Electrical Quantities

Question Paper 3

Level	IGCSE
Subject	Physics
Exam Board	CIE
Topic	Electricity and Magnetism
Sub-Topic	Electrical Quantities
Paper Type	Alternative to Practical
Booklet	Question Paper 3

Time Allowed: **52 minutes**

Score: **/43**

Percentage: **/100**

1 The class is determining the resistance of a resistor.

Fig. 2.1 shows the circuit.

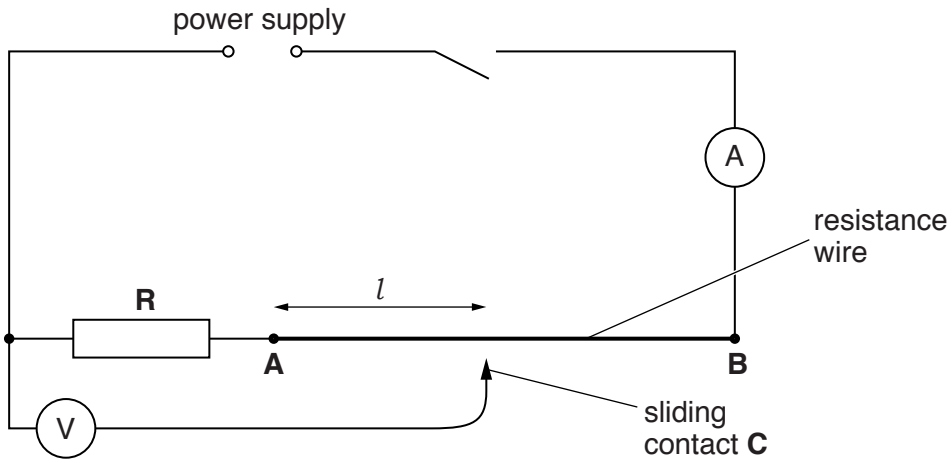


Fig. 2.1

(a) A student places the sliding contact **C** at a distance l from end **A** of the resistance wire. She records the reading on the voltmeter.

(i) Read the meter shown in Fig. 2.2. Record, in Table 2.1, this value of V for length $l = 100\,\text{cm}$.

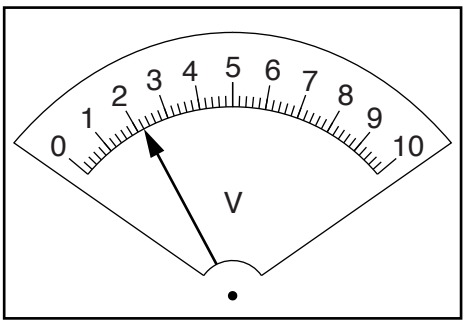


Fig. 2.2

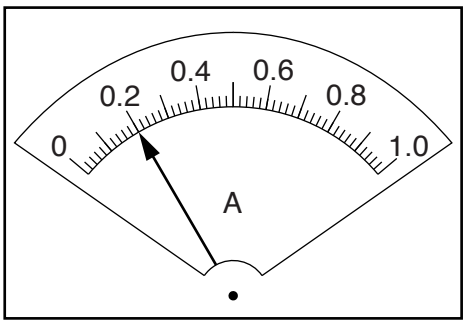


Fig. 2.3

Table 2.1

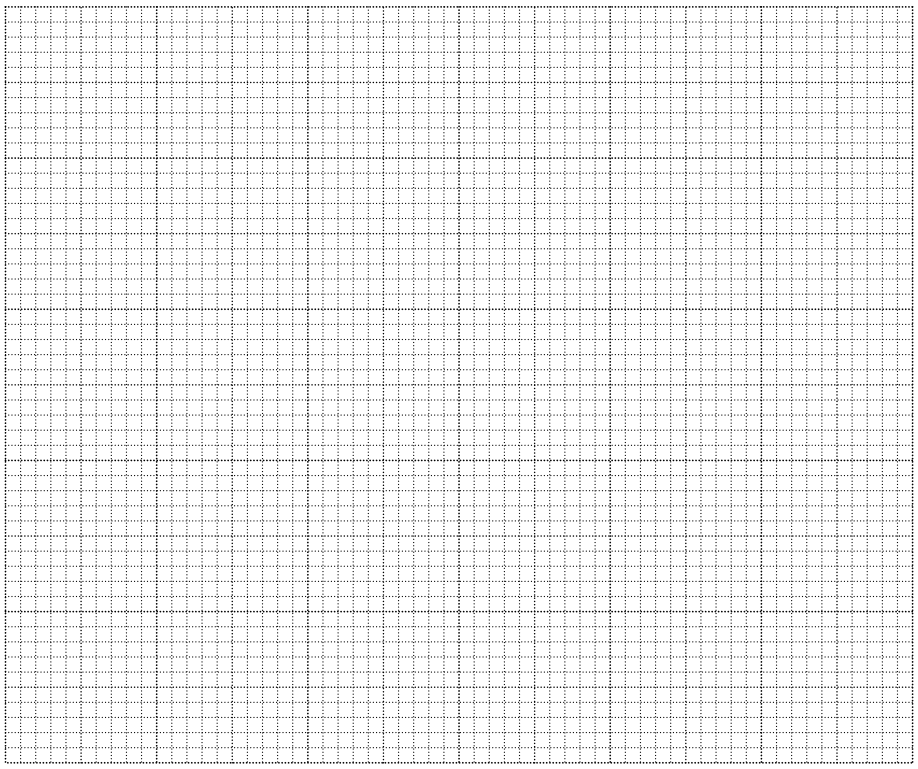
l/cm	V/V
20.0	1.1
40.0	1.4
60.0	1.6
80.0	1.9
100.0	

[1]

(ii) Read the meter shown in Fig. 2.3. Record this current I.

I = ...[1]

(b) Plot a graph of V/V (y-axis) against l/cm (x-axis). Start both axes at the origin (0, 0).



[4]

(c) **(i)** Determine the value of the intercept Y on the y-axis.

Y = ...[1]

(ii) Calculate the ratio $\frac{Y}{I}$. The value of I is your answer to part **(a)(ii)**.

$\frac{Y}{I}$ = ...

(iii) $\frac{Y}{I}$ is numerically equal to the resistance R of the resistor **R**.

Write down a value for R to a suitable number of significant figures for this experiment. Include the unit.

R = ...
[2]

[Total: 9]

2 The IGCSE students are investigating the effect of an electromagnet.

Fig. 4.1 shows part of the equipment they are using.

The current I in the coil of the electromagnet is gradually increased and the reading m on the balance is recorded.

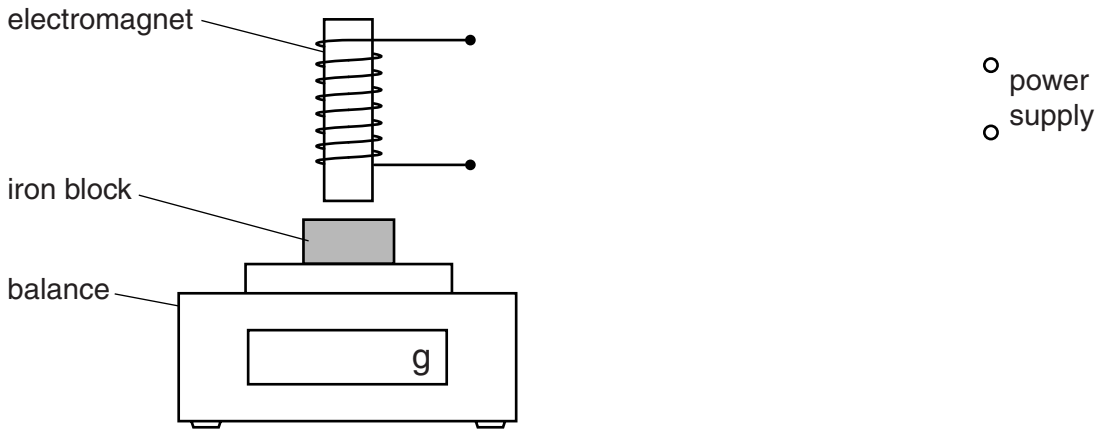


Fig. 4.1

(a) The students are using a variable resistor (rheostat) to change the current in the series circuit that is connected to the electromagnet.

On Fig. 4.1, use standard symbols to draw a circuit containing a variable resistor and an ammeter connected in a way that would be suitable for the experiment. [2]

(b) The readings are shown in Table 4.1.

Table 4.1

I/A	m/g	M/g
0.00	61.37	0.00
1.00	57.25	4.12
2.00	53.13	
3.00	49.01	

(i) At each current, a value M is calculated.

$M = m_0 - m$, where m_0 = 61.37 g, the balance reading when I = 0.00 A.

Complete the table by calculating and recording M for currents of 2.00 A and 3.00 A. [1]

(ii) State whether the results suggest that M is proportional to I.

Justify your statement with reference to the results.

statement .....

.....

justification .....

.....

.....

[2]

[Total: 5]

3 The IGCSE class is investigating the resistance of a wire.

The circuit used is shown in Fig. 3.1.

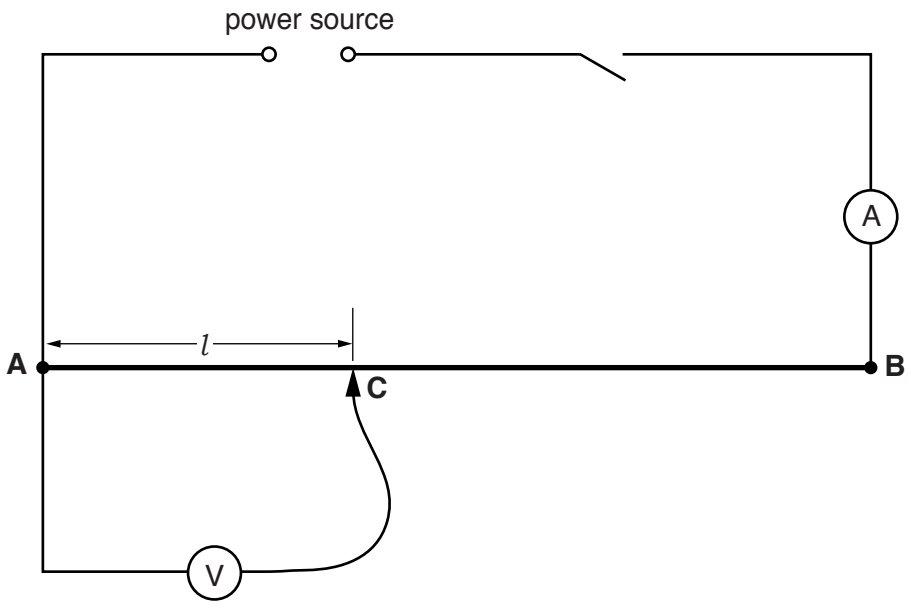


Fig. 3.1

(a) A student measures the potential difference V across different lengths l of the wire **AB** and the current I in the wire. The wire **AB** is 1.00m long. The readings are shown in Table 3.1.

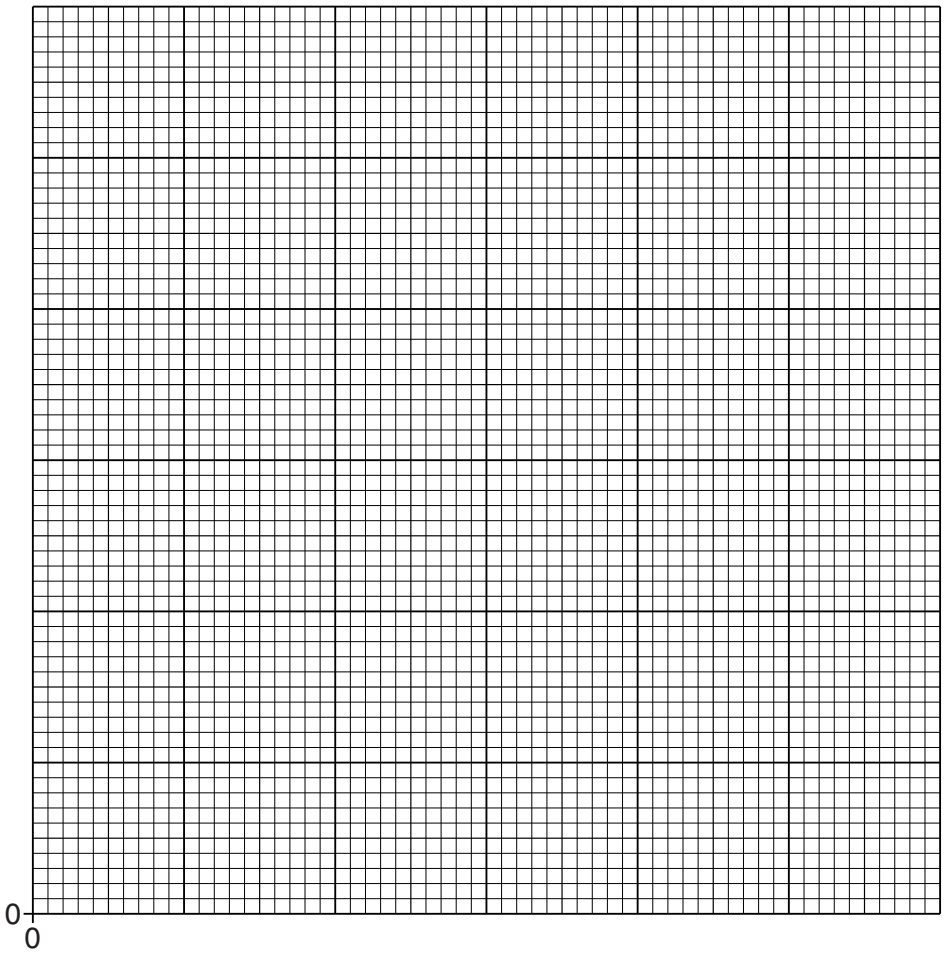
Calculate the resistance R of each length l of the wire **AB**, using the equation $R = \frac{V}{I}$. Record the values of R in the table.

Table 3.1

l/cm	V/V	I/A	R/Ω
10.0	0.36	0.73	
20.0	0.70	0.71	
30.0	1.10	0.73	
40.0	1.45	0.73	
50.0	1.80	0.72	

[2]

(b) Plot a graph of R/Ω (y-axis) against l/cm (x-axis). Start both axes at the origin (0,0).



[5]

(c) State whether your graph shows that the resistance R is proportional to the length l. Justify your answer by reference to the graph.

statement .....

justification .....

.....

[2]

(d) Suggest how you could further test your statement in **(c)**, using the same apparatus.

.....

.....[1]

[Total: 10]

4 The IGCSE class is investigating the resistance of a wire.

Fig. 3.1 shows the circuit.

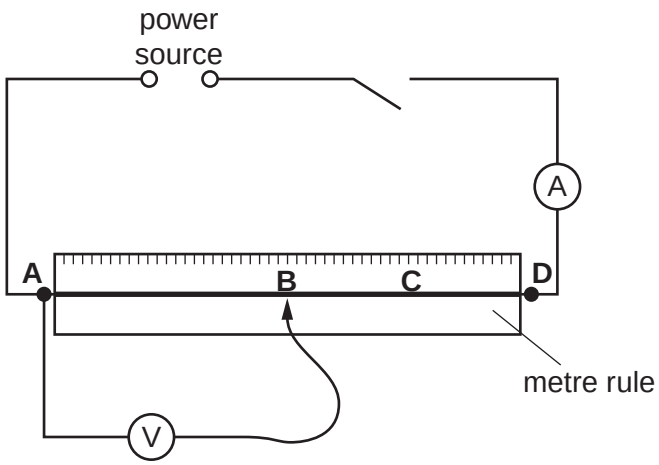


Fig. 3.1

(a) A student measures the current *I* in the circuit and the p.d. *V* across the section of wire **AB**. He records the length *l* of the wire **AB**. He repeats the procedure with the voltmeter connected across section **AC** of the wire and then with the voltmeter connected across section **AD** of the wire. The readings are shown in Table 3.1.

Table 3.1

voltmeter connected across	*l* /	*I* /	*V* /	*R* /
AB	50	0.21	0.9	
AC	75	0.22	1.4	
AD	100	0.20	1.7	

(i) Calculate the values of resistance *R* for each length of wire using the equation $R = \frac{V}{I}$. Enter the values in the table.

(ii) Complete the column headings in the table. [3]

(b) It is suggested that the resistance across **AB** should be half the resistance across **AD**. State whether the results support this suggestion and justify your answer with reference to the results.

statement .....

justification .....

.....[2]

(c) It is known that changes in temperature affect the resistance of the wire. State how you can limit the temperature changes when carrying out this experiment.

.....

.....[1]

(d) The student wishes to use a lower current so he adds a variable resistor to the circuit.

(i) Draw the standard circuit symbol for a variable resistor.

(ii) On Fig. 3.1, mark with an X a suitable position in the circuit for the variable resistor. [2]

[Total: 8]

5 The IGCSE class is investigating the resistance of a wire.

The circuit is shown in Fig. 3.1.

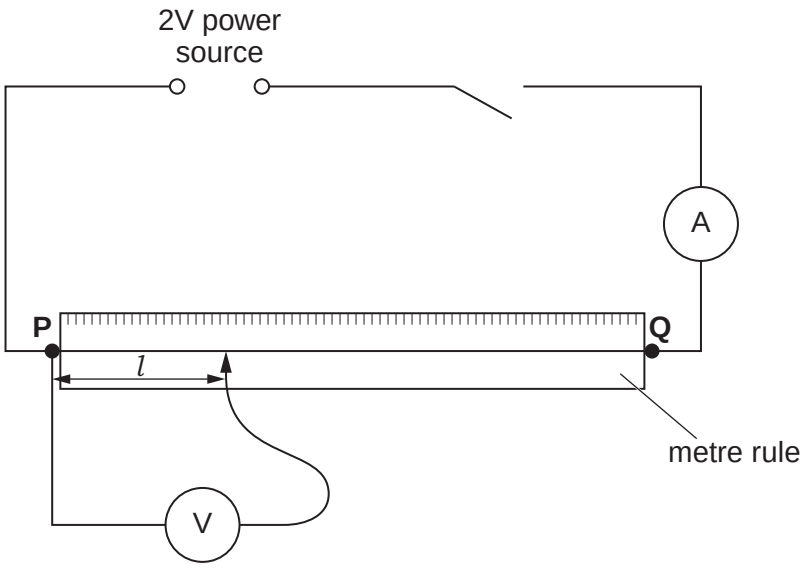


Fig. 3.1

(a) A student measures and records in Table 3.1 the current I in the circuit and the potential difference V across a length l = 0.250 m of wire **PQ**.

She repeats the procedure using l values of 0.500 m and 0.750 m.

(i) Complete the heading for each column of the table.

(ii) Calculate the resistance R of each length l of the wire using the equation $R = \frac{V}{I}$.

Record the values of R in the table.

Table 3.1

l /	V /	I /	R /
0.250	0.54	0.32	
0.500	1.10	0.32	
0.750	1.61	0.32	

[4]

(b) Use numbers from the table to suggest and justify a relationship between the length l of the wire and its resistance R. Show your working.

relationship .....

.....

justification .....

.....

.....[3]

(c) Use the results to predict the resistance of a 1.50 m length of the same wire. Show your working.

prediction ..... [2]

(d) Another student proposes that the accuracy of the experiment would be improved by using a 12 V power source.

Suggest two effects that this might have on the experiment.

1. .....

.....

2. .....

.....[2]

[Total: 11]