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Cambridge Assessment International Education

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PHYSICAL SCIENCE **0652/61**

Paper 6 Alternative to Practical **October/November 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.

DC (WW/JG) 346412/2

1 A student investigates the resistance of a filament lamp.

Fig. 1.1 shows the circuit the student uses. This is circuit **1**.

circuit **1**

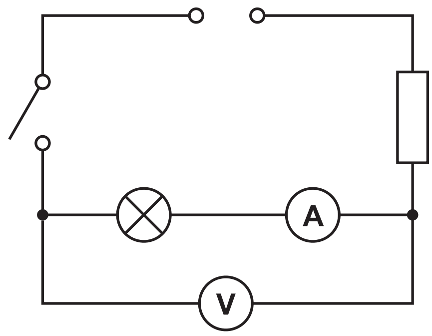


Fig. 1.1

(a) State how zero errors are avoided when taking an ammeter or a voltmeter reading.

....

.... [1]

(b) The student measures the potential difference V and the current I in circuit **1**.

Fig. 1.2 and Fig. 1.3 show the readings on the voltmeter and ammeter.

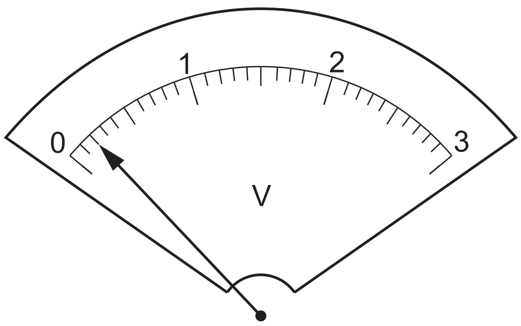


Fig. 1.2

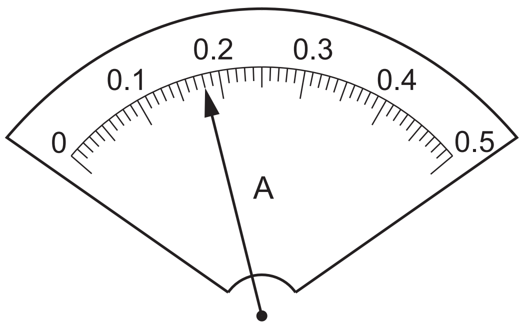


Fig. 1.3

(i) Record in Table 1.1 in the row for circuit **1** these values of V and I. [2]

Table 1.1

circuit	V/V	I/A	R/.....
1			
2	1.2	0.27	

(ii) Complete the heading in Table 1.1 by adding the unit for resistance R. [1]

(c) The student:

- Rearranges the circuit as shown in circuit **2** in Fig. 1.4.
- Measures the potential difference V and the current I in circuit **2**.
- Records in Table 1.1 in the row for circuit **2** these values of V and I.

circuit **2**

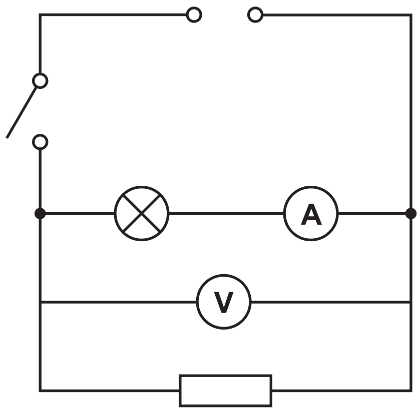


Fig. 1.4

Calculate the resistance R of the lamp in each circuit.

Use the equation shown.

$$R = \frac{V}{I}$$

Record in Table 1.1 your values of R to **two** significant figures. [2]

(d) Two values are considered to be the same within the limits of experimental error if they are within 10% of each other.

State if your values of resistance are the same within the limits of experimental error.

Justify your answer by reference to your data in Table 1.1.
Include a calculation in your answer.

....

.... [2]

(e) A student adds an additional resistor to the circuit to create a new circuit arrangement.

Complete the circuit diagram in Fig. 1.5 by:

- adding a voltmeter to measure the potential difference across the filament lamp
- adding an ammeter to measure the current through the filament lamp.

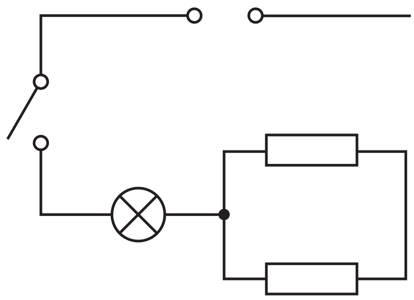


Fig. 1.5

[2]

[Total: 10]

2 A student determines the weight of a block using a balancing method.

Fig. 2.1 shows the assembled apparatus the student uses.

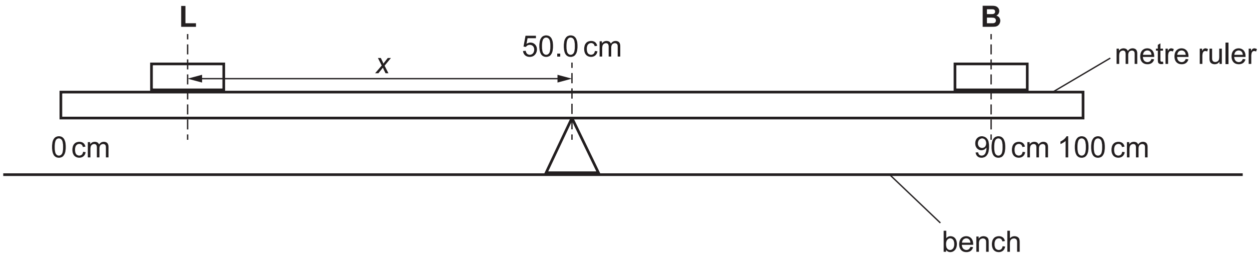


Fig. 2.1

(a) Procedure

The student:

- places block **B** on the metre ruler at the 90.0 cm mark
- places a load **L** = 1.0 N on the metre ruler and adjusts the position of **L** so that the metre ruler is balanced.

(i) Fig. 2.2 shows the position *P* of load **L** on the metre ruler when balanced.

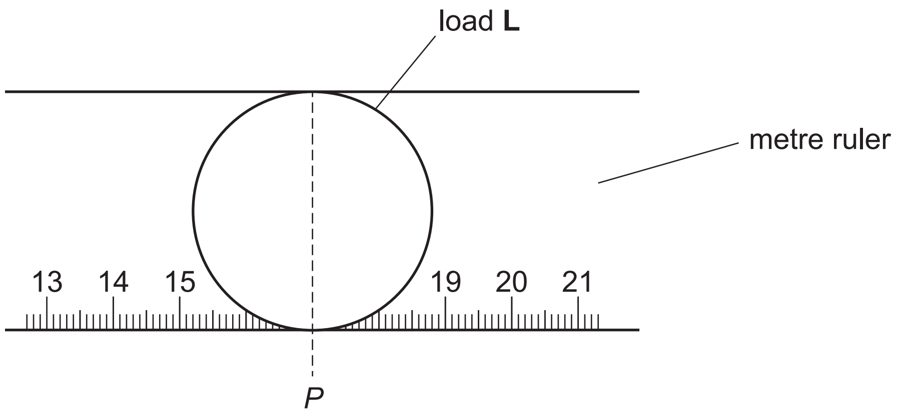


Fig. 2.2

Determine the position *P* of the centre of the load **L** as shown in Fig. 2.2.

Show your working.

P = ... cm [2]

DO NOT WRITE IN THIS MARGIN

(ii) Calculate the distance *x* of the centre of load **L** from the 50.0 cm mark.

Record in Table 2.1 this value of *x*.

[1]

Table 2.1

L / N	x / cm	$\frac{1}{L}$ / $\frac{1}{\text{N}}$
1.0		1.00
1.5	22.0	
2.0	16.5	0.50
2.5	13.2	0.40
3.0	11.2	0.33

(b) The student repeats the procedure keeping the position of block **B** constant, using loads L = 1.5 N, 2.0 N, 2.5 N and 3.0 N. The student's results are shown in Table 2.1.

Calculate the value of $\frac{1}{L}$ for L = 1.5 N.

Record in Table 2.1 this value to **two** decimal places.

[1]

(c) On the grid plot $\frac{1}{L}$ (vertical axis) against *x*.

Do **not** start your graph at the origin (0, 0).

[2]

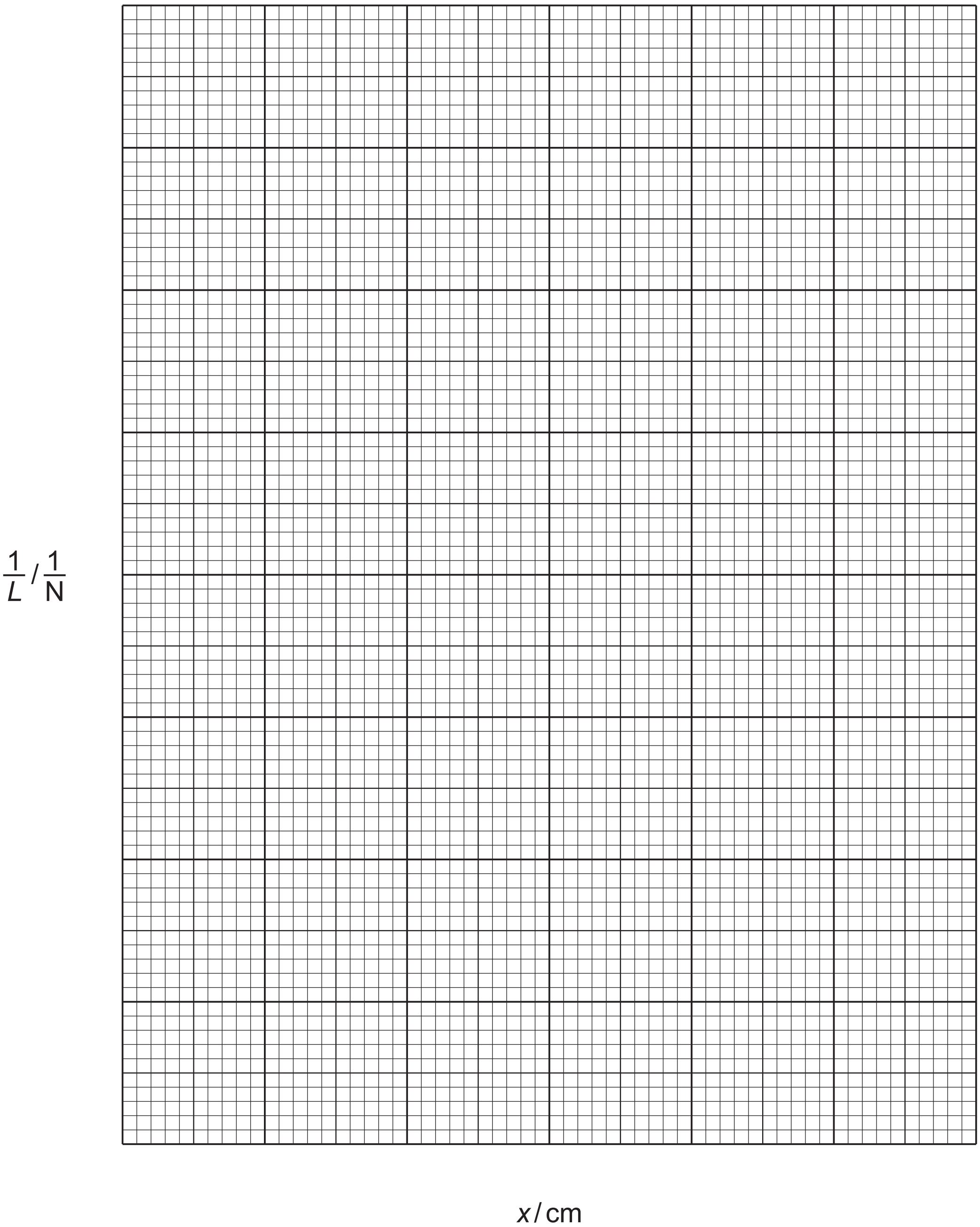
(d) Draw the straight line of best fit. [1]

(e) Calculate the gradient *G* of the line.

Show your working.

Indicate on your graph the points you use to calculate the gradient.

G = ... [2]



(f) Calculate the weight W of block **B**.

Use the equation shown and your value of G from **(e)**.

$$W = \frac{1}{40G}$$

W = ... N [1]

[Total: 10]

3 A student determines the percentage yield of a reaction.

When green copper carbonate solid is heated it forms black copper oxide solid and carbon dioxide gas.

copper carbonate → copper oxide + carbon dioxide.

The mass of the copper carbonate decreases as the carbon dioxide is given off.

(a) Procedure

The student:

step 1 records in Table 3.1 the mass of an empty evaporating basin
step 2 adds copper carbonate to the evaporating basin
step 3 records in Table 3.1 the mass of the evaporating basin and copper carbonate
step 4 puts the evaporating basin on a tripod and gauze
step 5 heats the copper carbonate strongly for approximately 3 minutes. Stirs the copper carbonate occasionally
step 6 turns off the Bunsen burner and leaves the evaporating basin to cool down
step 7 records in Table 3.1 the mass of the evaporating basin and copper oxide.

Table 3.1

mass of empty evaporating basin / g	25.2
mass of evaporating basin and copper carbonate (before heating) / g	
mass of evaporating basin and copper oxide (after heating) / g	

(i) Suggest why the copper carbonate is stirred while it is being heated in step 5.

....

.... [1]

(ii) Draw a labelled diagram of the assembled apparatus used in step 5.

[2]

(iii) Suggest how the student knows when **all** of the copper carbonate has decomposed.

....

.... [1]

(iv) Fig. 3.1 shows the balance reading for the mass of evaporating basin and copper carbonate and the mass of evaporating basin and copper oxide.

28.73 g	26.88 g
mass of evaporating basin and copper carbonate	mass of evaporating basin and copper oxide

Fig. 3.1

Record in Table 3.1 these values to the nearest 0.1 g. [2]

(b) (i) Calculate the mass of copper carbonate in the evaporating basin.

Use the results in Table 3.1.

mass of copper carbonate .... g

Calculate the mass of copper oxide that the experiment is expected to make.

Use the equation shown and your calculated mass of copper carbonate.

mass of copper oxide expected = 0.64 × mass of copper carbonate

expected mass of copper oxide = ... g [1]

(ii) Calculate the mass of copper oxide actually made in the reaction.

Use the results in Table 3.1.

mass of copper oxide actually made = ... g [1]

(iii) Calculate the percentage yield of copper oxide formed in the experiment.

Use the equation shown.

$$\text{percentage yield of copper oxide} = \frac{\text{mass of copper oxide actually made, } \mathbf{(b)(ii)}}{\text{expected mass of copper oxide, } \mathbf{(b)(i)}} \times 100$$

percentage yield of copper oxide = ... [1]

(c) **(i)** Suggest why the yield is not 100%.

....

.... [1]

(ii) Suggest an improvement to the experiment that increases confidence in the results.

Explain your answer.

....

.... [1]

(d) The student measures the rate of decomposition of copper carbonate by collecting and measuring the volume of carbon dioxide made.

They put the copper carbonate into a conical flask and attach a delivery tube and stopper.

(i) Suggest the piece of apparatus needed to collect and measure the volume of carbon dioxide.

.... [1]

(ii) Suggest the other piece of apparatus needed to make a measurement so that the rate of decomposition can be calculated.

.... [1]

[Total: 13]

Question 4 starts on page 12

4 When magnesium reacts with dilute hydrochloric acid, aqueous magnesium chloride and hydrogen gas are made.

magnesium + hydrochloric acid $\rightarrow$ magnesium chloride + hydrogen

Plan an experiment to find the relationship between the mass of magnesium used and the volume of hydrogen made.

Assume you are provided with:

- magnesium
- dilute hydrochloric acid.

Assume you have access to any common laboratory apparatus.

Include in your plan:

- the apparatus you will use
- a brief description of the method
- the measurements you will make
- the variables you will control
- how you will use your results to reach a conclusion.

You may draw a results table if you wish. You are not required to add any readings to your table.

You may draw a diagram if you wish.

[7]

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