AQA Physics GCSE

Required Practical 3

Resistance

Method taken from AQA Required Practical Handbook

Aim:

To investigate how the resistance of a wire depends on its length and how resistance varies in a series and parallel circuit.

Equipment List:

- Suitable power supply
- Ammeter
- Voltmeter
- Crocodile clips
- Wire with no insulation
- Metre ruler
- Switch
- Connecting leads
- Two wire-wound resistors e.g. 10Ω
- Tape

Method 1 - Resistance of a Wire:

1. Set up a simple circuit, as shown in diagram 1. Attach a length of wire along a metre ruler using pieces of tape. Attach a crocodile clip to one end (x = 0cm on the ruler).
2. Attach the second crocodile clip at x = 10cm on the ruler and record both the current and voltage through the wire.
3. Repeat by moving the crocodile clip 10cm along the wire and each time recording the current and voltage measured.
4. Calculate the resistance of the wire at each point using the equation V=IR, where V is the potential difference (measured in volts) and I is the current (measured in Amps).
5. Plot a graph of the length of the wire (x-axis, units = metres) against the resistance of the wire at that point (y-axis, units = Ω)

Blank Table of Results:

Length of Wire (cm)	Current (A)	Potential Difference (V)	Resistance (Ω)
10			
20			
30			

Method 2 - Resistance within a Circuit

1. Construct the circuit shown in diagram 2.
2. Switch on the power supply & close the switch. Record the voltage and current shown.
3. Construct the circuit shown in diagram 3 (rearrange the resistors from series to parallel).
4. Switch on the power supply & close the switch. Record the voltage and ammeter for this circuit arrangement.

The resistors are still the same resistance, so why has the voltage and current changed?

5. Calculate the total resistance of each circuit, using the equation V=IR.

The total resistances for each circuit should be different. Can you work out how resistance changes depending on how you arrange the resistors (in series or in parallel)?

Expected Results:

The total resistance differs depending on if the resistors are arranged in series or parallel.

For series circuits (see diagram 2):

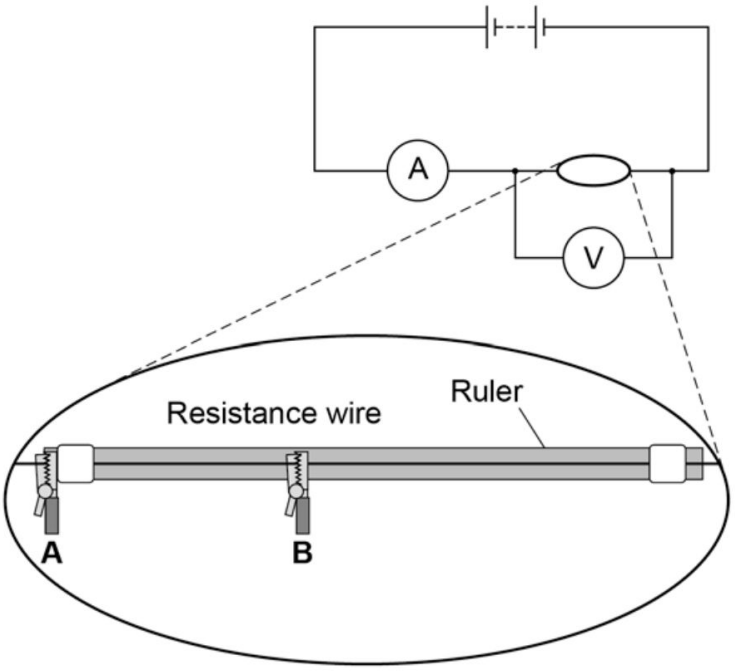
$$R_{Total} = R_1 + R_2$$

For parallel circuits (see diagram 3):

$$\frac{1}{R_{Total}} = \frac{1}{R_1} + \frac{1}{R_2}$$

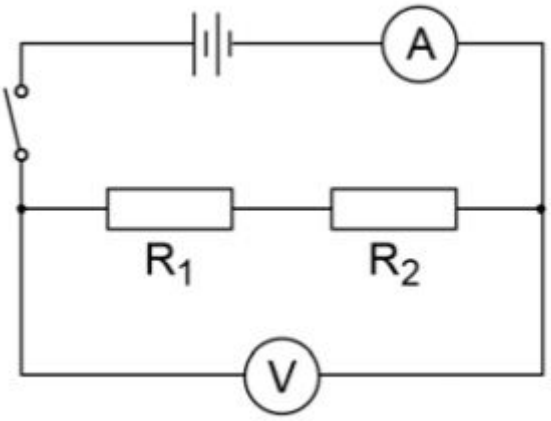
Diagrams:

Diagram 1 - Circuit to measure the resistance of a wire



Source: AQA Required Practical Handbook

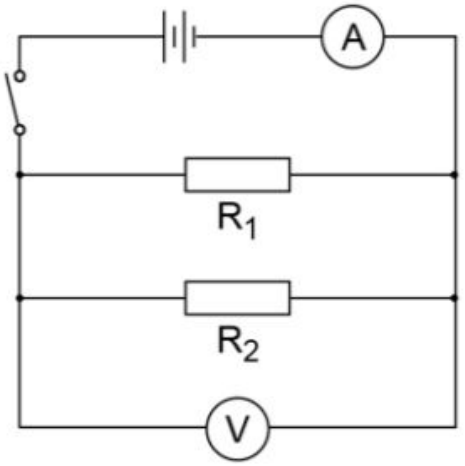
Diagram 2 - Resistors arranged in Series



Source: AQA Required Practical Handbook

Diagram 3 - Resistors arranged in Parallel

Source: AQA Required Practical Handbook



Safety Precautions:

- The uninsulated wire may become hot as current passes through it. Avoid handling the wire.