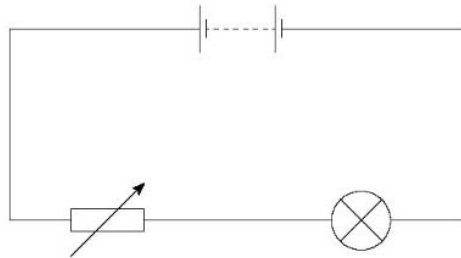


**WJEC Physics GCSE**  
**Topic 1.1: Electric circuits**  
Questions by topic

1.

The diagram shows a lamp connected to a battery and a variable resistor.



- (a) (i) Describe how the circuit is used to obtain a **series of measurements** of the voltage across the lamp and the current through it. **You should add symbols to the circuit** of any additional components you would use. [4]

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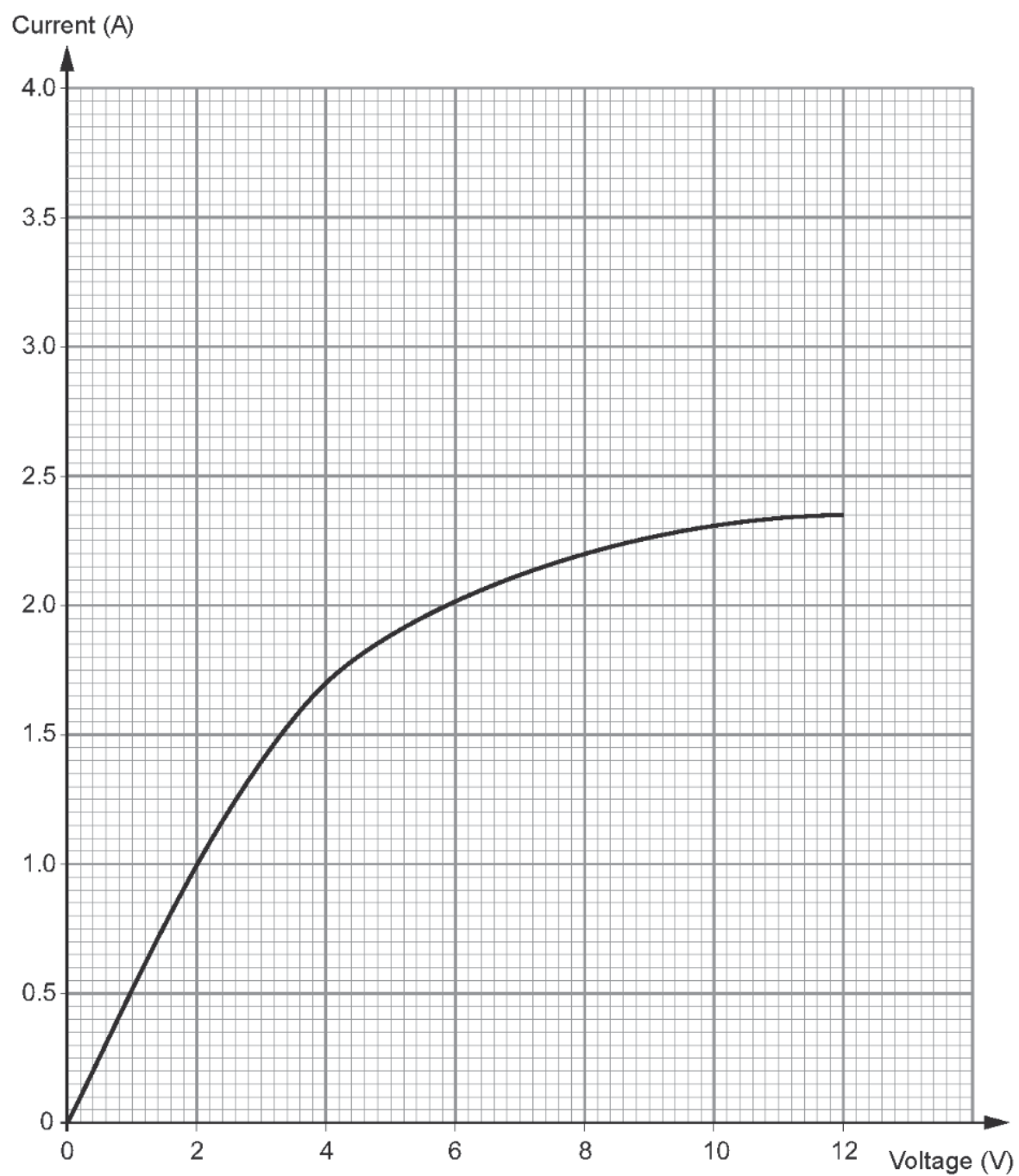
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(ii) The results for the lamp are shown on the graph below.



A resistor has a resistance of  $4\Omega$ . Draw a line on the graph above to show the current through it and the voltage across it up to 12 V. [3]

- (b) (i) Use the graph and an equation from page 2 to find the power of the lamp when it has the same resistance as the resistor. [3]

..... W

- (ii) Compare the resistances of the lamp and resistor when a voltage of 12 V is applied to each. Give a reason for your answer. [2]

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12

2.

(a) Use the equations:

$$\text{current} = \frac{\text{voltage}}{\text{resistance}}$$

and

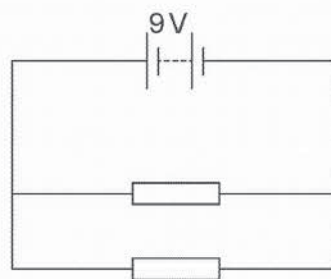
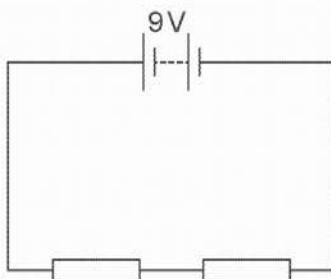
$$\text{power} = \text{voltage} \times \text{current}$$

to calculate the power loss in a  $920\Omega$  resistor when connected to 230V.

[4]

power = ..... W

(b) The diagrams show how 2 identical resistors can be connected in series and parallel with the same battery. The voltage is shared equally between the resistors when they are connected in series.



Explain how the circuits compare in terms of the:

[6 QWC]

- voltage across the resistors
- current through the resistors and battery
- power loss in the resistors.

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3.

- (a) Describe how you would investigate how the resistance of a filament lamp changes with the voltage. [6 QWC]

Include in your answer:

- a labelled circuit diagram;
- how you would obtain a range of results;
- how you would analyse the data.

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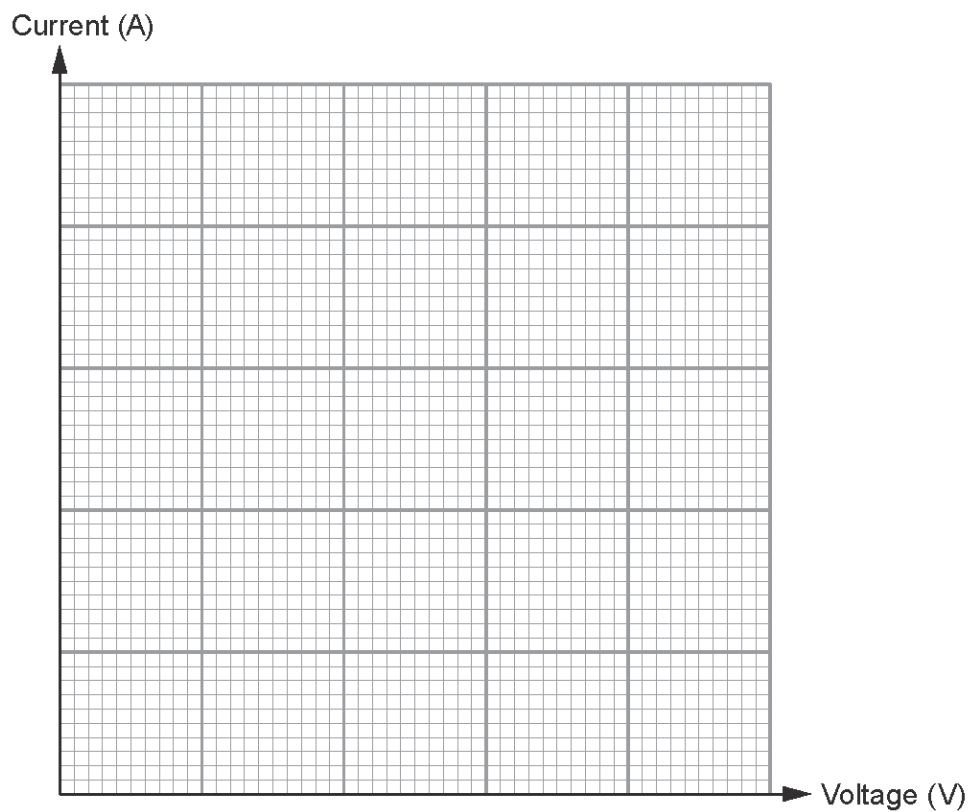
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(b) A table of results for a similar investigation is shown below.

Voltage (V)	Current (A)
0	0
2.0	1.0
4.0	1.4
6.0	1.7
8.0	1.9
10.0	2.0

(i) Plot the data on the grid below and draw a suitable line.

[3]



- (ii) Use the graph and an equation from page 2 to calculate the resistance of the lamp at 5 V. [3]

resistance = .....  $\Omega$

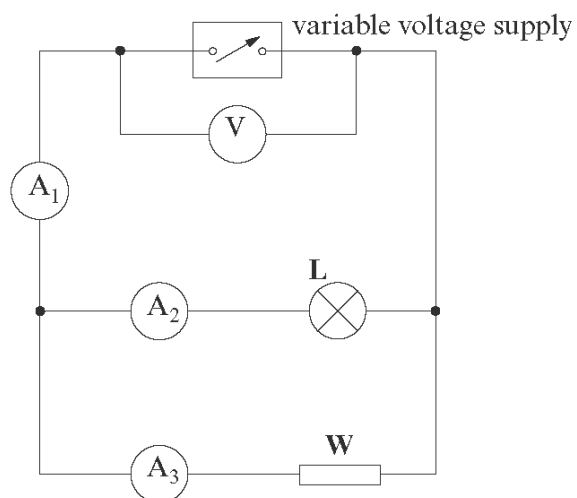
- (iii) Use the graph to explain how the resistance of the lamp changes as the voltage increases. [2]

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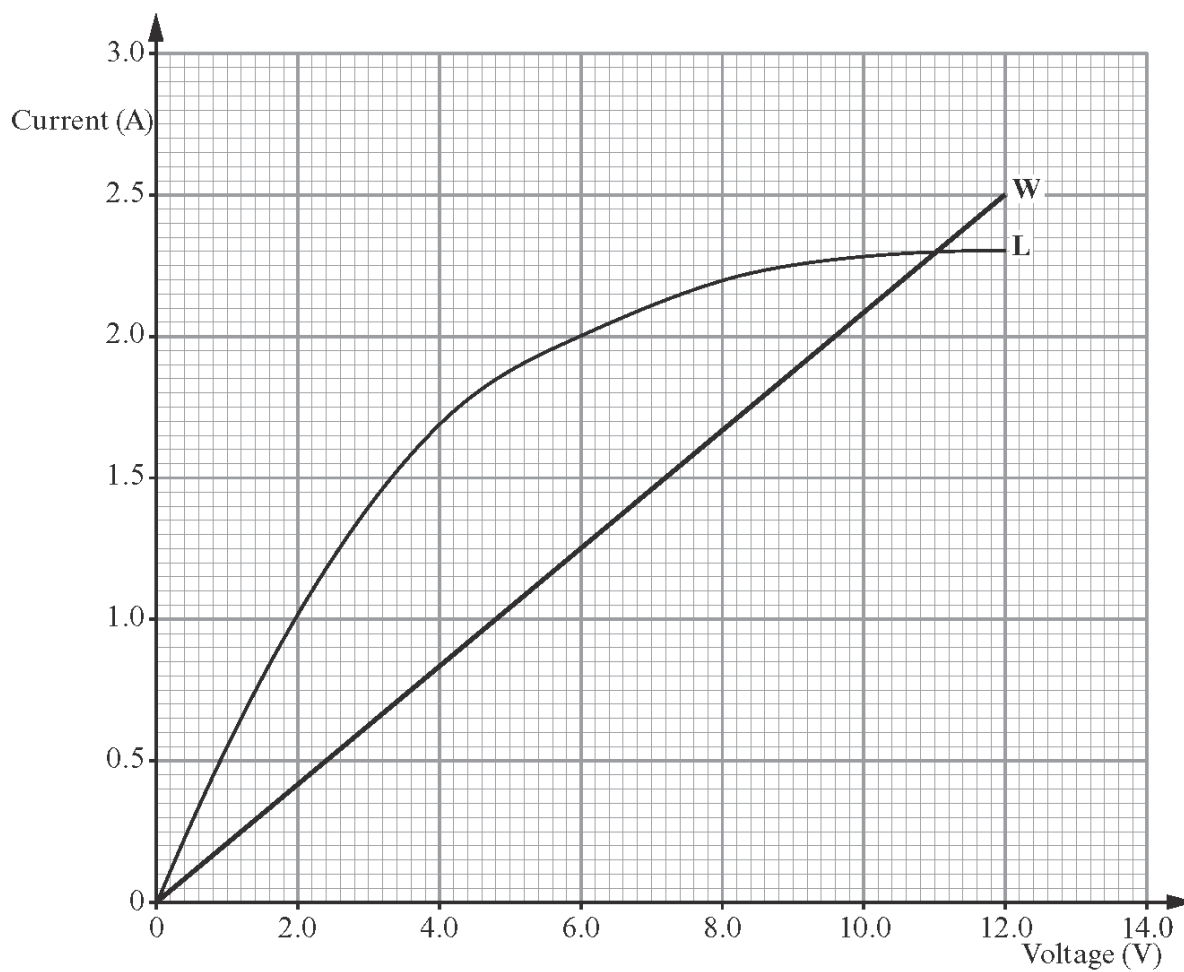
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4. The diagram shows a circuit used to investigate currents in a parallel circuit when the voltage is varied. A lamp **L** and a wire **W** are connected in parallel with a variable voltage supply. The circuit has 3 ammeters  $A_1$ ,  $A_2$  and  $A_3$  as shown.



The currents through the lamp, **L**, and the wire, **W**, depend on the voltage applied to them in the way shown on the graph below.



- (a) (i) Use the graph to find the current through the lamp when the voltmeter reading is 6 V. [1]

Current = ..... A

- (ii) Using an equation from page 2, calculate the resistance of the lamp at 6 V. [2]

Resistance = .....  $\Omega$

- (iii) Using an equation from page 2, calculate the power produced by the lamp at 6 V. [2]

Power = ..... W

- (iv) At what voltage, were the power of the lamp and wire the same? ..... V [1]

- (v) Find the current through ammeter  $A_1$  at 6 V. [1]

Current = ..... A

- (b) The voltage supply in the diagram is increased from 6 V to 12 V.

- (i) Compare the resistances of the lamp and wire at 12 V. [1]

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- (ii) Give a reason for your answer. [1]

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5.

A student investigated the changes in resistance of a 12 V filament lamp and wrote the following report of her experiment.

A 12 V power supply was connected in series with an ammeter, the lamp and a variable resistor. A voltmeter was connected in parallel with the lamp.

Initially the variable resistor was set on its highest setting and readings were taken from the ammeter and voltmeter. The setting on the variable resistor was changed 6 times and the readings were taken from the meters each time.

The student did not write anything more.

Your task is to complete the report.

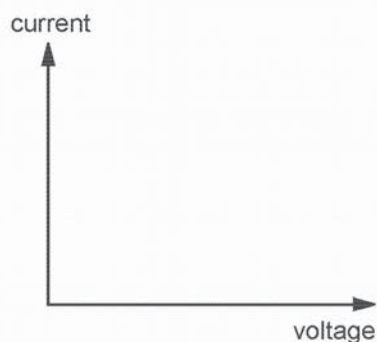
[6 QWC]

You should include the following points in your answer:

- a circuit diagram from the description given by the student;
- an explanation of how the results should be used to obtain resistance values;
- a sketch graph of how the current through the lamp would change with increasing voltage;
- a brief description of **how** the resistance of the lamp would change with increasing voltage (not **why** it changes).

Draw your circuit diagram below

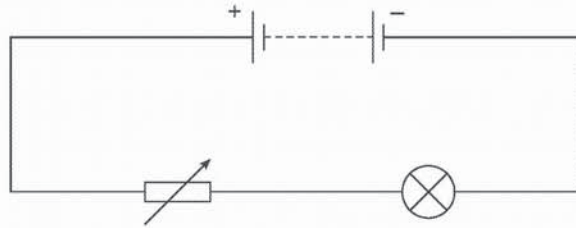
Draw your graph below



A rectangular area representing a sheet of lined paper. It contains ten horizontal ruling lines, each composed of a series of small dots. The lines are evenly spaced and span the width of the area.

**6.**

The diagram shows a lamp connected to a battery and a variable resistor.



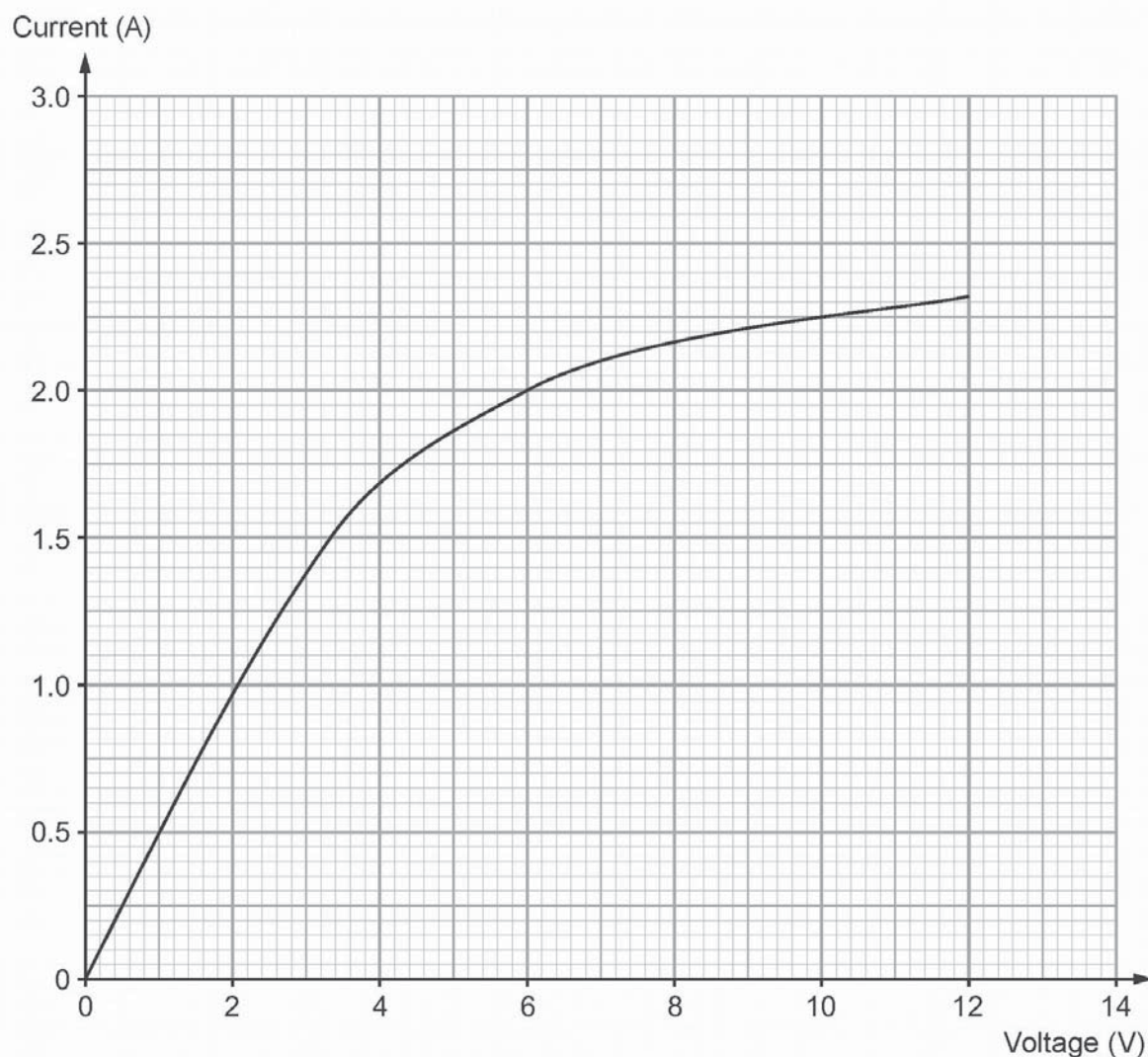
- (a) Describe how the circuit can be used to obtain a **series of measurements** to show how the current through the lamp varies with the voltage across it. [6 QWC]

In your answer you should:

- include the names of the measuring instruments needed;
- **add these instruments** to the circuit diagram above;
- describe how a series of measurements is obtained.

[illegible]

- (b) The current through the lamp was measured for voltages up to 12 V.  
A graph of the results is shown on the grid below.



- (i) Use the graph to find the current through the lamp when a voltage of 6 V is applied to it. [1]

current = ..... A

- (ii) Use the equation:

$$\text{resistance} = \frac{\text{voltage}}{\text{current}}$$

to calculate the resistance of the lamp at 6V.

[2]

resistance = .....  $\Omega$

- (iii) Use an equation from page 2 to calculate the power produced by the lamp at 6V.

[2]

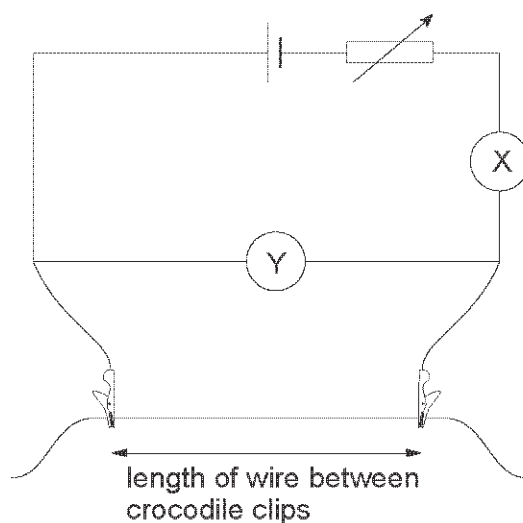
power = ..... W

- (iv) The lamp is replaced by a resistor which remains at constant temperature. At 10V the resistor and lamp have the same resistance. **Add a line** to the graph to show how the current through the resistor varies with voltage.

[2]

7.

The circuit shown is used to investigate how the resistance depends upon the length of a wire.



The results from the experiment are shown in a table.

Length of wire (cm)	Voltage (V)	Current (A)	Resistance of wire ( $\Omega$ )
10	1.80	0.90	2.00
20	1.80	0.45	4.00
30	1.80	.....	6.00
50	1.80	0.18	10.00
60	1.80	0.15	12.00
75	1.80	0.12	15.00

(a) Use the equation:

$$\text{current} = \frac{\text{voltage}}{\text{resistance}}$$

to fill in the missing value in the table.

[2]

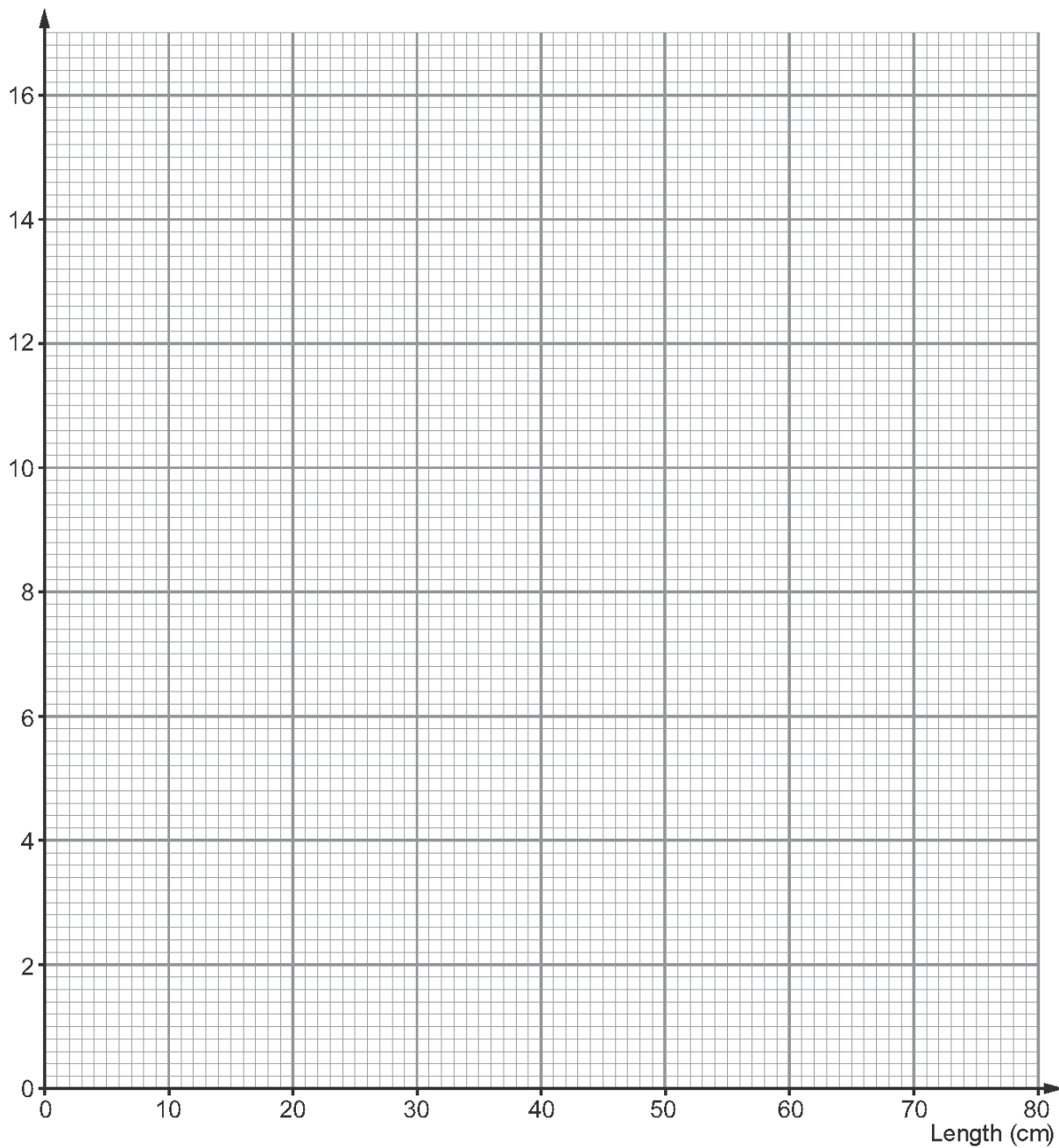
(b) Write down the name of the quantity that is measured by X in the diagram above.

[1]

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- (c) (i) Plot the values of **resistance** against **length** for the wire on the following grid and draw a suitable line. [3]

Resistance ( $\Omega$ )



- (ii) Describe the relationship between the resistance and length of the wire. [2]

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- (d) Use the table on page 8 to answer the following question. The science technician stated that a **one metre length** of the wire had a resistance of  $30\Omega$ . Explain whether this statement was true. [2]

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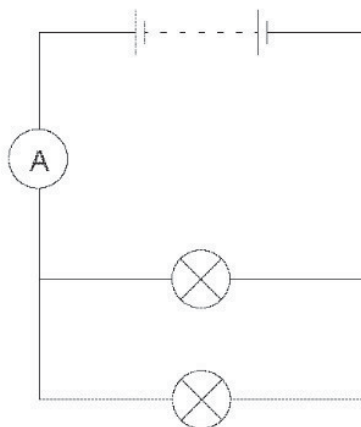
- (e) State, giving a reason, whether a second set of readings should have been taken. [1]

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**8 (part (a) (i) HIGHER).**

Two identical lamps, each having a constant resistance of  $8\ \Omega$  are connected as shown. In this circuit the lamps each have a power output of  $18\text{ W}$ .



- (a) (i) Use an equation from page 2 to calculate the current through each lamp. [3]

current = ..... A

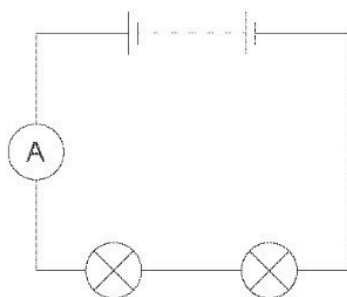
- (ii) Write down the reading on the ammeter. [1]

..... A

- (iii) Use the equation  $V = IR$  to calculate the voltage of the battery. [2]

voltage = ..... V

- (b) The same two lamps are now connected in series with the same battery.



- (i) Explain why the ammeter reading has decreased. [2]

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- (ii) Calculate the power dissipated by each lamp in this circuit, given that the current is 0.75 A. [2]

power = ..... W

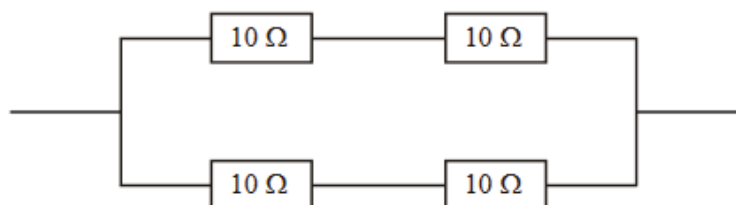
- (iii) Give a reason why lamps are connected in parallel rather than in series in domestic circuits. [1]

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**9 (HIGHER).**

Four  $10\ \Omega$  resistors are connected as shown in the diagram.



Calculate the total resistance of the combination.

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Total resistance = .....

**(3)**