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Cambridge Assessment International Education

# Cambridge IGCSE™

CANDIDATE NAME

CENTRE NUMBER

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**PHYSICS** **0625/62**

Paper 6 Alternative to Practical **February/March 2025**

**1 hour**

You must answer on the question paper.

No additional materials are needed.

**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 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 [ ].

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

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[Turn over

**1** A student investigates the behaviour of a spring, and then uses the spring to determine the mass of an object.

The apparatus is shown in Fig. 1.1.

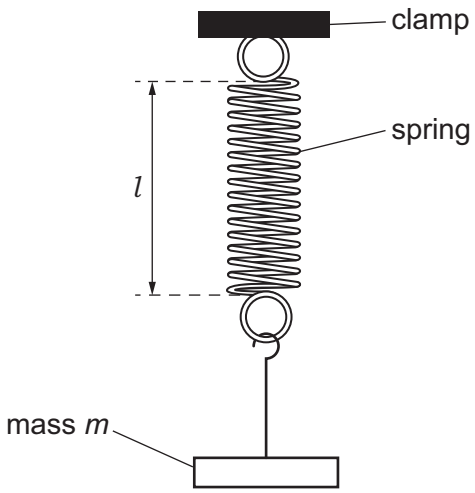



**Fig. 1.1**

**(a)** The student suspends a mass $m$ = 100 g from the spring.
She measures, and records in Table 1.1, the stretched length $l$ of the spring, as indicated in Fig. 1.1.

Describe **two** techniques for measuring the length of the spring, to ensure an accurate reading. You may draw a diagram.

1 .....

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2 .....

.....

[2]

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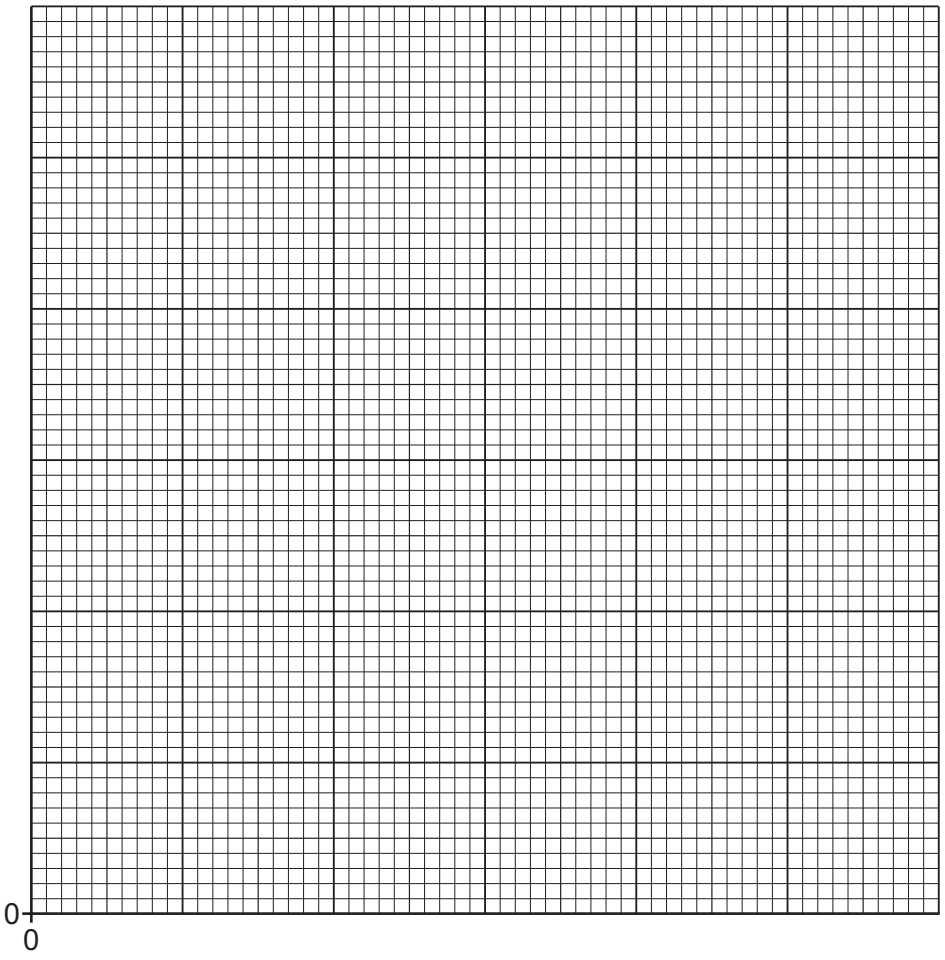
**(b)** She repeats step **(a)** for values of $m$ = 200 g, $m$ = 300 g, $m$ = 400 g and $m$ = 500 g.
Her readings are shown in Table 1.1.

**Table 1.1**

| $m$ / g | $l$ / cm |
|---|---|
| 100 | 6.0 |
| 200 | 9.2 |
| 300 | 13.6 |
| 400 | 16.8 |
| 500 | 21.0 |

Plot a graph of $l$ / cm ($y$-axis) against $m$ / g ($x$-axis).
Start the axes from the origin (0, 0).

Draw a best-fit straight line. The line might not go through the origin.




[4]

**(c)** Use your graph to determine the length $l_0$ of the spring with no load on it.

$l_0$ = ..... cm [1]



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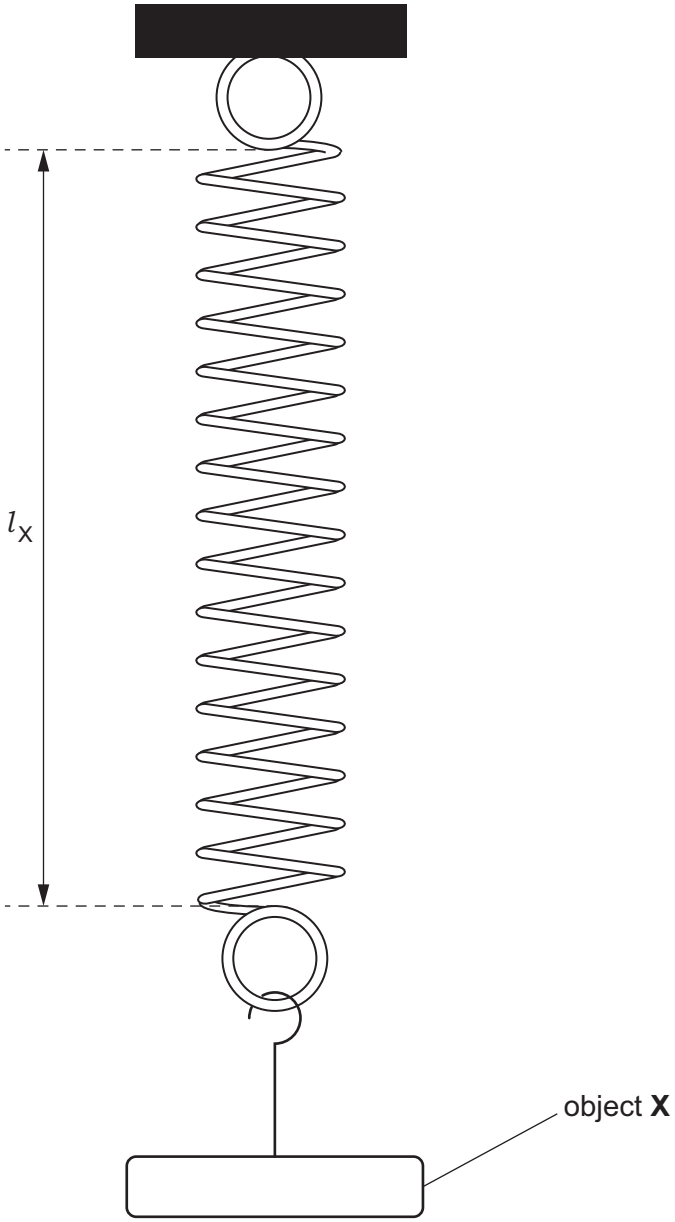



**Fig. 1.2**

**(d)** An object **X** is suspended from the spring.

**(i)** On Fig. 1.2, measure the stretched length $l_X$ of the spring.

$l_X$ = ..... [1]

**(ii)** Use the graph and your reading from **(d)(i)**, to determine the mass $m_X$ of object **X**. Show clearly on the graph how you obtained your answer.

$m_X$ = .....g [2]

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**(e)** Two students measure the mass of another object using the same method and apparatus. One student records the mass as 132.6 g. The other student records the mass as 130 g.

State and explain which answer has the more suitable number of significant figures for this experiment.

statement .....

explanation .....

.....

[1]

[Total: 11]

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**2** A student investigates the effect of insulation on the cooling of water.

He uses the apparatus shown in Fig. 2.1.

Beaker A is covered with material that is a thermal insulator.

Beaker B is identical to beaker A but has no insulation.

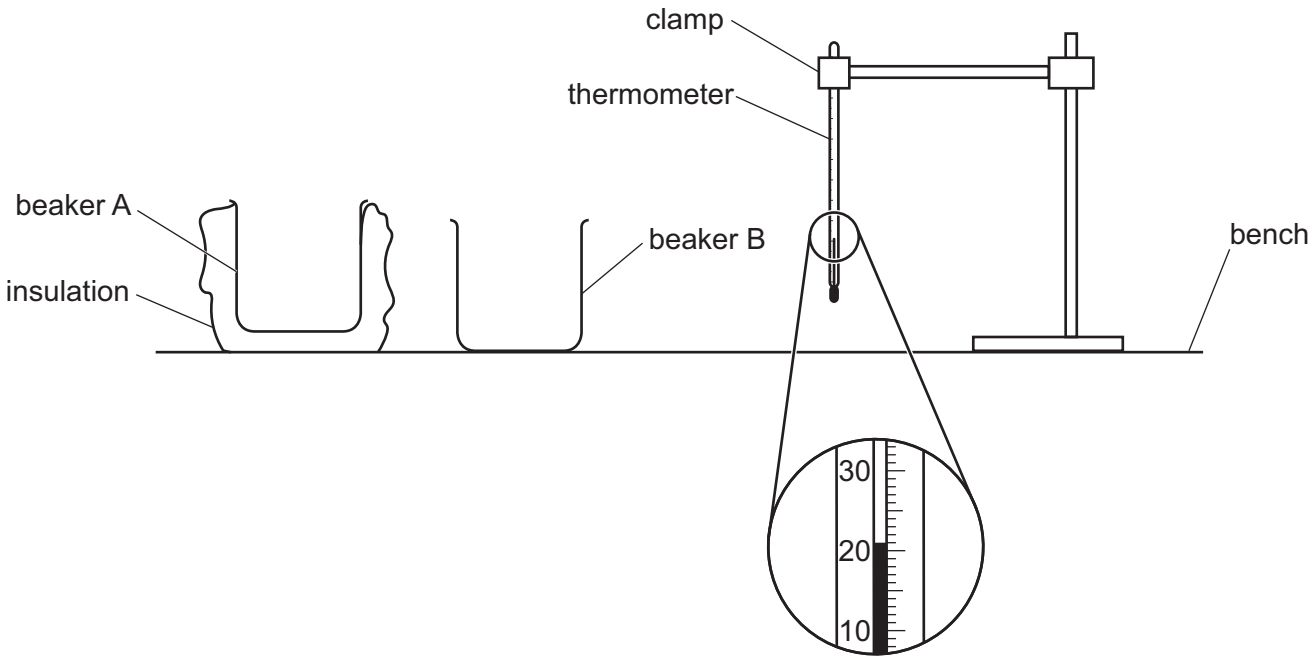



**Fig. 2.1**

**(a) (i)** Record room temperature $\theta_R$ shown on the thermometer in Fig. 2.1.

$\theta_R$ = ..... [1]

**(ii)** Describe **one** technique used to ensure that the room temperature reading is as accurate as possible.

.....

..... [1]

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**(b)** The student pours 200 $cm^3$ of hot water into beaker A and records the temperature $\theta$ at time $t = 0$.

He records, in Table 2.1, the temperature of the water in the beaker every 30 s.

The student repeats the procedure for beaker B.

It is important that the temperatures are recorded at exactly every 30 s.

Describe a technique which will make it easier for the student to do that.

.....

.....

..... [1]

**Table 2.1**

| | beaker A with insulation | beaker B without insulation |
|---|---|---|
| $t$ / s | $\theta$ / °C | $\theta$ / °C |
| 0 | 92.5 | 93.0 |
| 30 | 90.5 | 90.5 |
| 60 | 89.0 | 88.5 |
| 90 | 87.5 | 87.0 |
| 120 | 86.0 | 85.5 |
| 150 | 85.0 | 84.0 |
| 180 | 85.5 | 83.0 |

**(c)** Write a conclusion stating whether the insulation affects the rate of cooling of the water. Justify your answer by referring to values from the results.

.....

.....

.....

..... [2]

**(d) (i)** Calculate the average cooling rate $x_1$ during the first half of the experiment for the water in beaker B. Use the readings for beaker B from Table 2.1 and the equation:

$$x_1 = \frac{\theta_0 - \theta_{90}}{T},$$

where $T$ = 90 s and $\theta_0$ and $\theta_{90}$ are the temperatures of the water in beaker B at times $t$ = 0 and $t$ = 90 s.

Include the unit.

$x_1$ = ..... [1]

**(ii)** Calculate the average cooling rate $x_2$ during the second half of the experiment for the water in beaker B. Use the readings for beaker B from Table 2.1 and the equation:

$$x_2 = \frac{\theta_{90} - \theta_{180}}{T},$$

where $T$ = 90 s and $\theta_{90}$ and $\theta_{180}$ are the temperatures of the water in beaker B at $t$ = 90 s and $t$ = 180 s.

Include the unit.

$x_2$ = ..... [1]

**(e)** A student suggests that, for this type of experiment, the temperature of the water in each beaker at time $t$ = 0 must be the same for the comparison to be fair.

Use your answers from **(d)(i)** and **(d)(ii)** to explain whether this is necessary.

.....

.....

..... [2]

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**(f)** **(i)** A student wants to eliminate, from the comparison, any thermal energy lost from the surface of the water.

Suggest a change to the equipment which will do that.

.....

..... [1]

**(ii)** Suggest what effect this change will have on the cooling rates of the water in beaker A and beaker B.

.....

..... [1]

[Total: 11]

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**3** A student investigates the refraction of light by a transparent block.

The student's ray-trace sheet is shown full-size in Fig. 3.1.

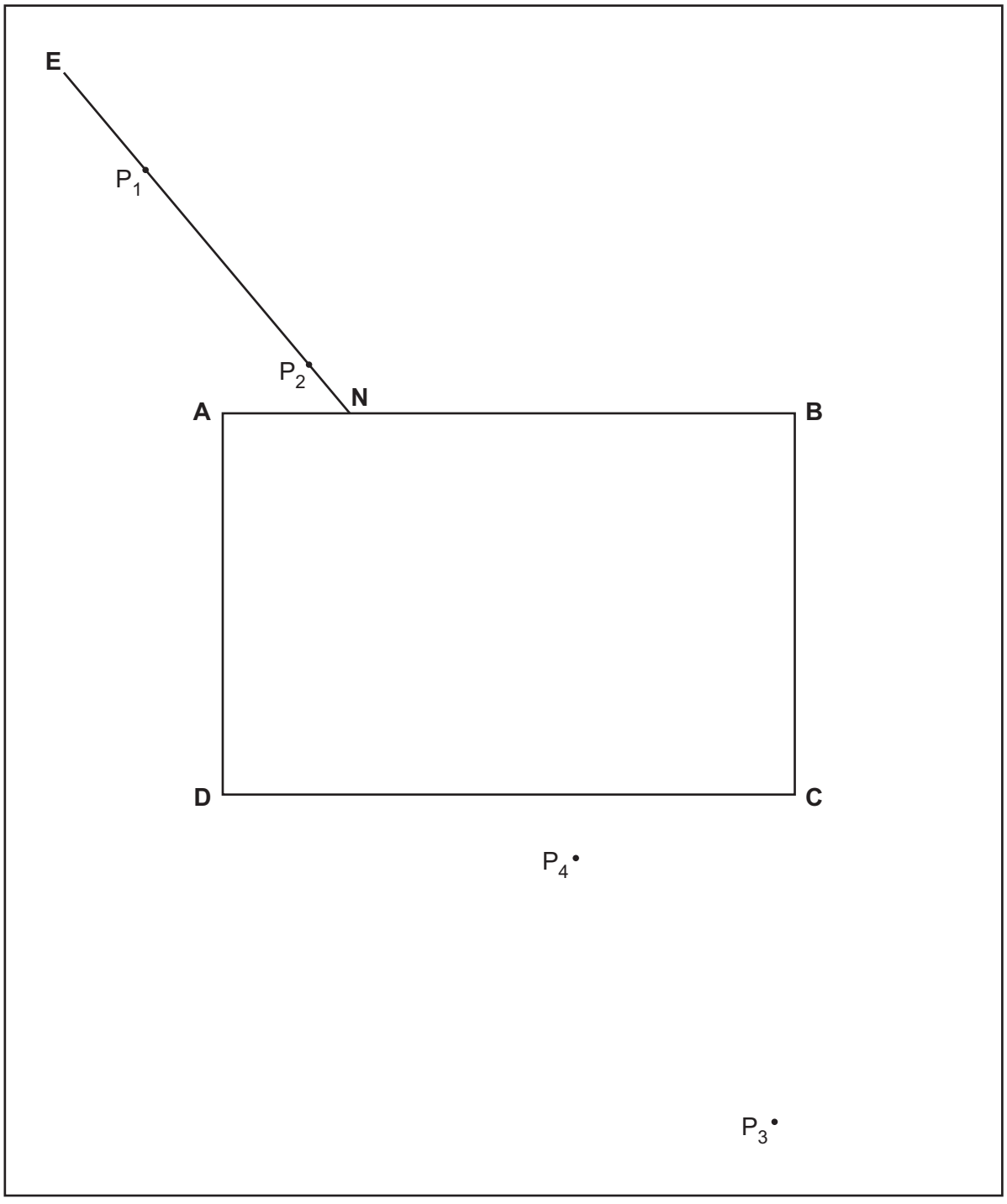



**Fig. 3.1**

**(a)** The student places a transparent block **ABCD** near the centre of the ray-trace sheet as indicated in Fig. 3.1.

**(i)** Draw a normal to point **N**, extending above **AB**. Label the upper end of the normal with the letter **L**. [1]

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**(ii)** The student draws line **EN** as shown in Fig. 3.1.
On Fig. 3.1, measure the acute angle $\theta$ between the lines **LN** and **EN**.
An acute angle is an angle of less than 90°.

$\theta$ = ..... [1]

**(b)** The student places two pins $P_1$ and $P_2$ on line **EN** as shown in Fig. 3.1.

**(i)** Measure distance *d* between pins $P_1$ and $P_2$.

*d* = ..... cm [1]

**(ii)** State whether the two pins are a suitable distance apart for accurate ray tracing.
Explain your answer.

statement .....

explanation .....

..... [1]

**(c)** The student views the images of $P_1$ and $P_2$ through the block.
He places two pins $P_3$ and $P_4$ so that pins $P_3$ and $P_4$ and the images of $P_1$ and $P_2$ all appear exactly one behind the other.

Draw a line through $P_3$ and $P_4$. Extend this line to meet **CD**.

Label the point at which this line meets **CD** with the letter **F**. Label the lower end of this line with the letter **G**.

Extend line **EN** to approximately 5 cm below line **CD**.
Label the point at which this line crosses **CD** with the letter **H**. Label the lower end of this line with the letter **J**.

[1]

**(d)** **(i)** Measure the acute angle $\alpha$ between lines **CD** and **GF**.

$\alpha$ = .....°

Measure the acute angle $\beta$ between lines **CD** and **JH**.

$\beta$ = .....°
[1]

**(ii)** A student suggests that angle $\alpha$ should be equal to angle $\beta$.

State whether your results support this suggestion. Justify your answer by reference to values from your results.

statement .....

justification .....

.....
[2]



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**(e)** Describe **two** techniques to use in this type of experiment to ensure results are accurate.

1 .....

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2 .....

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[2]

**(f)** Suggest **one** reason why different students, all doing this experiment carefully, may not obtain identical results.

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..... [1]

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**4** A student investigates the resistance of a wire.

Plan an experiment which enables him to investigate how the length of a wire affects the resistance of the wire.

Resistance $R$ is calculated from the equation: $R = \frac{V}{I}$

where $V$ is the potential difference (p.d.) across the wire and $I$ is the current in the wire.

The apparatus available includes:

- a selection of wires
- a variable power supply
- an ammeter
- a voltmeter.

In your plan:

- list any additional apparatus needed
- complete Fig. 4.1 to show a voltmeter connected to measure the potential difference across the wire
- explain briefly how to do the experiment, including the measurements to take so that the resistance can be determined
- state the key variables to keep constant
- draw a table, or tables, with column headings, to show how to display the readings (you are **not** required to enter any readings in the table)
- explain how to use the readings to reach a conclusion.

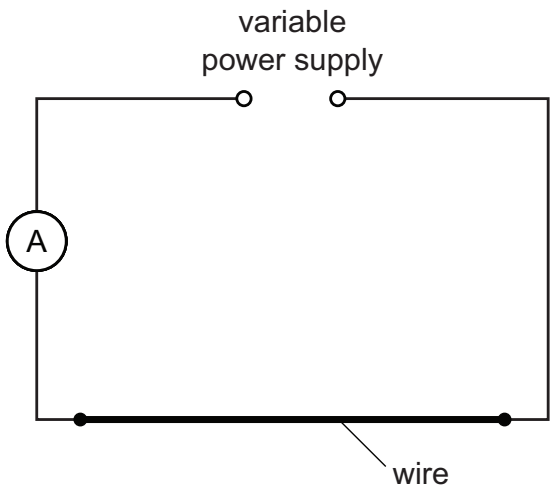



**Fig. 4.1**

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