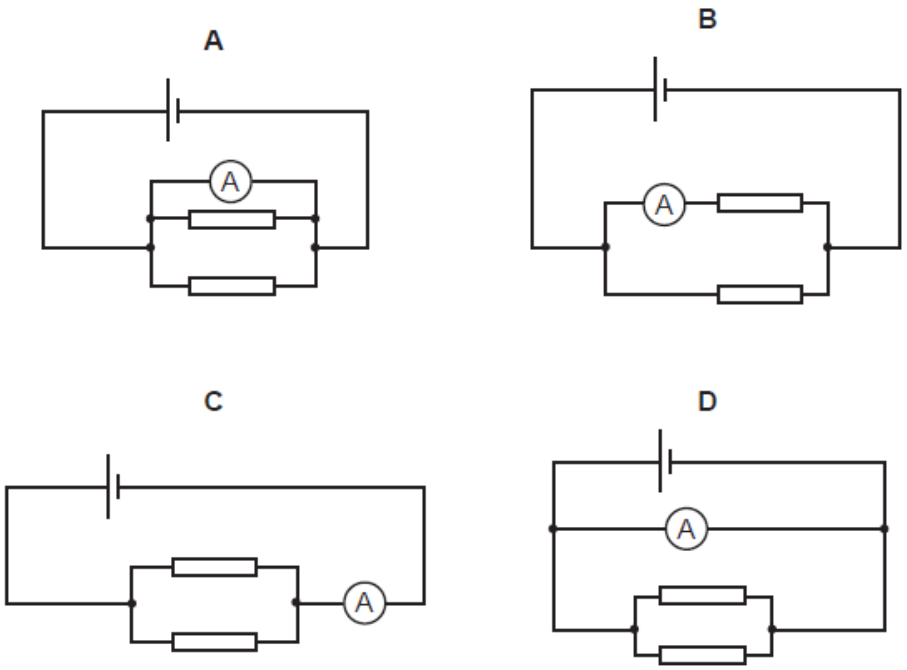
Electricity 2

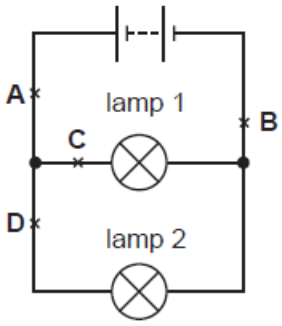
1.

In which circuit does the ammeter read the total current through both resistors?



2.

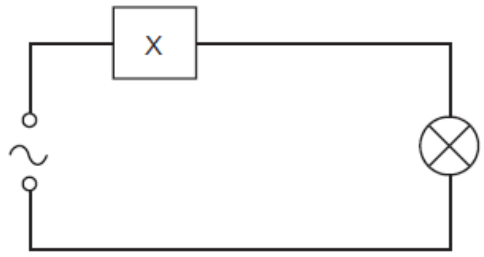
The diagram shows a circuit, with four possible positions to place a switch.



At which labelled point should a switch be placed so that lamp 1 remains on all the time and lamp 2 can be switched on and off?

3.

The device X in this circuit is designed to cut off the electricity supply automatically if too much current flows.



What is device X?

A a fuse

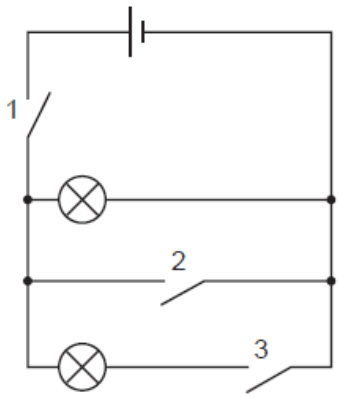
B a relay

C a resistor

D an ammeter

4.

A student connects two lamps in the circuit shown.



Which switches must he close to light both lamps?

A 1 and 2

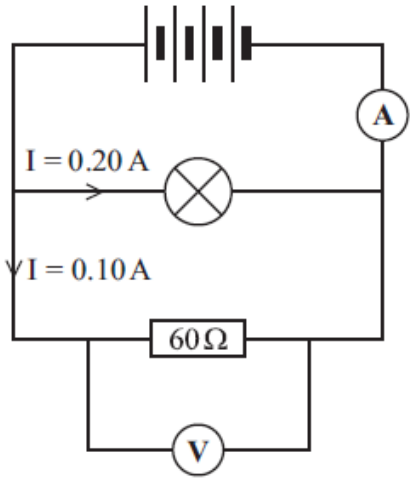
B 1, 2 and 3

C 1 and 3

D 2 and 3

5.

A circuit was set up as shown in the diagram.



(a) Each cell provides a potential difference of 1.5 volts.

(a) (i) What is the total potential difference provided by the four cells in the circuit?

.....

Total potential difference = ... volts
(1 mark)

(a) (ii) What will be the reading on the voltmeter?

.....
(1 mark)

(b) The current through the lamp is 0.20 amps.
The current through the resistor is 0.10 amps.

What is the reading on the ammeter?

.....

Reading on ammeter = ... amps
(1 mark)

(c) Use a phrase from the box to complete the following sentence.

greater than	equal to	smaller than

The resistance of the lamp is ..... 60 Ω .

Give a reason for your answer.

.....

.....

(2 marks)

6.

Fig. 8.1 shows a battery with a resistor connected across its terminals. The e.m.f. of the battery is 6.0 V.

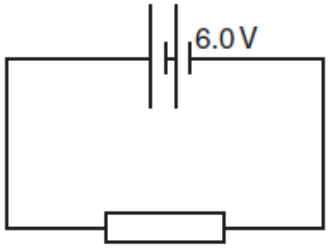


Fig. 8.1

The battery causes 90 C of charge to flow through the circuit in 45 s.

(a) Calculate

(i) the current in the circuit,

current = ...

(ii) the resistance of the circuit,

resistance = ...

(iii) the electrical energy transformed in the circuit in 45 s.

energy = ...

[6]

(b) Explain what is meant by the term *e.m.f. of the battery*.

.....

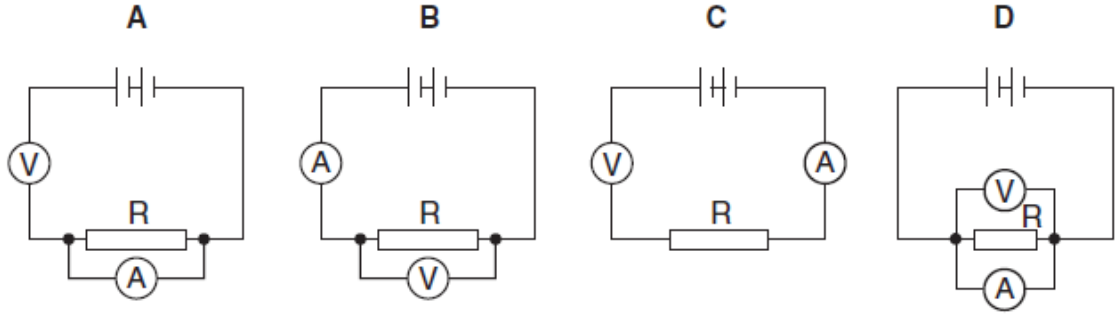
.....

.....[2]

7.

A student wants to find the resistance of resistor R using a voltmeter and an ammeter.

Which circuit should the student use?



8.

Why is a circuit breaker or a fuse used in a mains electric circuit?

A It allows spare current to be returned to the mains.

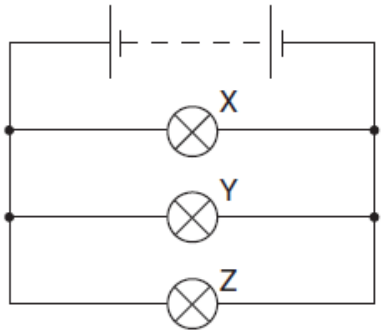
B It improves the insulation of the wiring.

C It protects the mains wiring from current overload.

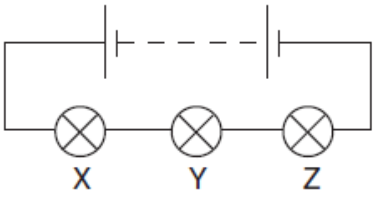
D It saves energy by reducing the current.

9.

The diagrams show two ways in which three lamps may be connected.



circuit 1



circuit 2

Which statement is correct?

A If lamp Y breaks in circuit 1, both the other lamps will go out.

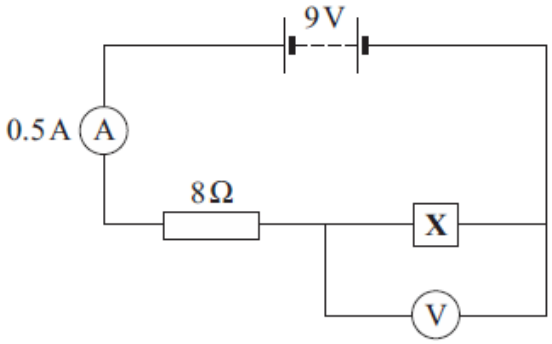
B If lamp Y breaks in circuit 2, both the other lamps will go out.

C If lamp Y breaks in circuit 1, lamp Z will go out, but lamp X will remain on.

D If lamp Y breaks in circuit 2, lamp Z will go out, but lamp X will remain on.

10.

(a) The circuit diagram drawn below includes a component labelled **X**.



(a) (i) Calculate the potential difference across the 8 ohm resistor.

Show clearly how you work out your answer.

.....

.....

Potential difference = ... volts

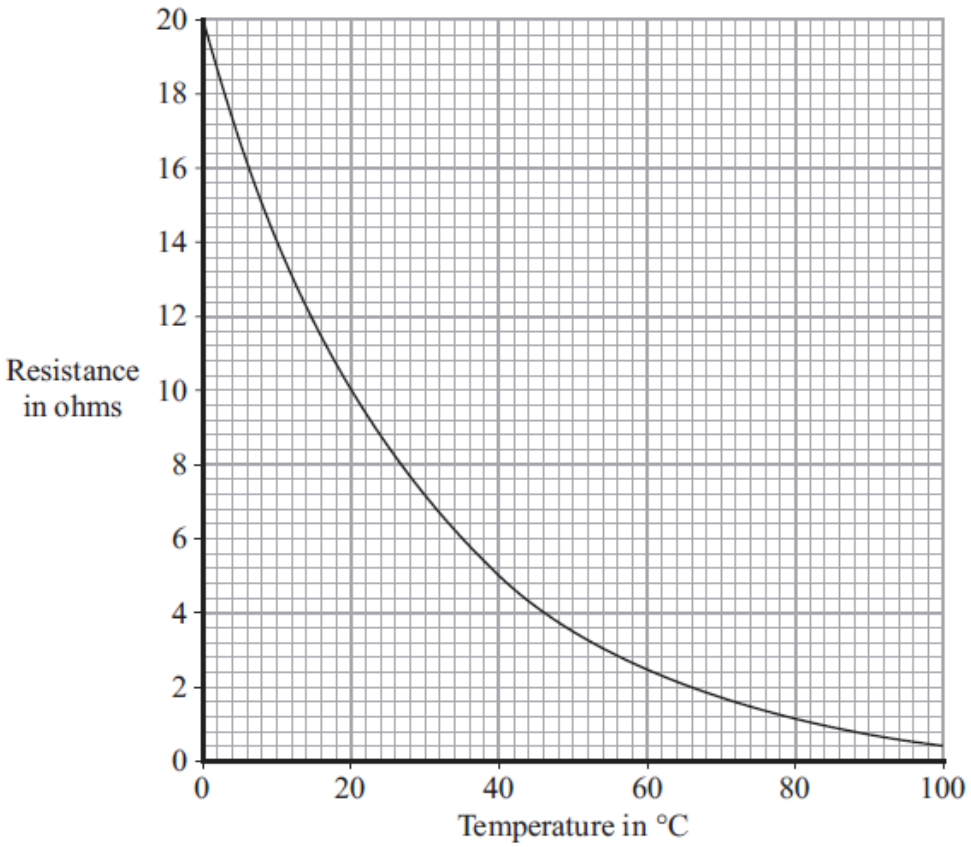
(2 marks)

(a) (ii) What is the potential difference across component **X**?

.....

(1 mark)

(b) The graph shows how the resistance of component **X** changes with temperature.



(b) (i) What is component **X**?

.....

(1 mark)

(b) (ii) Over which range of temperatures does the resistance of component **X** change the most?

Put a tick (✓) in the box next to your choice.

0 °C to 20 °C ☐

20 °C to 40 °C ☐

40 °C to 60 °C ☐

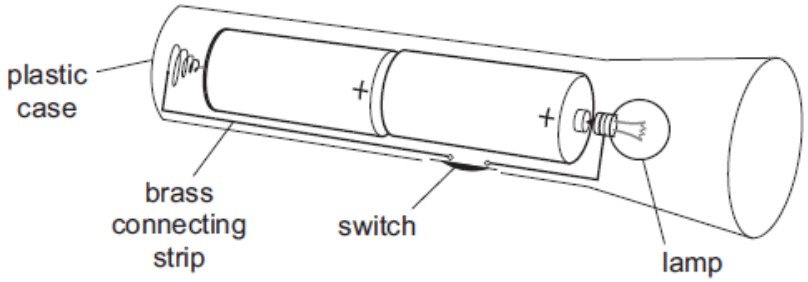
60 °C to 80 °C ☐

80 °C to 100 °C ☐

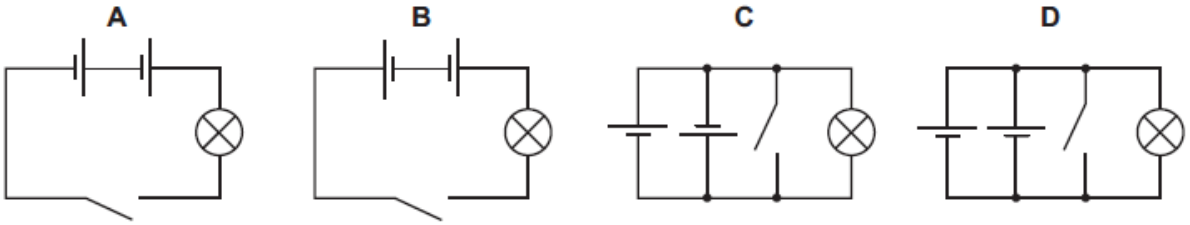
(1 mark)

11.

The diagram shows a torch containing two 2 V cells, a switch and a lamp.



What is the circuit diagram for the torch?



12.

Fig. 8.1 shows an electric circuit containing a battery, a 4.7 Ω resistor, an ammeter and a variable resistor with a sliding contact. The variable resistor is set at zero. The ammeter and battery have such a small resistance that it can be ignored.

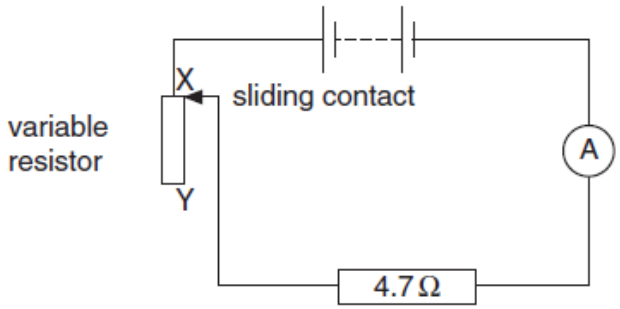


Fig. 8.1

(a) In what unit do we measure the e.m.f. of the battery? .....[1]

(b) Write down the equation that links resistance, potential difference (p.d.) and current.

[2]

(c) The ammeter shows that the current through the 4.7 Ω resistor is 0.5 A.

Calculate the p.d. across the resistor.

p.d. across resistor = ... [2]

(d) The sliding contact of the variable resistor is moved from X to Y.

(i) What happens to the resistance of the variable resistor?

.....

(ii) What happens to the reading on the ammeter?

.....
[2]

(e) The variable resistor is now adjusted to make the total resistance of the circuit 10.0 Ω. What is the resistance of the variable resistor now?

resistance of variable resistor = ... Ω [2]

13.

(a) Fig. 11.1 shows a circuit containing a lamp and a variable resistor.

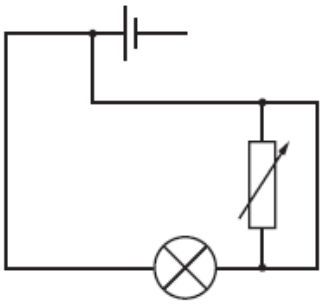


Fig. 11.1

The circuit does not work. The lamp does not light and altering the setting on the variable resistor makes no difference.

In the space below, re-draw the diagram, showing a circuit in which the variable resistor may be used to change the brightness of the lamp. [2]

(b) Fig. 11.2 shows two resistors and an ammeter connected in series to a 6 V d.c. supply. The resistance of the ammeter is so small that it can be ignored.

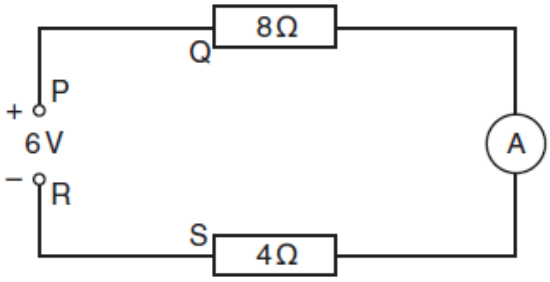


Fig. 11.2

(i) Calculate the combined resistance of the 8 Ω and 4 Ω resistors in series.

combined resistance = ... Ω [2]

(ii) **1.** Calculate the current supplied by the 6 V d.c. supply.

current = ...

2. State the value of the current

in section PQ of the circuit .....

recorded by the ammeter .....

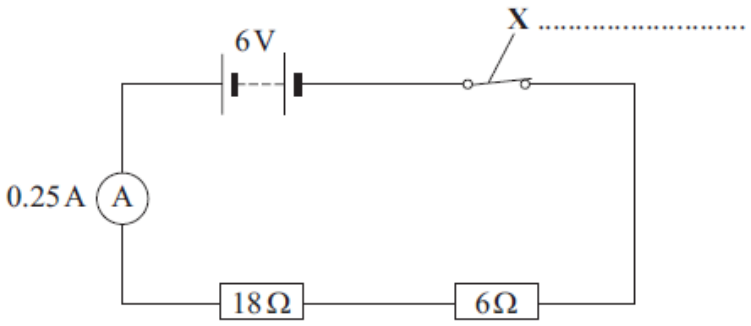
in section SR of the circuit .....

[5]

(iii) On Fig. 11.2, show a voltmeter connected to measure the potential difference across the 4 Ω resistor. [1]

14.

A circuit diagram is shown below.



(a) Use a word from the box to label component **X**.

fuse	**switch**	**thermistor**

(1 mark)

(b) Calculate the total resistance of the two resistors in the circuit.

.....

Total resistance = ... Ω

(1 mark)

(c) The reading on the ammeter is 0.25 A.

The current through the 6 Ω resistor will be:

bigger than 0.25 A **equal to 0.25 A** **smaller than 0.25 A**

Draw a ring around your answer.

(1 mark)

(d) The 6 V battery is made by correctly joining several 1.5 V cells in series.

Calculate the number of cells needed to make the battery.

.....

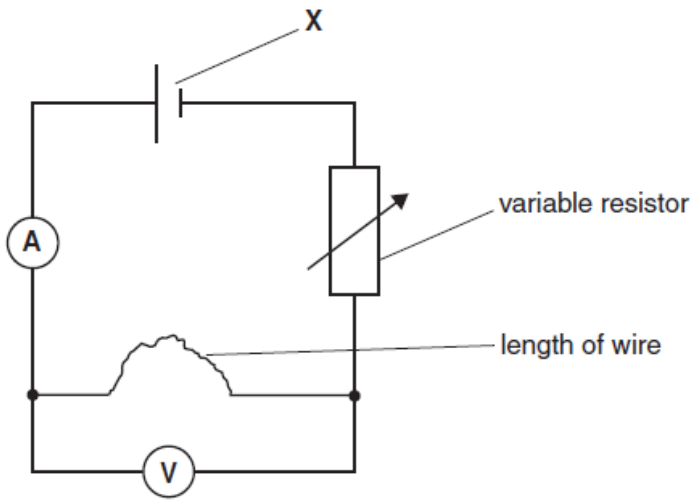
Number of cells = ...

(1 mark)

15.

Jenny wants to measure the resistance of a wire.

She uses this circuit.



(a) Jenny changes the variable resistor. The resistance gets less.

What happens to the current in the circuit when the resistance gets less?

..... [1]

(b) The reading on the ammeter is 0.5 A. The reading on the voltmeter is 1.5 V.

(i) Calculate the resistance of the wire.

Use the equations on page 2 to help you.

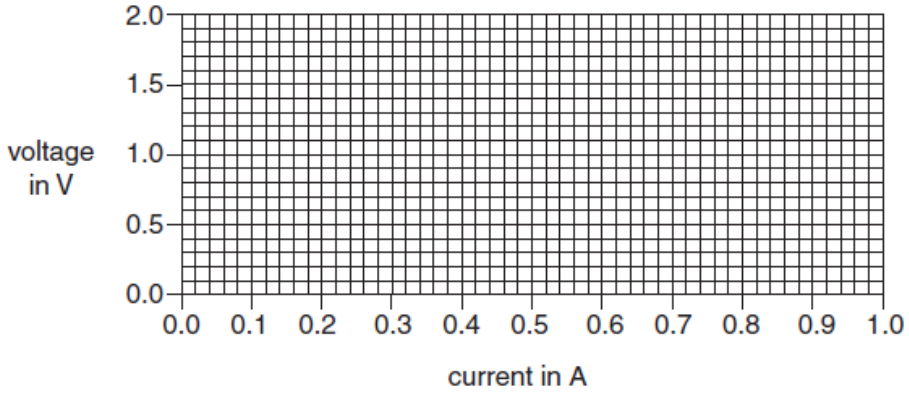
.....

.....

resistance of wire = ... Ω [2]

(ii) Jenny plots a graph to show how the voltage varies with current.

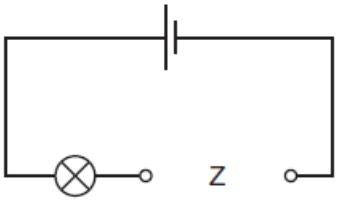
Use the axes to draw her graph.



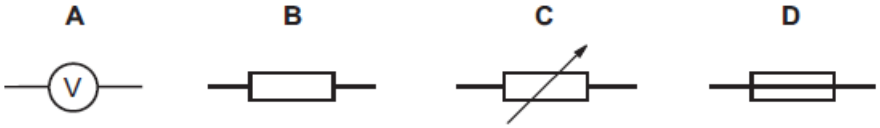
[3]

16.

An electrical component is to be placed in the circuit at Z, to allow the brightness of the lamp to be varied from bright to dim.



What should be connected at Z?



17.

(a) The list below contains the names of five different components that might be found in an electric circuit.

capacitor light-dependent resistor resistor thermistor variable resistor

Which of these has

(i) a resistance that falls rapidly when the temperature rises,

.....

(ii) a resistance that changes when a sliding contact is moved,

.....

(iii) a high resistance in the dark but a low resistance in daylight?

.....

[3]

(b) A lamp shines with full brightness when connected to a 12 V battery, as shown in Fig. 11.1.

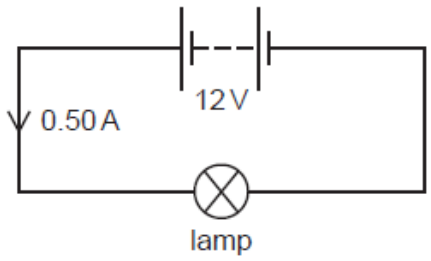


Fig. 11.1

(i) **1.** Write down the equation that links resistance with p.d. and current.

2. The current in the lamp is 0.50 A. Calculate the resistance of the lamp.

resistance of lamp = ...
[4]

(ii) A resistor is now connected in series with the lamp, as shown in Fig. 11.2.

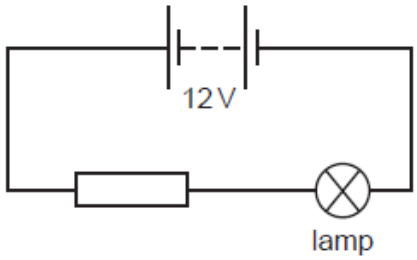


Fig. 11.2

1. State what happens to the current in the lamp when the resistor is added.

.....

2. Explain your answer.

.....

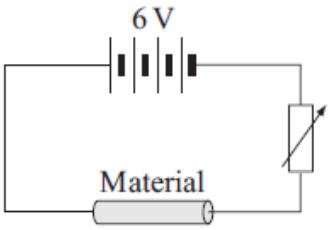
.....

3. Suggest what change might be seen in the lamp.

.....
[3]

18.

(a) The diagram shows the circuit used to investigate the resistance of a material.
The diagram is incomplete: the ammeter and voltmeter are missing.



(i) Draw the symbols for the ammeter and voltmeter on the diagram in the correct places. *(2 marks)*

(ii) How can the current through the material be changed?

.....

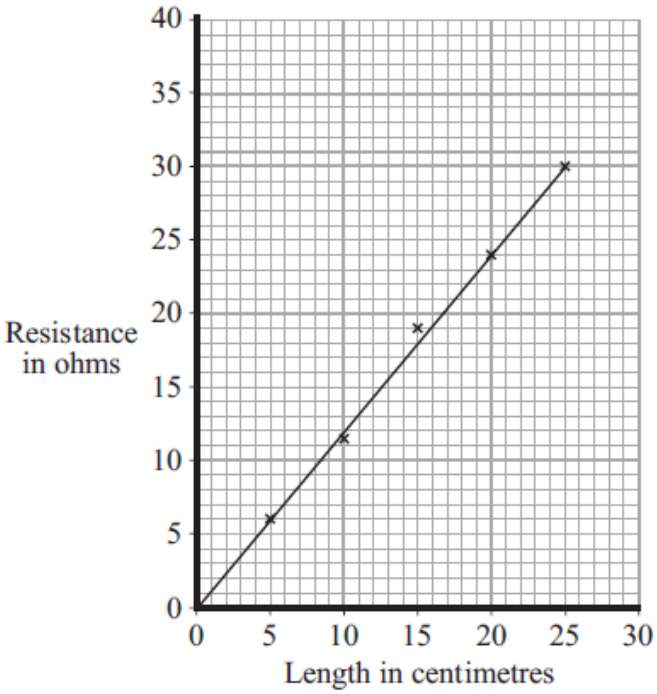
.....

(1 mark)

(b) The material, called conducting putty, is rolled into cylinders of different lengths but with equal thicknesses.

Graph 1 shows how the resistance changes with length.

Graph 1



(i) Why has the data been shown as a line graph rather than a bar chart?

.....

.....

(1 mark)

(ii) The current through a 30 cm length of conducting putty was 0.15 A.

Use **Graph 1** to find the resistance of a 30 cm length of conducting putty.

Resistance = ... ohms

(1 mark)

(iii) Use your answer to (b)(ii) and the equation in the box to calculate the potential difference across a 30 cm length of conducting putty.

potential difference = current × resistance

Show clearly how you work out your answer.

.....

.....

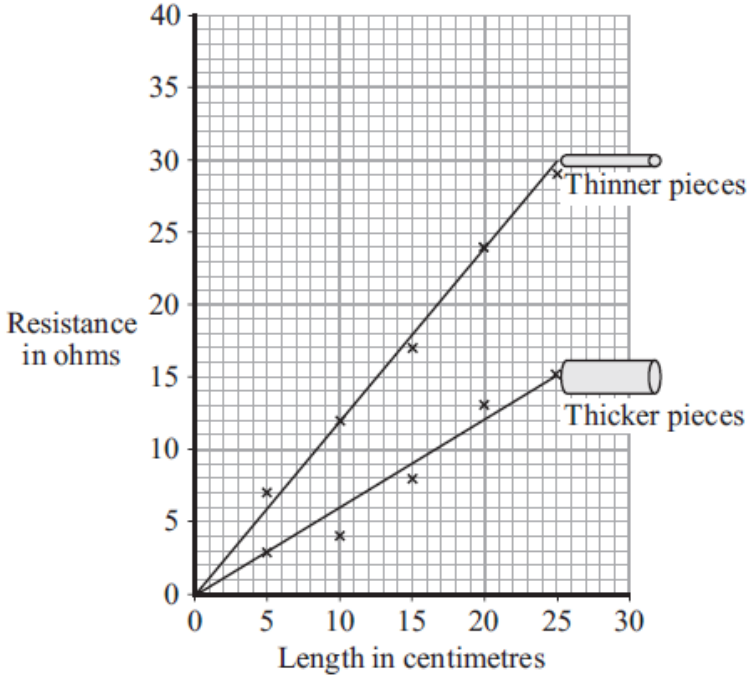
.....

Potential difference = ... volts

(2 marks)

(c) A second set of data was obtained using thicker pieces of conducting putty. Both sets of results are shown in **Graph 2**.

Graph 2



(i) What is the relationship between the resistance and the thickness of the conducting putty?

.....

.....

(1 mark)

(ii) Name **one** error that may have reduced the accuracy of the results.

.....

(1 mark)

(iii) How could the reliability of the data have been improved?

.....

.....

(1 mark)