



# Cambridge International AS & A Level

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## PHYSICS

9702/32

Paper 3 Advanced Practical Skills 2

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

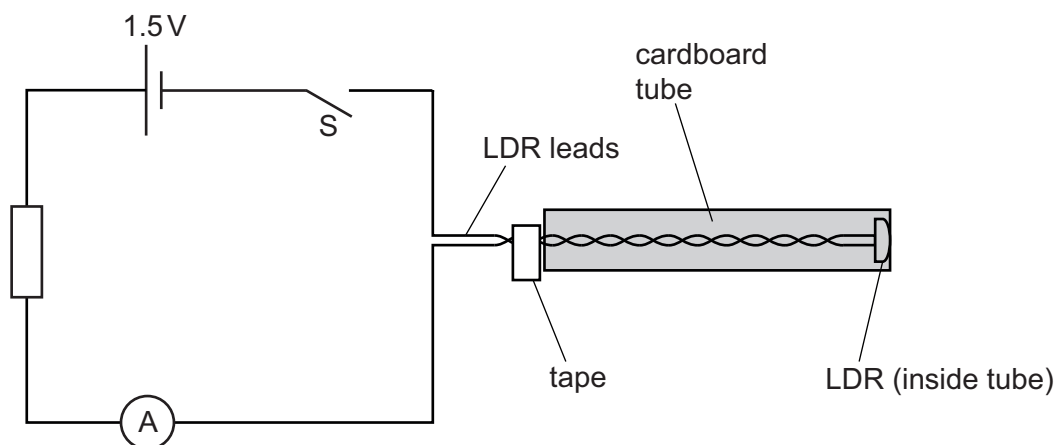
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This document has **12** pages. Any blank pages are indicated.

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

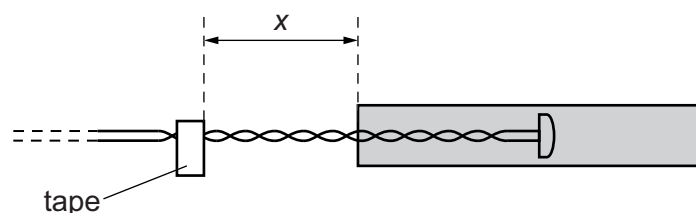
**1** In this experiment, you will investigate a light-dependent resistor (LDR).

**(a)** • Connect the circuit shown in Fig. 1.1.



**Fig. 1.1**

- Ensure that the switch S is open.
- Slide the LDR leads into the tube until the front of the LDR is just level with the open end of the tube, as shown in Fig. 1.1.
- With the LDR in this position, attach a piece of adhesive tape to the leads as a marker at the other end of the tube, as shown in Fig. 1.1.
- Slide the tube until the LDR is approximately half-way along it, as shown in Fig. 1.2.



**Fig. 1.2**



\* 0000800000003 \*



3

- The distance between the tape and the tube is  $x$ .

Measure and record  $x$ .

$x =$  .....

- Close S and record the ammeter reading  $I$ .

$I =$  .....

- Open S.

[2]





- (b) Change  $x$  by moving the LDR to a new position inside the tube, with  $x$  in the range 4 cm to 18 cm. Record  $x$  and  $I$ .

Repeat until you have six sets of values of  $x$  and  $I$ .

Record your results in a table. Include values of  $\sqrt{I}$  in your table.

[10]

- (c) (i) Plot a graph of  $\sqrt{I}$  on the  $y$ -axis against  $x$  on the  $x$ -axis.

[3]

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

[1]

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

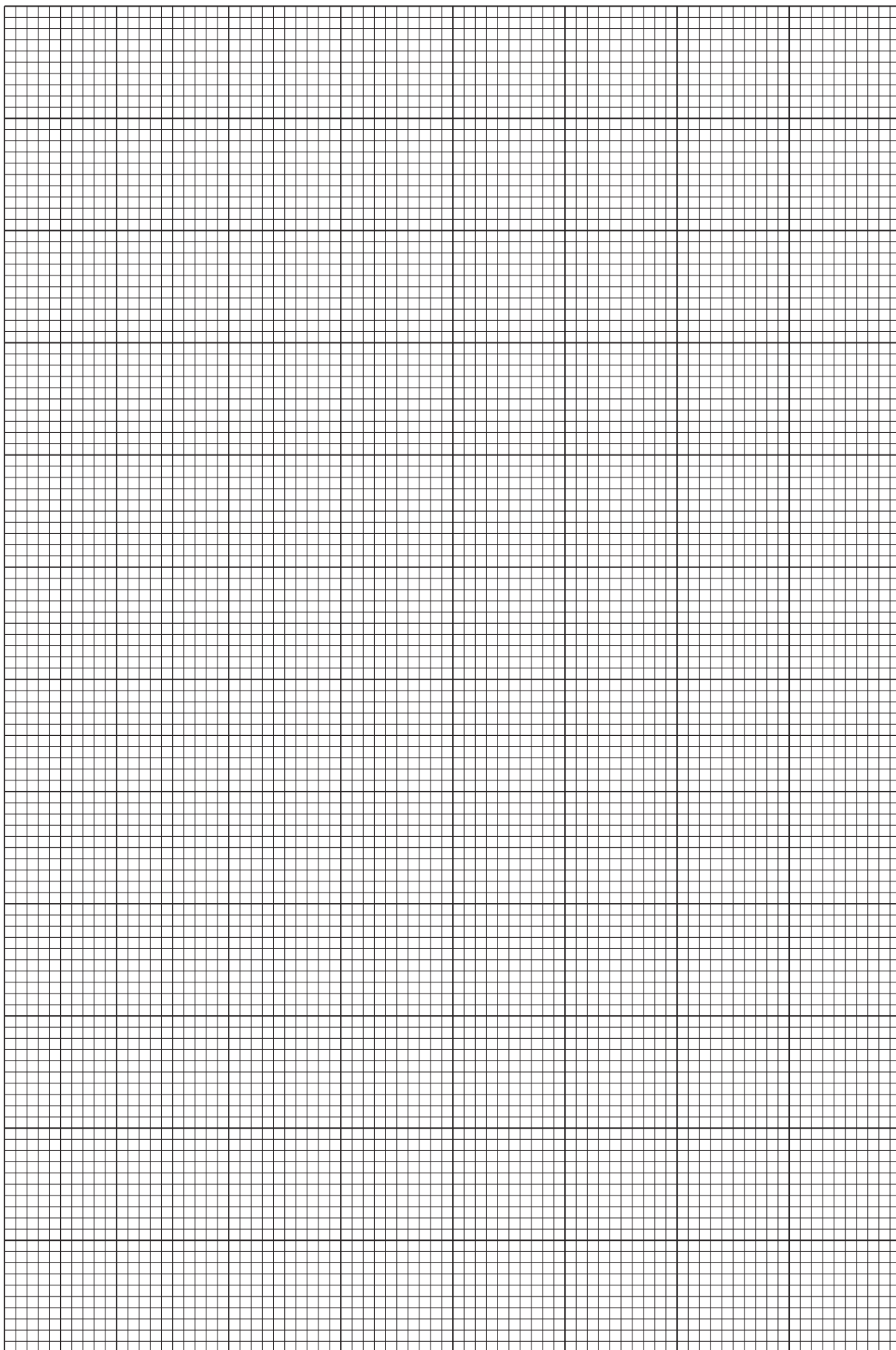
gradient = .....

$y$ -intercept = .....

[2]



\* 0000800000005 \*





(d) It is suggested that the quantities  $I$  and  $x$  are related by the equation

$$\sqrt{I} = ax + b$$

where  $a$  and  $b$  are constants.

Using your answers in (c)(iii), determine the values of  $a$  and  $b$ .

Give appropriate units.

$a =$  .....

$b =$  .....

[2]

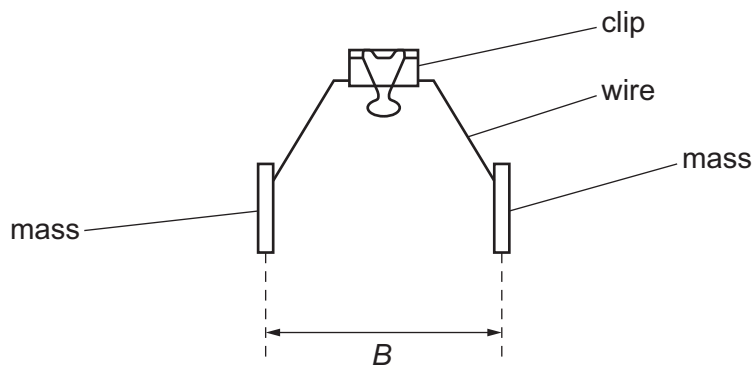
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**You may not need to use all of the materials provided.**

**2** In this experiment, you will investigate the elastic properties of rubber cord.

- (a) (i)** You are provided with a wire with a clip and two slotted masses attached, as shown in Fig. 2.1.



**Fig. 2.1**

The distance between the centres of the two slotted masses is  $B$ , as shown in Fig. 2.1.

Measure and record  $B$ .

$B =$  ..... [1]

- (ii)** Estimate the percentage uncertainty in your value of  $B$ . Show your working.

percentage uncertainty = .....% [1]



- (b) (i) • You are provided with two lengths of rubber cord. Select the **longer** cord.
- The diameter of the cord is  $d$ .

Measure and record  $d$ .

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

- (ii) • Suspend the clip, wire and masses using the **longer** cord secured in the two clips, as shown in Fig. 2.2.

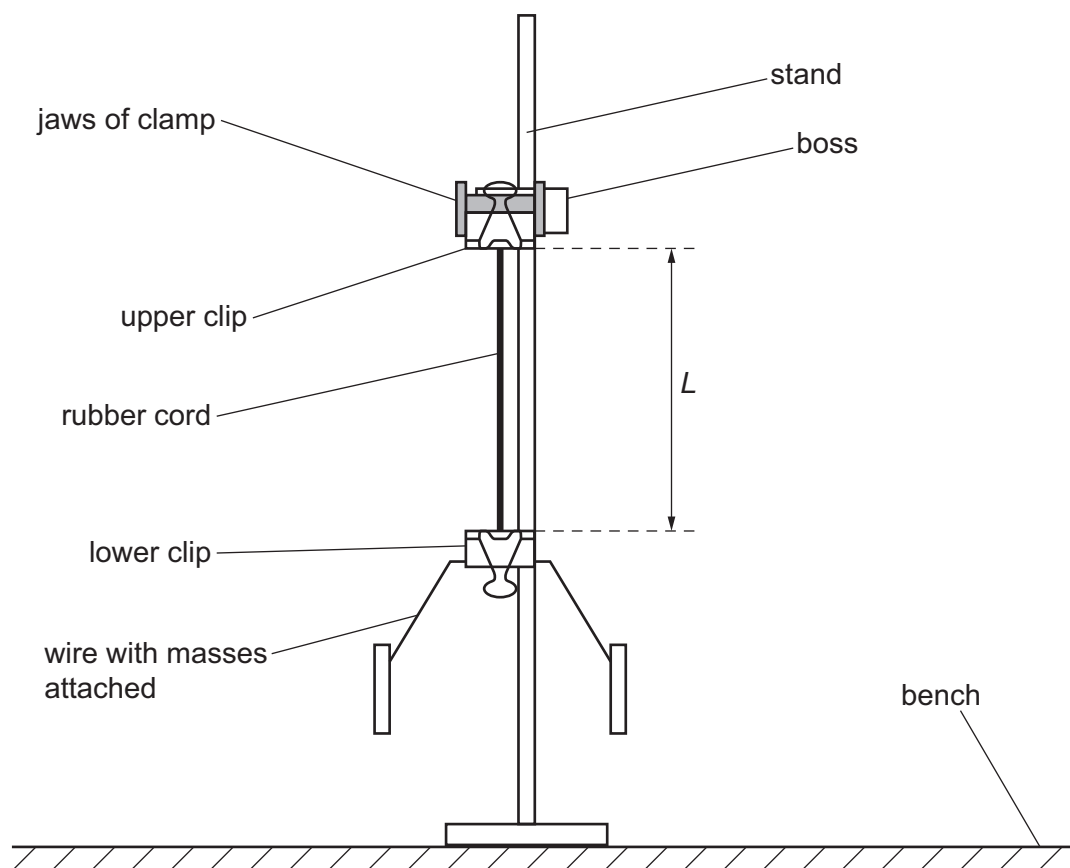


Fig. 2.2 (not to scale)

- The length of cord between the two clips is  $L$ , as shown in Fig. 2.2.

Measure and record  $L$ .

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



\* 0000800000009 \*



9

- (iii) • Keeping the cord vertical, rotate the lower clip through approximately  $180^\circ$  and release the clip. The clip will rotate with a small number of oscillations.
- Take measurements to determine the period  $T$  of these oscillations.

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

(c) Using the **shorter** length of rubber cord, repeat (b).

$d = \dots\dots\dots$

$L = \dots\dots\dots$

$T = \dots\dots\dots$  s  
[3]





(d) It is suggested that the relationship between  $T$ ,  $B$ ,  $L$  and  $d$  is

$$T^2 = \frac{B^2 L}{k d^4}$$

where  $k$  is a constant.

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

first value of  $k$  = .....

second value of  $k$  = .....

[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 20%.

Using this uncertainty, explain whether your results support the relationship in (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]





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