



CANDIDATE
NAME

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CENTRE
NUMBER

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CANDIDATE
NUMBER

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0625/52

May/June 2022

1 hour 15 minutes

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

- 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	
3	
4	
Total	

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

- 1 In this experiment, you will investigate the balancing of a metre rule.

Carry out the following instructions, referring to Fig. 1.1.

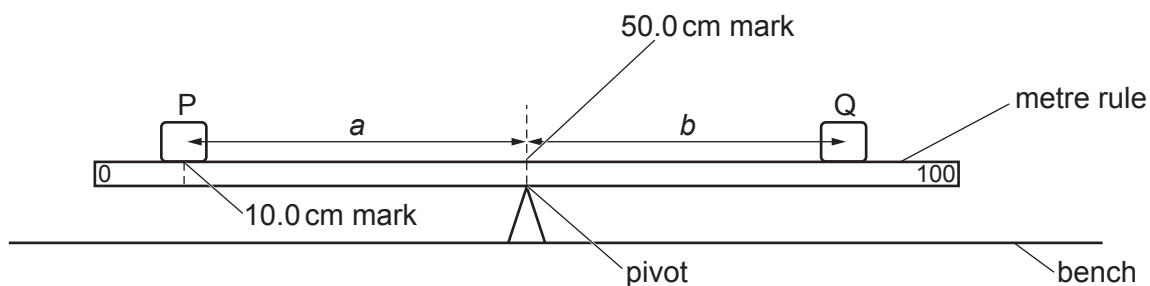


Fig. 1.1

- (a) • Place the metre rule on the pivot at the 50.0 cm mark.
- Place object P with its centre on the metre rule at the 10.0 cm mark.
- (i) Record, in Table 1.1, the distance a from the centre of object P to the pivot. [1]
- (ii) • Place object Q on the metre rule.
- Keep object P at the 10.0 cm mark and adjust the position of object Q until the metre rule is as close to balancing as possible.

Record, in Table 1.1, the distance b between the centre of object Q and the pivot. [1]

- (iii) Repeat the steps above with object P placed at the 15.0 cm mark, 20.0 cm mark, 25.0 cm mark and 30.0 cm mark.

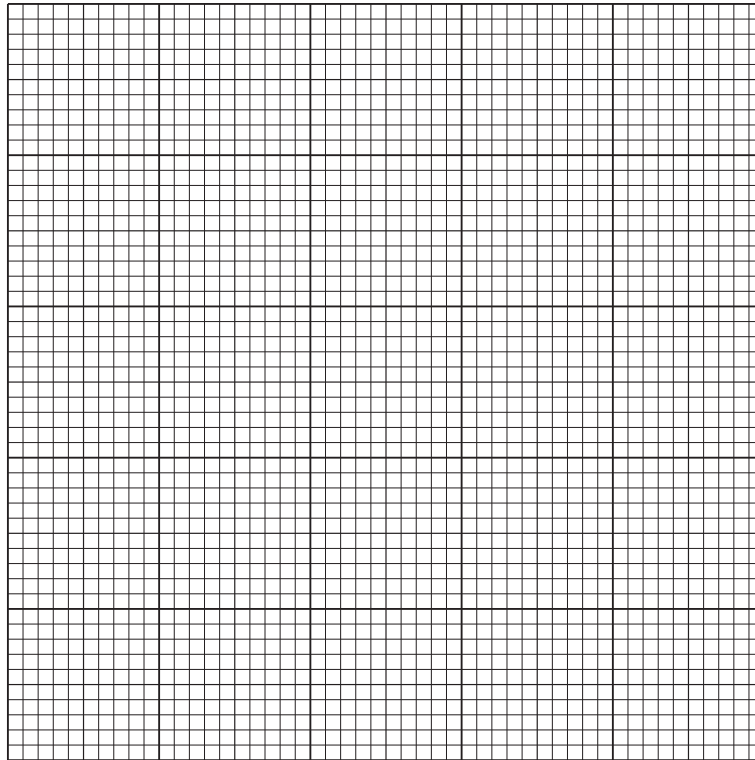
Record all the values of a and b in Table 1.1.

Table 1.1

a/cm	b/cm

[2]

- (b) Plot a graph of a/cm (y -axis) against b/cm (x -axis). You do **not** need to start your graph from the origin (0,0).



[4]

- (c) Determine the gradient G of the graph.

Show clearly on the graph how you obtained the necessary information.

$G = \dots\dots\dots$ [3]

[Total: 11]

- 2 In this experiment, you will investigate the resistances of combinations of resistors.

Carry out the following instructions, referring to Fig. 2.1. The circuit has been set up for you.

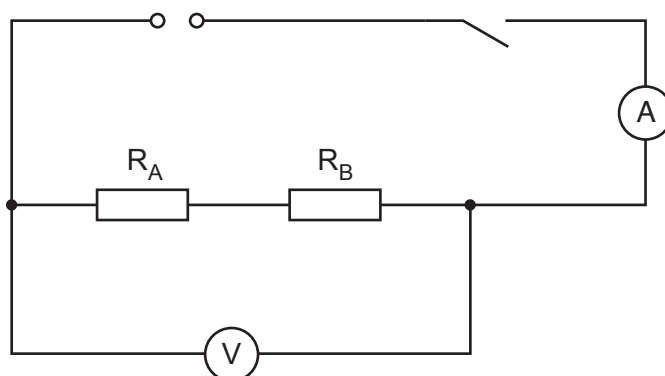


Fig. 2.1

- (a) Close the switch.

- (i) Measure the current I_1 in the circuit.

$$I_1 = \dots\dots\dots \text{ A [1]}$$

- (ii) Measure the potential difference (p.d.) V_1 across resistors R_A and R_B in series.

$$V_1 = \dots\dots\dots \text{ V [1]}$$

- (iii) Open the switch.

Calculate the resistance R_1 of the combination of resistors in series. Use the equation

$$R_1 = \frac{V_1}{I_1}.$$

Include the unit.

$$R_1 = \dots\dots\dots \text{ [1]}$$

- (b) Disconnect the voltmeter. Connect resistor R_C in parallel with resistors R_A and R_B .

Do **not** change the series combination of resistors R_A and R_B .

Connect the voltmeter across the combination of all three resistors.

- (i) Draw a circuit diagram showing the circuit described in (b).

[2]

- (ii) Close the switch.

Measure the current I_2 in the circuit.

$$I_2 = \dots\dots\dots \text{ A}$$

Measure the potential difference V_2 across the combination of the three resistors.

$$V_2 = \dots\dots\dots \text{ V}$$

Open the switch.

Calculate the resistance R_2 of the combination of resistors. Use the equation

$$R_2 = \frac{V_2}{I_2}.$$

Include the unit.

$$R_2 = \dots\dots\dots$$

[2]

- (c) Disconnect the voltmeter. Rearrange the resistors to set up the circuit shown in Fig. 2.2.

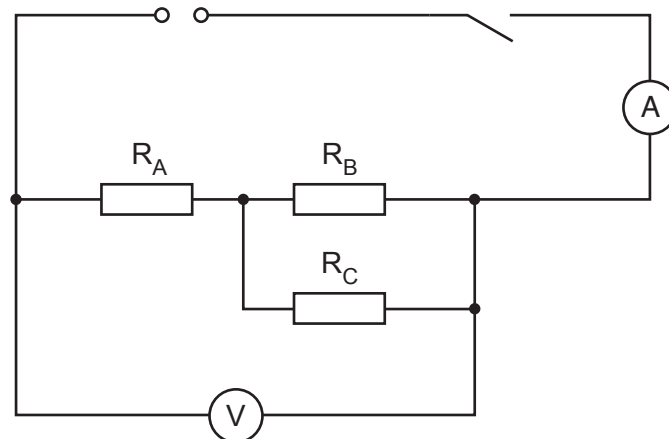


Fig. 2.2

Close the switch.

Measure the current I_3 in the circuit.

$I_3 = \dots\dots\dots$ A

Measure the potential difference V_3 across the combination of the three resistors.

$V_3 = \dots\dots\dots$ V

Open the switch.

Calculate the resistance R_3 of the combination of resistors. Use the equation

$$R_3 = \frac{V_3}{I_3}.$$

Include the unit. Give your answer to a suitable number of significant figures for this experiment.

$R_3 = \dots\dots\dots$ [2]

- (d) A student thinks the three resistors R_A , R_B and R_C have the same resistance within the limits of experimental accuracy.

Suggest how the student could use the apparatus provided to test his idea.

.....

 [2]

[Total: 11]

- 3 In this experiment, you will determine the focal length f of a lens.

Carry out the following instructions, referring to Fig. 3.1.

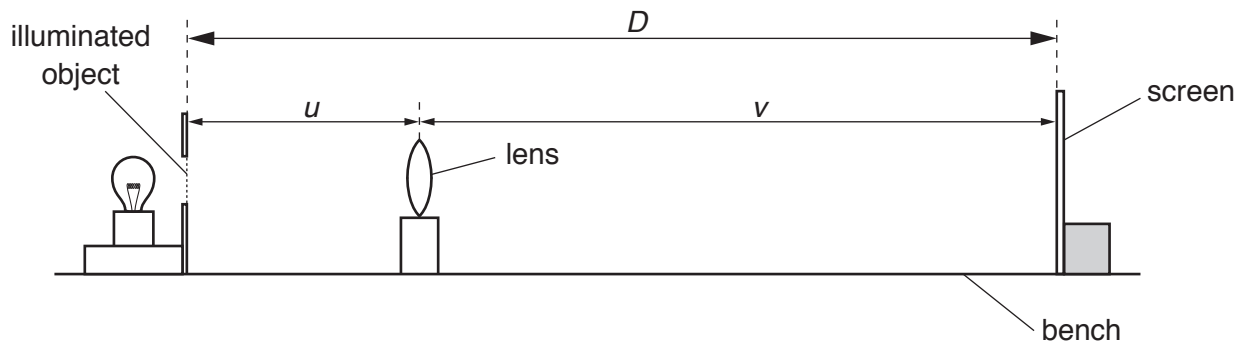


Fig. 3.1

- (a) • Place the screen a distance $D = 75.0$ cm from the illuminated object.
- Place the lens between the object and the screen so that the lens is close to the illuminated object.
 - Move the lens away from the object until a clearly focused image is formed on the screen.
- (i) Measure, and record in Table 3.1, the distance u between the centre of the lens and the illuminated object. [1]
- (ii) Measure, and record in Table 3.1, the distance v between the centre of the lens and the screen. [1]
- (iii) Calculate, and record in Table 3.1, the focal length f of the lens using the equation

$$f = \frac{uv}{D}. \quad [1]$$

- (b) • Place the screen at a distance $D = 85.0$ cm from the illuminated object.
- Place the lens between the object and the screen so that the lens is close to the illuminated object.
 - Move the lens until a clearly focused image is formed on the screen.

Measure, and record in Table 3.1, the distance u between the centre of the lens and the illuminated object.

Measure, and record in Table 3.1, the distance v between the centre of the lens and the screen.

Calculate, and record in Table 3.1, the focal length f of the lens using the equation

$$f = \frac{uv}{D}.$$

Table 3.1

D/cm	u/cm	v/cm	f/cm
75.0			
85.0			

[2]

- (c) Calculate the average value f_A of the focal length of the lens. Show your working.

$f_A = \dots\dots\dots \text{cm}$ [2]

- (d) State **two** precautions that you took to obtain accurate readings in this experiment.

1.

.....

2.

.....

[2]

- (e) A student states that a more accurate value for the focal length f of the lens can be determined by plotting a graph of uv against D . The gradient of the graph is numerically equal to the focal length.

- (i) Suggest a suitable number of sets of readings that the student should take.

..... [1]

- (ii) Explain briefly how this graphical method can give a more accurate value for the focal length.

.....

.....

.....

..... [1]

[Total: 11]

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4 A student investigates insulators.

Plan an experiment to list insulating discs in order from best insulator to worst insulator.

You are **not** required to carry out this investigation.

The following apparatus is available:

- five discs made from different insulating materials
- a thermometer
- a stop-watch
- a heated metal cylinder (see Fig. 4.1)
- a second metal cylinder with a hole for the thermometer (see Fig. 4.1).

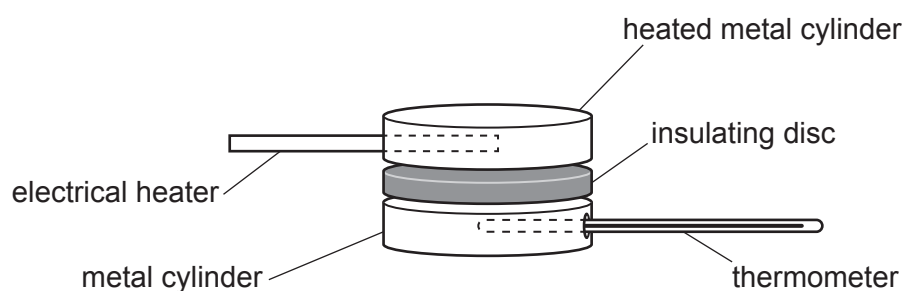


Fig. 4.1

You can also use other apparatus and materials that are usually available in a school laboratory.

In your plan, you should:

- explain briefly how you would carry out the investigation
- state the key variables that you would control
- draw a table, or tables, with column headings, to show how you would display your readings (you are **not** required to enter any readings in the table)
- explain how you would use your readings to reach a conclusion.

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