

# **Easter HW 1 Combined science - Physics ( Foundation )**

## **Physics Paper 1**

### **Topic P2 Electricity**

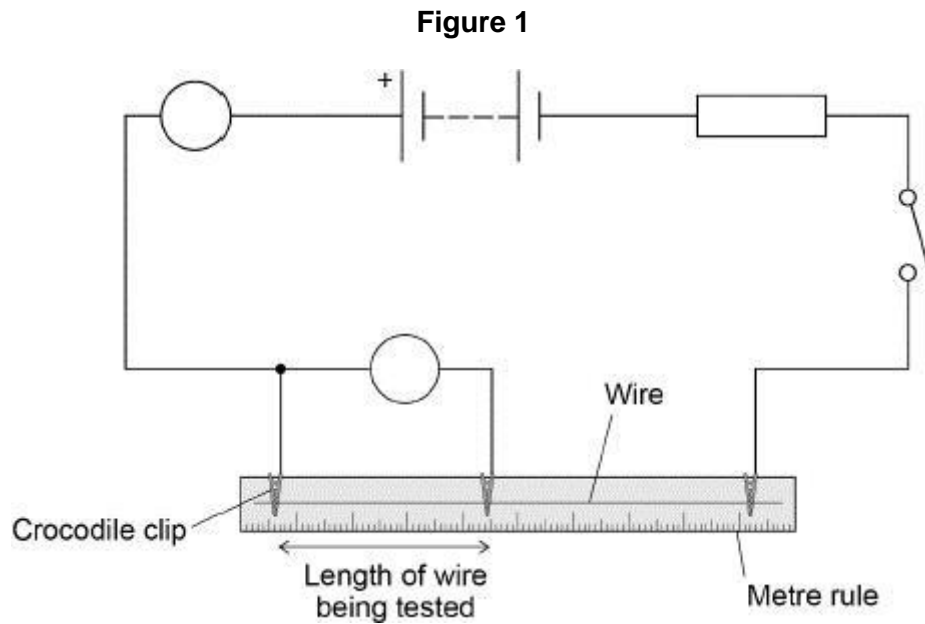
#### **6.2.1 Current, potential difference and resistance**

**You must complete this homework on Lined/ plain A4 paper and bring it in to school on 19/04/22**

**Q1.**

A student investigated how the resistance of a wire varies with the length of the wire.

**Figure 1** shows the circuit used.



(a) The symbols for the voltmeter and ammeter in **Figure 1** are **not** complete.

Complete the symbols for the voltmeter and ammeter in **Figure 1**.

(1)

(b) Which variable is the independent variable?

Tick (✓) **one** box.

The current in the wire

The length of the wire being tested

The resistance of the wire

The thickness of the wire

(1)

(c) Which variable is the dependent variable?

Tick (✓) **one** box.

The current in the wire

The length of the wire being tested

The resistance of the wire

The thickness of the wire

(1)

- (d) The student took repeat readings of potential difference for a 30 cm length of the wire.

The readings were:

0.16 V   0.17 V   0.15 V

Calculate the mean potential difference.

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Mean potential difference = \_\_\_\_\_ V

(2)

The length of the wire was increased to 60 cm

The current in the wire was 0.50 A

The mean potential difference across the wire was 0.32 V

- (e) Calculate the resistance of the 60 cm length of wire.

Use the equation:

$$\text{resistance} = \frac{\text{potential difference}}{\text{current}}$$

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Resistance = \_\_\_\_\_  $\Omega$

(2)

- (f) Calculate the power dissipated in the 60 cm length of wire.

Use the equation:

$$\text{power} = \text{potential difference} \times \text{current}$$

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Power = \_\_\_\_\_ W

(2)

- (g) Calculate the charge flow when there is a current of 0.50 A in the wire for 17 s

Use the equation:

charge flow = current  $\times$  time

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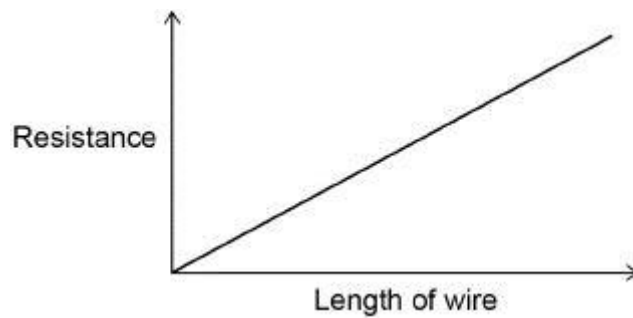
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Charge flow = \_\_\_\_\_ C

(2)

- (h) **Figure 2** is a sketch graph of the results.

**Figure 2**



The student repeated the investigation using a thicker wire made from the same metal. For the same length, the thicker wire has a lower resistance.

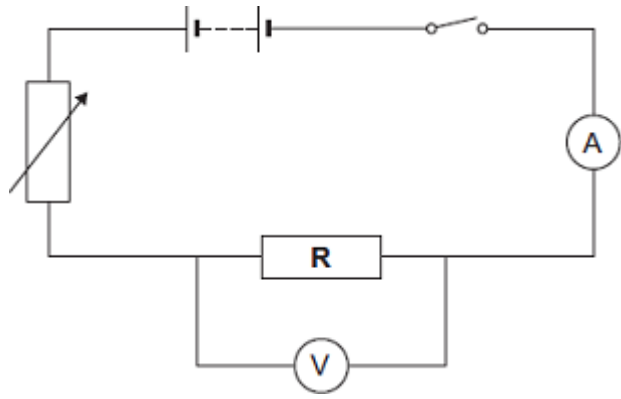
Draw a line on **Figure 2** to show how the resistance of the thicker wire varies with length.

(1)

(Total 12 marks)

**Q2.**

- (a) A resistor is a component that is used in an electric circuit.



- (i) Describe how a student would use the circuit to take the readings necessary to determine the resistance of resistor **R**.

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**(6)**

- (ii) Explain why the student should open the switch after each reading.

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**(2)**

- (iii) In an experiment using this circuit, an ammeter reading was 0.75 A. The calculated value of the resistance of resistor **R** was 16  $\Omega$ .

What is the voltmeter reading?

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Voltmeter reading = \_\_\_\_\_ V

(2)

(iv) The student told his teacher that the resistance of resistor **R** was 16  $\Omega$ .

The teacher explained that the resistors used could only have one of the following values of resistance.

**10  $\Omega$     12  $\Omega$     15  $\Omega$     18  $\Omega$     22  $\Omega$**

Suggest which of these resistors the student had used in his experiment.

Give a reason for your answer.

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(2)

(b) The diagram shows a fuse.



Describe the action of the fuse in a circuit.

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(3)

(Total 15 marks)

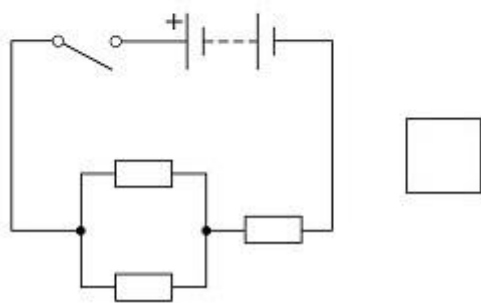
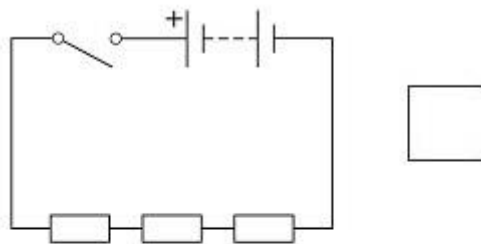
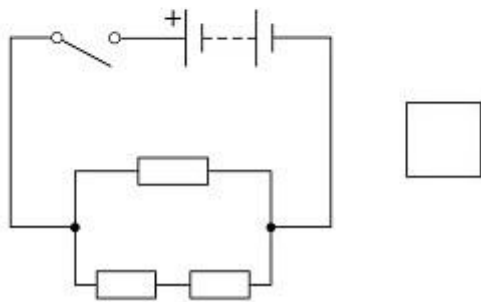
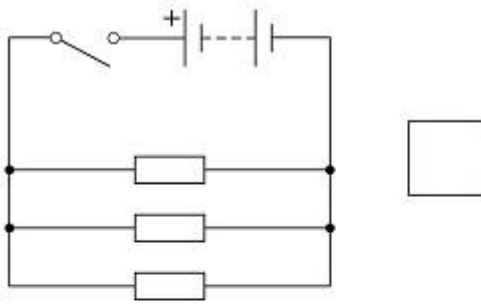
**Q3.**

A student investigated electrical circuits.

The student built a circuit with three resistors in series.

(a) Which circuit diagram shows a circuit containing three resistors in series?

Tick (✓) **one** box.



(1)

(b) The student determined the total resistance of the circuit.

To determine the resistance, the student needed extra components in the circuit.

Which **two** components did the student need?

Tick (✓) **two** boxes.

Ammeter

Diode

- Fuse
- Variable resistor
- Voltmeter

(2)

The student built circuits with different numbers of resistors in series.

All the resistors used were identical.

(c) The student switched the circuits off between readings.

Why did the student need to switch the circuits off?

Tick (✓) **one** box.

So the battery could recharge

So the current would increase

So the potential difference would increase

So the temperature of the resistors would remain constant

(1)

The table below shows the student's results.

Number of resistors	Total resistance in ohms
1	2.2
2	4.4
3	6.6
4	8.8
5	11.0
6	13.2

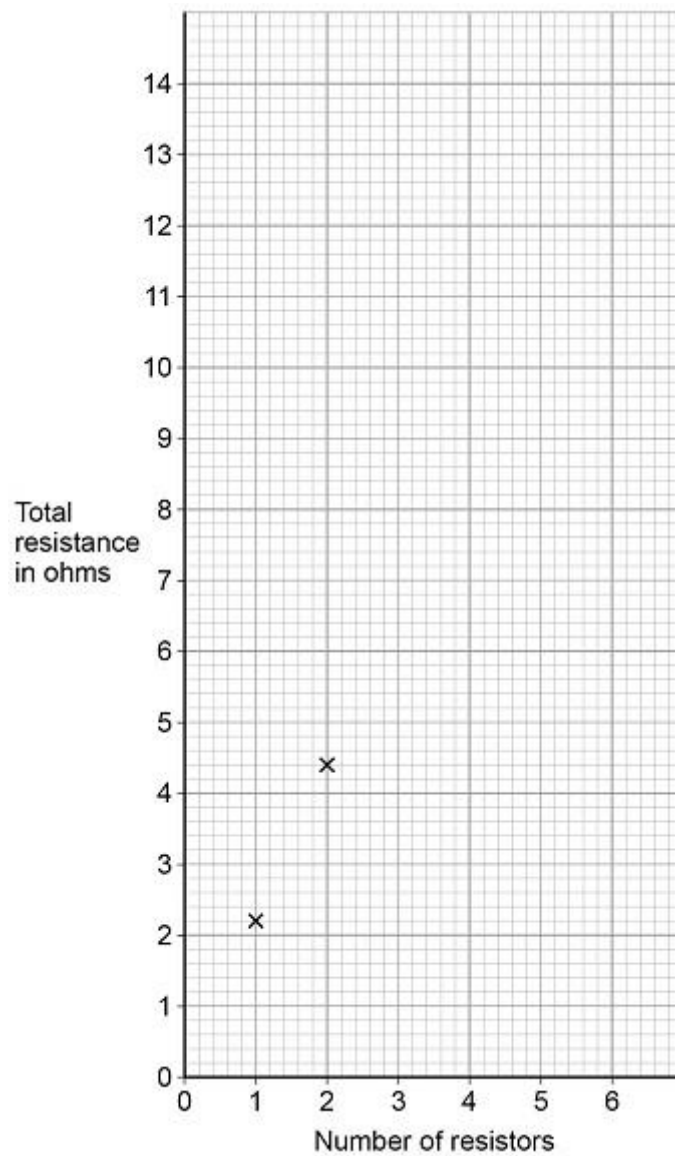
(d) Complete the graph below using data from the table.

You should:

- plot the rest of the results
- draw a line of best fit.



Figure



(3)

- (e) The student concluded that there was a linear relationship between resistance and the number of resistors.

How do the results support this conclusion?

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(1)

- (f) The student could have connected the resistors in parallel instead of in series.

How would the total resistance of three resistors in parallel compare with the total resistance of three resistors in series?

Tick (✓) **one** box.

Higher

Lower

The same

(1)  
(Total 9 marks)