemble the apparatus as shown in Figure 1.1.
 - Attach the 50 g mass to the back of the board using the bolt and nut.
 - Push the nail through the fourth hole from the top of the board, and fix the nail in the boss.
 - Hang the plumb line from the nail.

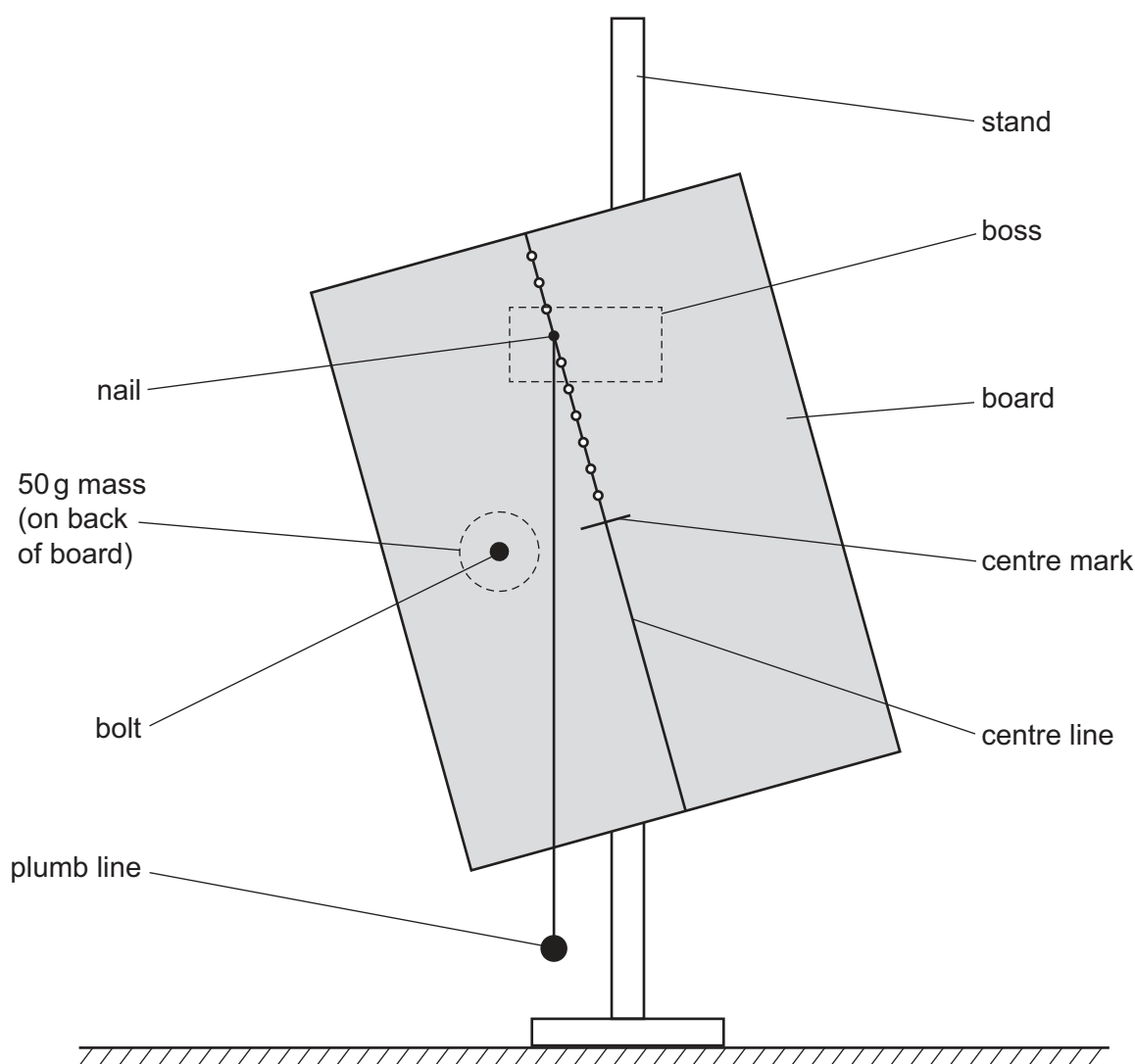


Figure 1.1

- Check that the board swings freely.

- The distance between the nail and the centre mark is d , as shown in Figure 1.2.

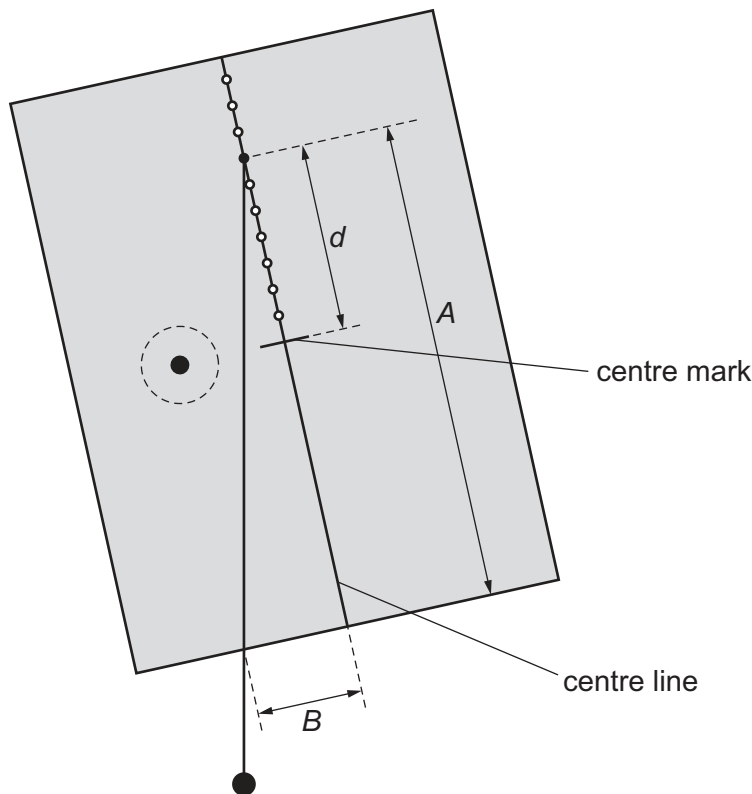


Figure 1.2

Measure and record d .

$d = \dots\dots\dots$

- The distance between the nail and the lower edge of the board is A , as shown in Figure 1.2.

Measure and record A .

$A = \dots\dots\dots$

- The distance along the lower edge of the board between the plumb line and the centre line is B , as shown in Figure 1.2.

Measure and record B .

$B = \dots\dots\dots$

- Calculate t using $t = \frac{B}{A}$.

$t = \dots\dots\dots$

[2]





- (b) Change d by moving the nail to another hole in the board. Measure and record d , A and B . Repeat until you have six sets of values.

Do **not** use holes that give values of B greater than 10.5 cm.

Record your results in a table. Include values of t and $\frac{1}{d}$ in your table.

[10]

- (c) (i) Plot a graph of t on the y -axis against $\frac{1}{d}$ on the x -axis.

[3]

- (ii) Draw the straight line of best fit.

[1]

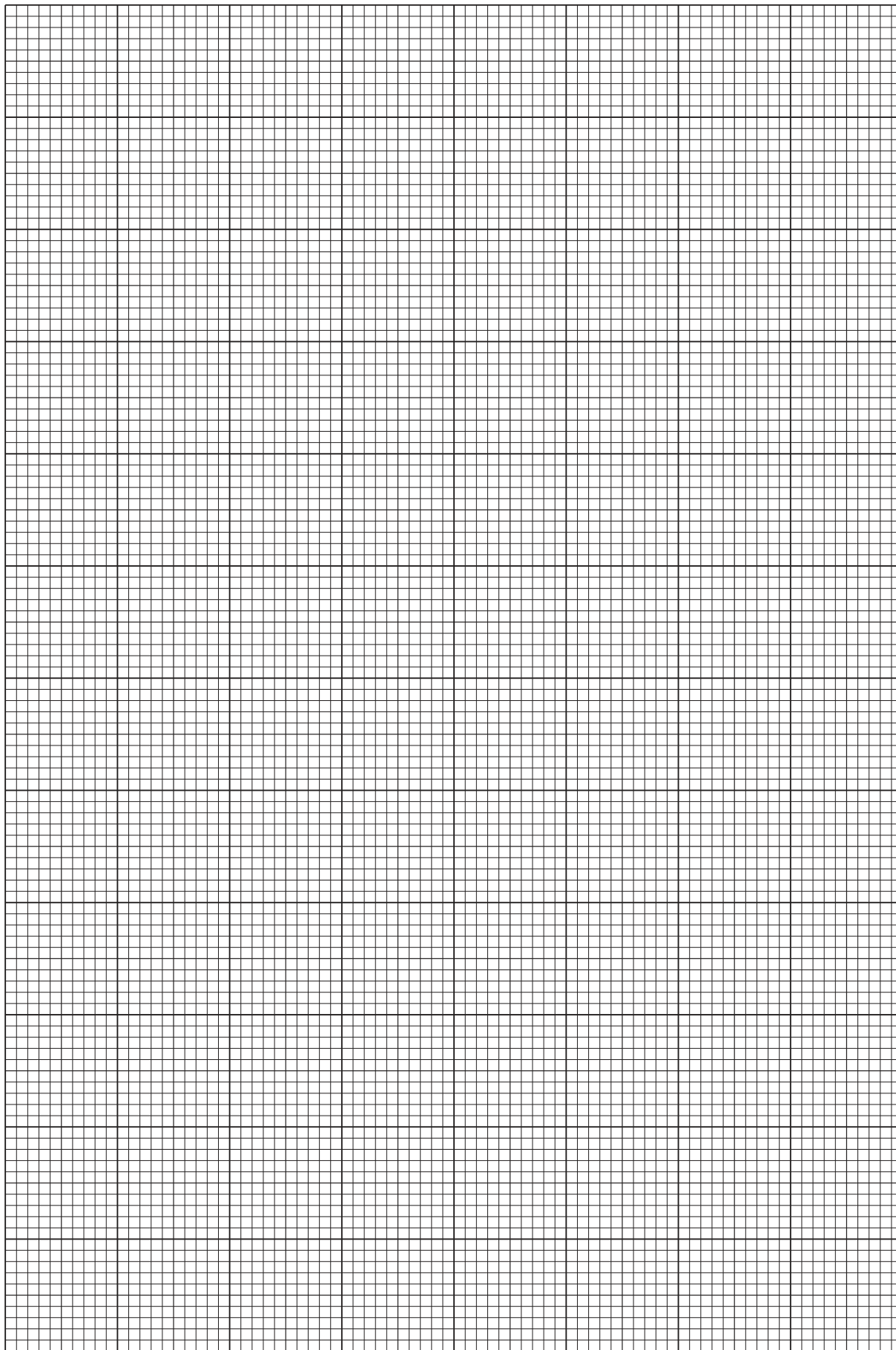
- (iii) Determine the gradient and y -intercept of this line.

gradient = ...

y -intercept = ...

[2]







(d) It is suggested that the quantities t and d are related by the equation

$$t = \frac{p}{d} + q$$

where p and q are constants.

Use your answers in **1(c)(iii)** to determine the values of p and q .
Give appropriate units.

$p =$

$q =$

[2]

[Total: 20]





Turn over



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

2 In this experiment, you will investigate the rate of flow of water through a tube.

(a) You have been provided with two lengths of tube. Select the **longer** tube.

(i) Measure and record the length L of the tube.

$L = \dots\dots\dots$ [1]

(ii) Using the calipers, measure and record the **internal** diameter D of the tube.

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

- (b) (i)
- Remove the plunger from the syringe.
 - Push one end of the tube onto the nozzle of the syringe body.
 - Assemble the apparatus as shown in Figure 2.1.

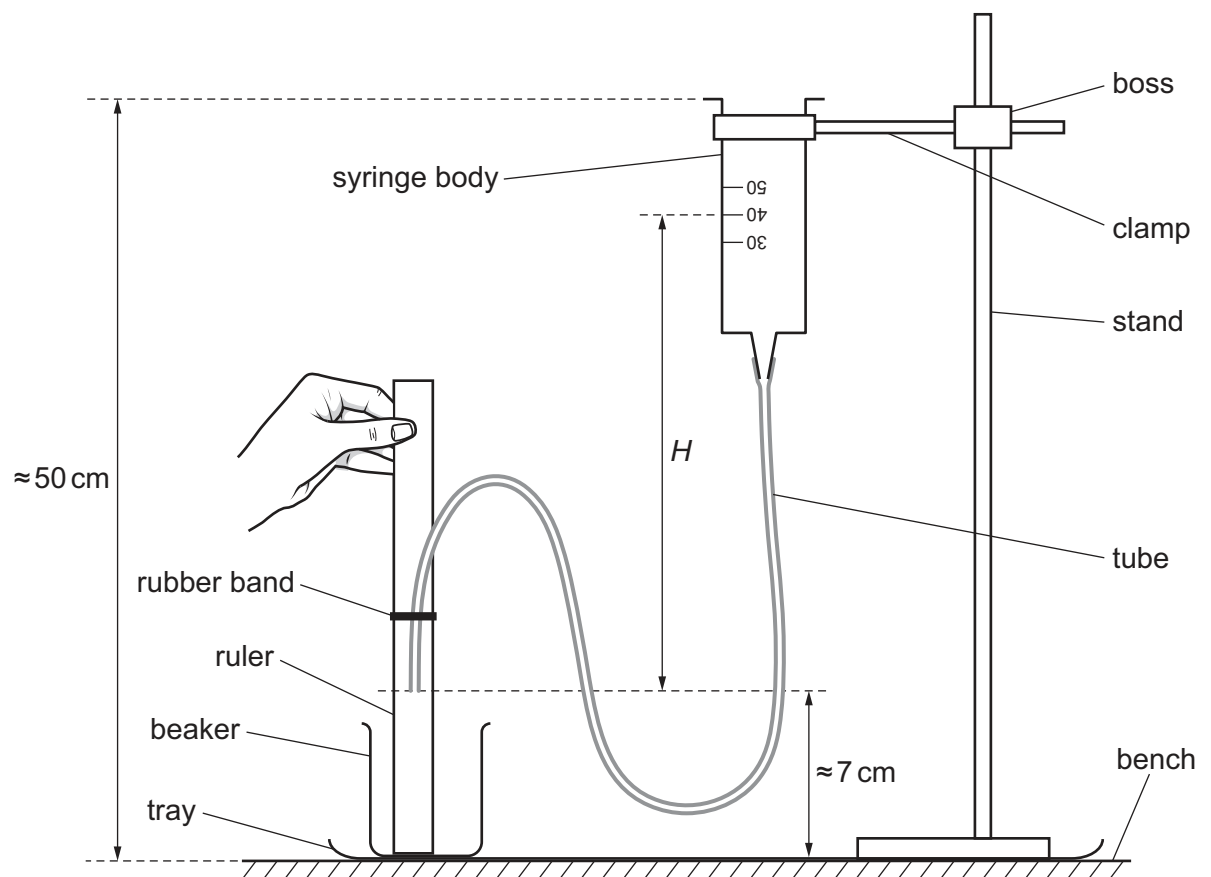


Figure 2.1



- Adjust the height of the boss so that the top of the syringe body is approximately 50 cm above the bench.
- The vertical distance between the lower end of the tube and the 40 cm³ graduation on the syringe body is H .

Measure and record H .

$$H = \dots\dots\dots [1]$$

- (ii) Estimate the percentage uncertainty in your value of H . Show your working.

$$\text{percentage uncertainty} = \dots\dots\dots \% [1]$$

- (iii) • Fill the syringe body with water from the jug.
- The time taken for the water level to move between the 50 cm³ graduation and the 30 cm³ graduation is T .

Determine T .

$$T = \dots\dots\dots [2]$$





(c) (i) Repeat **2(a)(i)** using the **shorter** tube.

$$L = \dots\dots\dots [1]$$

(ii) Repeat **2(b)(i)** and **2(b)(iii)** using the shorter tube and with the top of the syringe body approximately 30 cm above the bench.

$$H = \dots\dots\dots$$

$$T = \dots\dots\dots [2]$$

(d) Theory suggests that the relationship between T , D , H and L is

$$\frac{1}{T} = \frac{kD^4H}{L}$$

where k is a constant.

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

$$\text{first value of } k = \dots\dots\dots$$

$$\text{second value of } k = \dots\dots\dots [1]$$



(ii) Justify the number of significant figures that you have given for your values of k .

.....

.....

..... [1]

(e) It is suggested that the percentage uncertainty in the values of k is 15%.

Using this uncertainty, explain whether your results support the relationship in **2(d)**.

.....

.....

.....

..... [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
- 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]

Permission to reproduce items where third-party owned material protected by copyright is included has been sought and cleared where possible. Every reasonable effort has been made by the publisher (Cambridge University Press & Assessment) to trace copyright holders, but if any items requiring clearance have unwittingly been included, the publisher will be pleased to make amends at the earliest possible opportunity.

To avoid the issue of disclosure of answer-related information to candidates, all copyright acknowledgements are reproduced online in our Copyright Acknowledgements Booklet. This is produced for each series of examinations and is freely available to download at www.cambridgeinternational.org after the live examination series.

Cambridge International Education is the name of our awarding body and a part of Cambridge University Press & Assessment, which is a department of the University of Cambridge.

