
Resistance

Factors that affect the resistance of electrical circuits:

- length of a wire at constant temperature
- combination of resistors in series and parallel.

In this practical you will:

Activity 1:

- set up a circuit which can measure the potential difference and current across a wire at different lengths along the wire
- calculate the resistance for different lengths of wire and state the relationship between resistance and length.

Activity 2:

- use circuit diagrams to construct circuits with resistors in series and in parallel
- measure the potential difference and current in circuits with resistors in series and then in parallel.

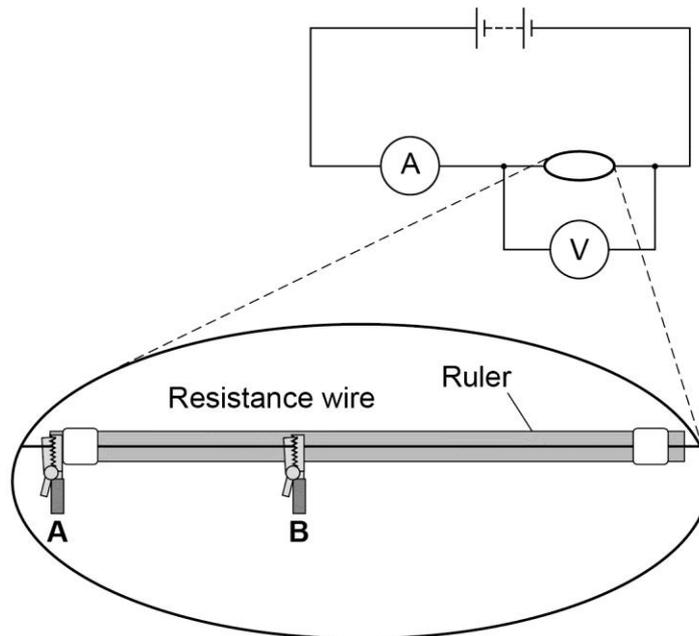
Activity 1: How does the length of the wire affect the resistance at a constant temperature?

Apparatus

- a battery or suitable power supply
- ammeter
- voltmeter
- crocodile clips
- resistance wire attached to a metre ruler
- connecting leads.

Method

1. Use the circuit diagram to set up and connect the circuit.



2. Connect a lead from the negative side of the ammeter to the crocodile clip at the zero end of the ruler. Connect a lead from the other crocodile clip to the negative side of the battery. Use this lead as a switch to disconnect the battery between readings.
3. Decide the interval distance (eg 10cm) you will investigate and connect the first distance to be tested between crocodile clips A and B.
4. Measure the readings on the voltmeter and ammeter at this distance.

5. Record your results in a table like this:

Length of wire in cm	Potential difference in volts	Current in amps	Resistance in ohms
10			

6. Move crocodile clip B and record the readings for the different lengths of wire eg 20cm, 30cm etc.

7. Calculate the resistance for each length of wire using the equation:

$$\text{resistance in } \Omega = \frac{\text{potential difference in V}}{\text{current in A}}$$

8. Plot a graph of resistance against length of wire.

9. You should be able to draw a straight line of best fit although it may not go through the origin. Why might this be the case?

What type of relationship is there between resistance and length?

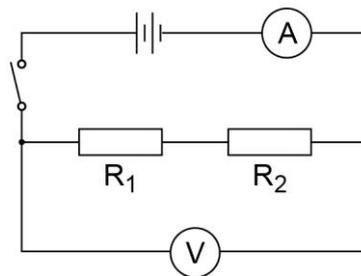
Activity 2: How does the arrangement of resistors in series and in parallel affect resistance?

Apparatus

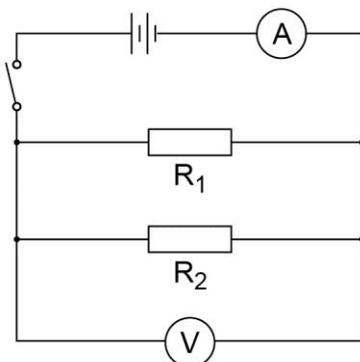
- a battery or suitable power supply
- a switch
- ammeter
- voltmeter
- crocodile clips
- two $10\ \Omega$ resistors
- connecting leads.

Method

1. Use the circuit diagram to set up and connect the circuit for two resistors in series $R_1=R_2$



2. Switch on and record the readings of the ammeter and the voltmeter.
3. Calculate the total resistance of the series circuit.
4. Set up the circuit for two resistors in parallel. Use the circuit diagram below. $R_1=R_2$



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5. Switch on and record the readings of the ammeter and the voltmeter.

 6. Calculate the total resistance of the parallel circuit.

 7. What conclusions can you make about the effect of adding resistors
 - in series
 - In parallel.

 8. How could you check the value of the resistance of R_1 and R_2 in either circuit?