



Cambridge International AS & A Level

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PHYSICS

9702/35

Paper 3 Advanced Practical Skills 1

October/November 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	
1	
2	
Total	

This document has **16** pages. Any blank pages are indicated.

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

- 1 In this experiment, you will investigate the equilibrium of a wooden rod.

Some of the apparatus has been set up for you.

- (a) (i) • Fig. 1.1 shows the rod with two eyes.

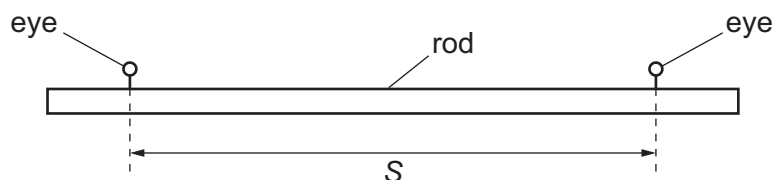


Fig. 1.1

The distance between the two eyes on the rod is S .

Measure and record S .

$S =$

- Complete the set-up of the apparatus as shown in Fig. 1.2.

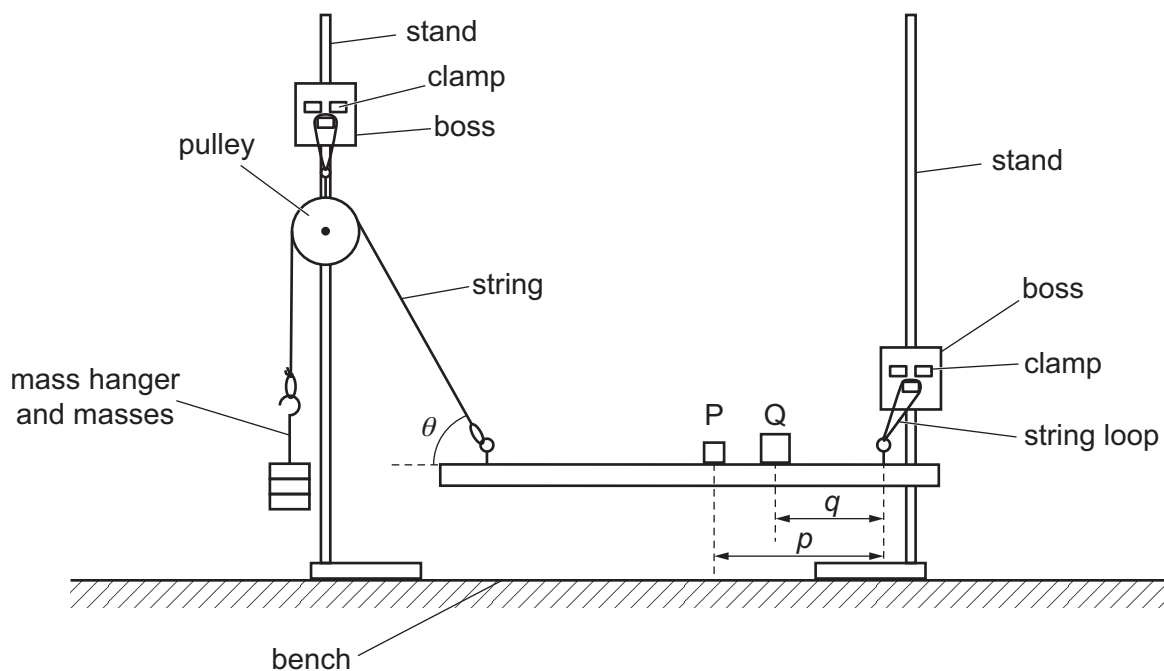


Fig. 1.2



- P and Q are masses.

The distance between the centre of mass P and the centre of the right-hand eye is p , as shown in Fig. 1.2.

The distance between the centre of mass Q and the centre of the right-hand eye is q , as shown in Fig. 1.2.

The angle between the string and the rod is θ .

Use some of the adhesive putty to attach Q to the rod so that q is approximately 26 cm.

- Use some of the adhesive putty to attach P to the rod. Adjust the position of P and the position of the stand with the pulley so that the rod is parallel to the bench and θ is approximately 45° .

Do not move the stands for the remainder of the experiment.

- Measure and record θ , p and q .

$\theta = \dots\dots\dots^\circ$

$p = \dots\dots\dots$

$q = \dots\dots\dots$

[2]

- (ii) The moment of the force about the eye due to mass P is T_P .

The moment of the force about the eye due to mass Q is T_Q .

The values of T_P and T_Q are given by:

$$T_P = 5Wp \quad \text{and} \quad T_Q = 7Wq$$

where W has the value 0.0981 N.

Calculate T_P and T_Q .

$T_P = \dots\dots\dots$

$T_Q = \dots\dots\dots$

[1]





- (b) Change the position of Q and adjust the position of P until the rod is again parallel to the bench. Measure p and q . Repeat until you have six sets of values of p and q .

Record your results in a table. Include values of T_P and T_Q in your table.

[8]

- (c) (i) Plot a graph of T_Q on the y -axis against T_P on the x -axis.

[3]

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

[1]

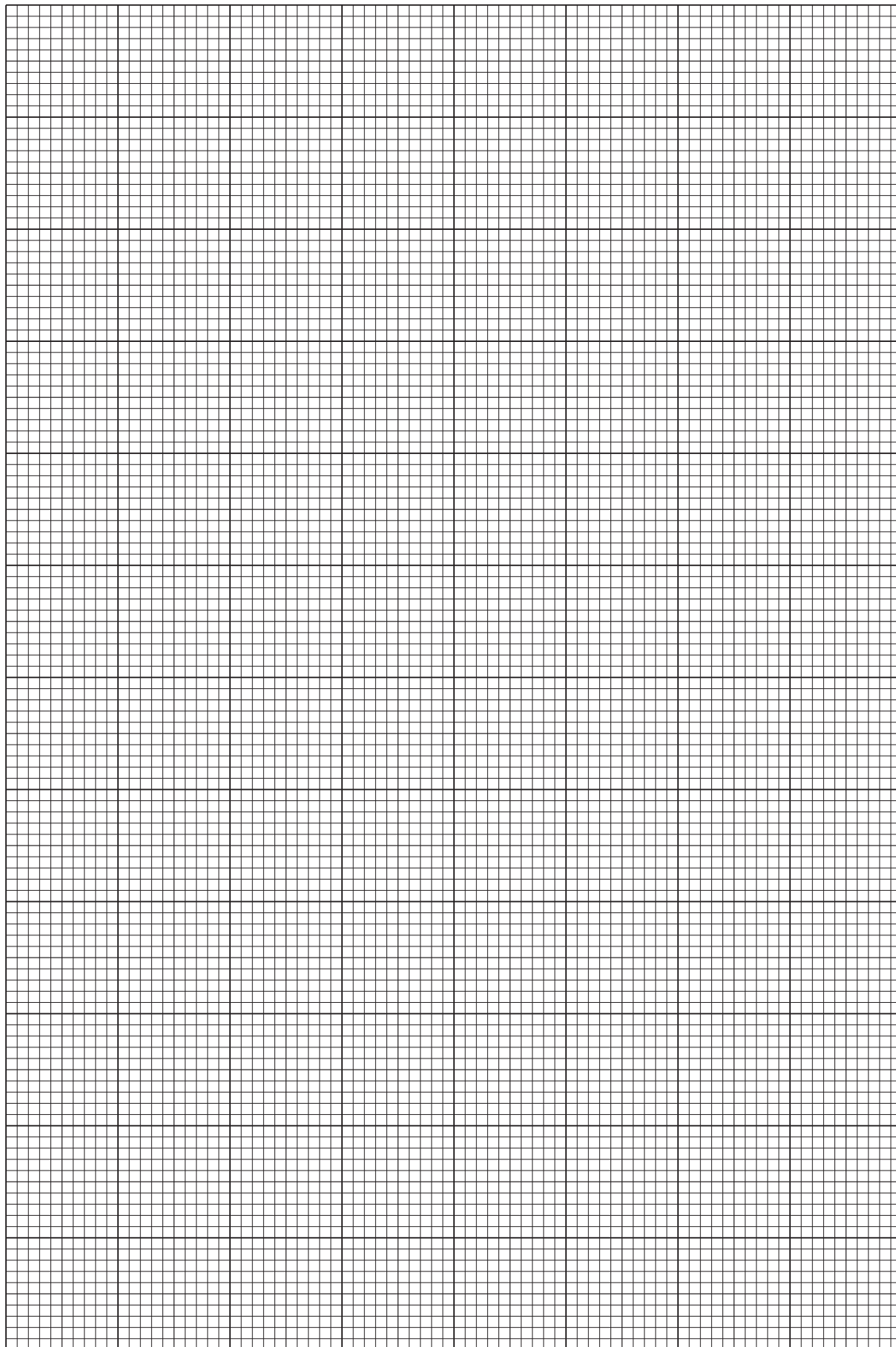
- (iii) Determine the gradient and y -intercept of this line.

gradient =

y -intercept =

[2]





- (d) (i) It is suggested that the quantities T_Q and T_P are related by the equation

$$T_Q = A + BT_P$$

where A and B are constants.

Using your answers in (c)(iii), determine the values of A and B .
Give appropriate units.

$$A = \dots\dots\dots$$

$$B = \dots\dots\dots$$

[2]

- (ii) Theory suggests that

$$R = F \sin \theta - \frac{2A}{S}$$

where R is the weight of the rod and F has the value 2.94 N.

Use your answers in (a)(i) and (d)(i) to determine a value for R .
Give an appropriate unit.

$$R = \dots\dots\dots [1]$$

[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 rolling of a plastic bottle.

(a) (i) You are provided with a plastic bottle with a cap, as shown in Fig. 2.1.

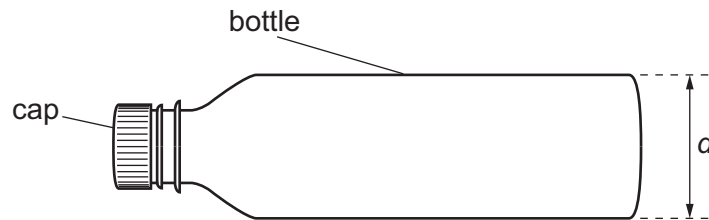


Fig. 2.1

The diameter of the base of the bottle is d .

Measure and record d .

$d = \dots\dots\dots$ [1]

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

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

(b) • Set up the apparatus as shown in Fig. 2.2.

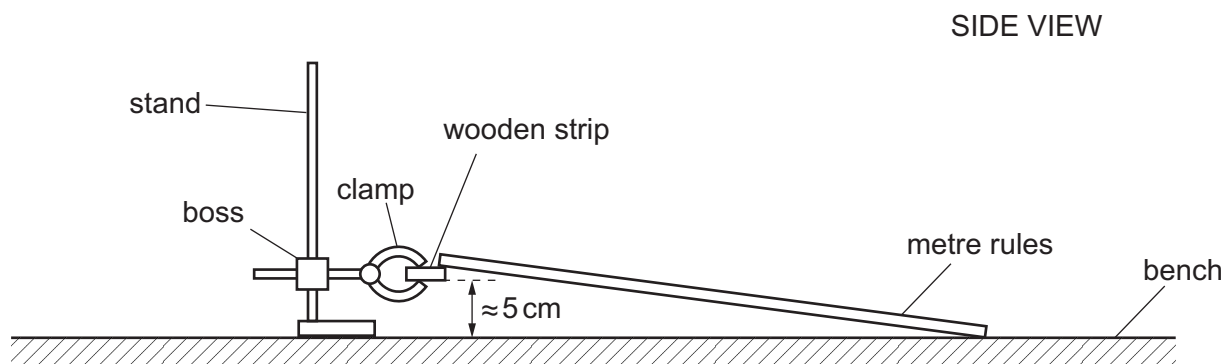


Fig. 2.2



- Adjust the two metre rules so that the rules are approximately parallel to each other, as shown in Fig. 2.3.

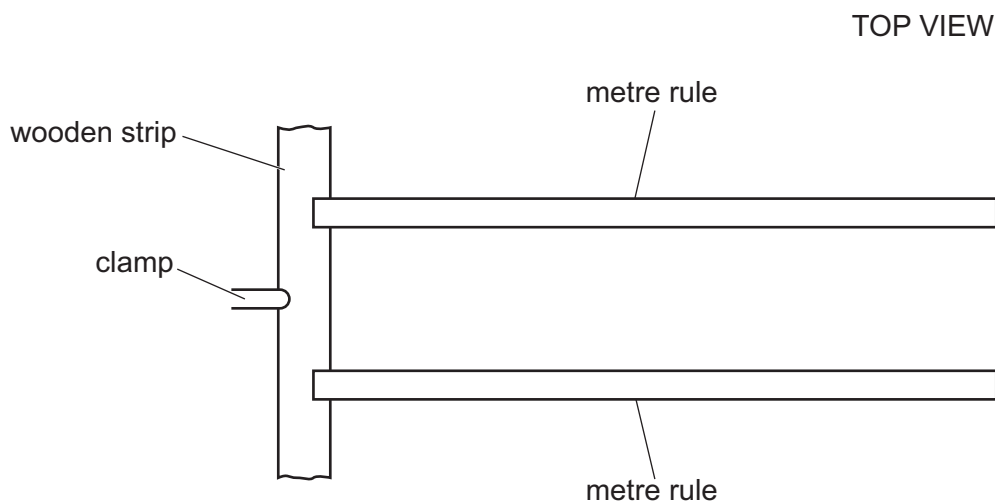


Fig. 2.3

- Pour all the water from the beaker into the bottle.
- Place the bottle on the two rules as shown in Fig. 2.4.

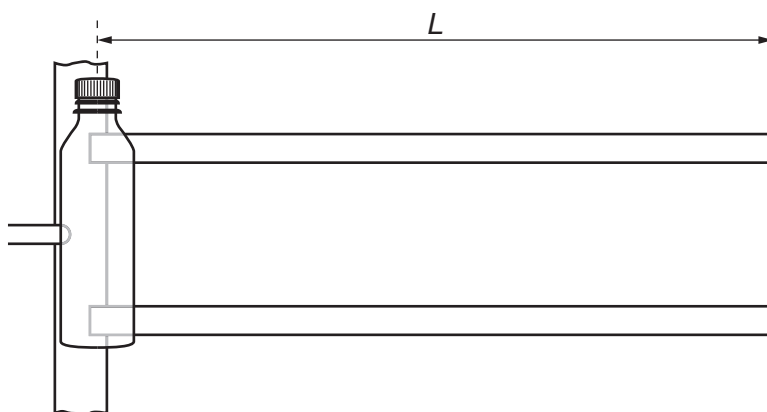


Fig. 2.4 (not to scale)

- Release the bottle. Adjust the rules so that the bottle rolls to the end of the rules.
- The distance that the bottle rolls on the rules is L , as shown in Fig. 2.4.

Measure and record L .

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



- (c) (i) • Stand the bottle upright on the bench.
- The height of the water in the bottle is h , as shown in Fig. 2.5.

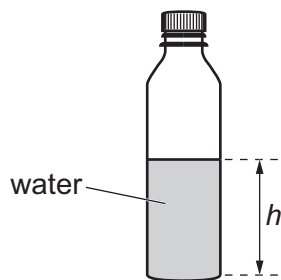


Fig. 2.5

Measure and record h .

$h =$

- The time for the bottle to roll distance L on the rules is t .

Take measurements to determine t .

$t =$ [3]

- (ii) A value for the acceleration a of the bottle is given by

$$a = \frac{2L}{t^2}.$$

Calculate a .

$a =$ [1]

- (iii) Justify the number of significant figures that you have given for your value of a .

.....

.....

..... [1]



- (d) • Pour approximately half the water from the bottle into the beaker.
- Repeat (c)(i) and (c)(ii).

$$h = \dots\dots\dots$$

$$t = \dots\dots\dots$$

$$a = \dots\dots\dots [2]$$

- (e) It is suggested that the relationship between a and h is

$$a = \frac{kd\sqrt{\pi h}}{2}$$

where k is a constant.

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

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

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





(f) 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 (e).

.....

.....

.....

..... [1]



(g) (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

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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

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3

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4

.....

[4]

[Total: 20]









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