2.4.2 More about resistance

videos

Electrical resistance is a measure of the opposition to the flow of charges (current) through a material. Materials with a big resistance strongly oppose the flow of charges, and so the current is reduced. They are known as electrical 'insulators'. Materials with a small resistance only weakly oppose the flow of charges and allow larger currents. They are known as electrical 'conductors'. Some materials are classified as 'semi-conductors'. Their resistance can be changed (e.g. thermistors and light dependent resistors).

Watch this animation to show how resistance arises:
http://micro.magnet.fsu.edu/electromag/java/filamentresistance/index.html

(1) Summarise what causes resistance in metal conductors.

(2) Why does resistance cause the material to heat up?

The unit for resistance is the ohm (Ω). The resistance of a component is the potential difference ($p.d.$) across the component divided by the current (I) flowing through the component:

$$R = \frac{p.d.}{I}$$

(3) Looking at this formula, what unit is an ohm equivalent to?

This formula is often written:

$$R = \frac{V}{I}$$

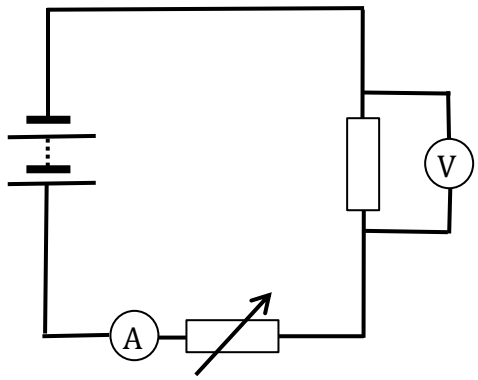
(4) Sketch the circuit symbols for a resistor and a variable resistor.

Resistors are used in circuits to reduce the flow of current. They obey ohm's law which states that: **"the current through a conductor is proportional to p.d. across it, provided the conditions do not change"**
(5) What is the main condition that could change?

Have a play with the following simulation:
https://phet.colorado.edu/en/simulation/ohms-law

(6) Keeping the resistance constant, how does increasing the voltage affect the current?

The characteristics of a resistor can be measured using the following circuit:



(7) Label the different circuit components.

(8) What would you do to investigate the characteristics of the resistor?

(9) Rearrange the formula $R = \frac{p.d.}{I}$ *to make p.d. the subject (i.e. p.d.= …).*

This formula is now in the form $y = mx + c$.

(10) Sketch the p.d. versus current graph you would get for this experiment. (Hint: Look at your equation in (9))

(11) Explain how you would use the graph to obtain a value for the resistance of the resistor.