Factors affecting the resistance in a wire – transcript

The resistance in a circuit changes due to factors like the length and thickness of the wire used.

It is the effects of these changes which are going to be investigated.

To measure how the resistance in a wire changes, the current (which is measured in Amperes) and the potential difference (which is measured in volts) should be recorded.

Wires are used to connect the voltmeter and ammeter to the power supply.

It is important to only change one variable at a time, the first of these will be the wire length.

A 110 cm length of 0.32 mm copper-nickel wire is measured and cut.

The wire is attached to the metre rule using tape.

It should be straight with no twists, knots or bends.

One crocodile clip is connected to the wire at the 0 cm point on the ruler.

The final connection in the circuit is made by attaching the second crocodile clip to the wire at the 10 cm mark. By doing this, the wire in the circuit is effectively 10 cm long.

Before the circuit is switched on, check carefully that it is set up as shown in the diagram.

Make sure a results table is ready to record the data.

After turning on the power the readings from the Ammeter and Voltmeter should be recorded.

The crocodile clip is now moved from the 10 cm to the 30 cm point.

The levels on the ammeter and voltmeter are recorded.

The crocodile clip is moved again to the 50 cm mark and the readings are noted.

Data should be collected as the crocodile clip is moved along the wire in 20 cm increments.

The resistance of each length of wire can be calculated using this equation. Resistance (R) equals the potential difference (V) divided by the Current (I).

The results table is completed using the calculated resistance for each length of wire.

Now all of the data has been collected a graph of the results can be drawn.

The independent variable (wire length) is plotted on the *x*-axis and the independent variable (the resistance) on the *y*-axis.

Each axis is labelled and the units evenly spaced so that they make the best use of the space.

The data is plotted by using a small cross for each point.

A straight line of best fit should be drawn on the graph.

The line should pass through the origin.

Other variables can now be changed to see how these may affect the resistance in the wire.

This time the material being used has been changed to copper, but the wire thickness is the same.

Wires of different thicknesses or other types of metal, for example steel, could be used.

The additional data is plotted onto the graph so that the factors that affect the resistance of the wire can be compared.

Each line is labelled so they can be identified.

The graph shows that the relationship between wire length and resistance is directly proportional.

The ability of a wire to conduct charge with the least resistance is an important consideration.

However, the best conductors are often the most expensive, and as materials heat up their resistance increases.

How do we decide which materials would be the best to use in different situations?