Electricity and Energy

Practical Electricity

N4

Electric Current

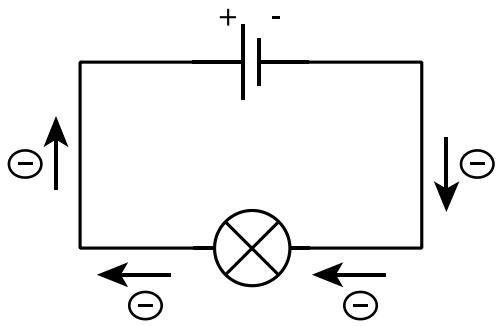
Materials can be divided into two main groups as conductors and insulators

Electrical conductors contain electrons which are free to move throughout the structure.

In electrical insulators, the electrons are tightly bound and cannot move.

All circuits need a source of energy and some electrical components which are connected by wires. The source of energy may be a battery or the mains.

If a battery is connected across a conductor such as a bulb, then the electrons will move in one direction around the circuit:



An **electric current** is the flow of electrons around a circuit. The greater the flow of electrons in a circuit, the greater is the current.

The **voltage** is the electrical energy supplied by the battery (or mains) to make the electrons move around the circuit.

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Electric Current

When we define an electric current we consider it to be the movement of a *group of electrons* around a circuit.

The smallest unit of electric charge is the charge on one electron, but this is too small a number to use practically, therefore we use the term Charge to describe a group of electrons at any one point.

A quantity of Charge has the symbol Q and is measured in units of Coulombs, C.

The size of an electric current will depend on the number of coulombs of charge passing a point in the circuit in one second.

amperes or **A**

coulombs or **C**

$$\text{current} = \frac{\text{charge}}{\text{time}} \qquad I = \frac{Q}{t}$$

seconds or **s**

This means that **electric current is defined** as the **electric charge transferred per second**.

Example

A current of 5 amperes flows through a lamp for 7 seconds. How much *charge* has passed through the lamp in that time?

I = 5 A

t = 7 s

Q = ?

Q = I x t

= 5 x 7

= **35C**

Therefore 35 coulombs of charge have passed through the lamp in 7 seconds.

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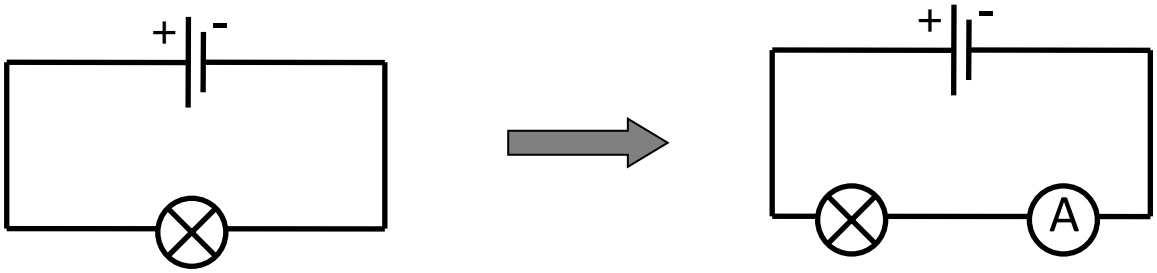
Measuring Current

Current is measured using an ammeter which has the symbol: 

Electric current is given the symbol I and is measured in amperes (A).

To measure the current through a component, make a gap in the circuit and connect the ammeter in series with the component.



In the circuit, the ammeter is in series with the bulb. The reading on the ammeter is the current through the bulb.

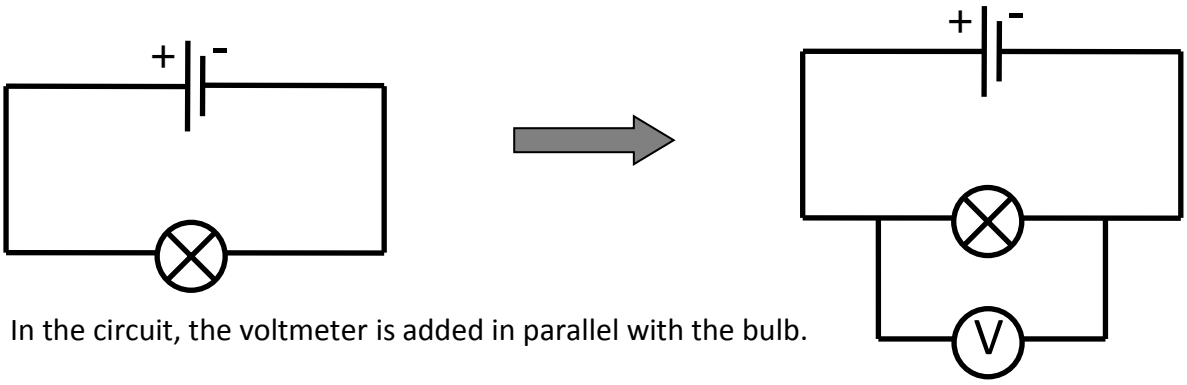
N4

Measuring Voltage

Voltage is measured using a voltmeter which has the symbol: 

Electrical voltage is given the symbol V and is measured in volts (V).

To measure the voltage across a component, use two extra wires to connect the voltmeter in parallel with the component.



In the circuit, the voltmeter is added in parallel with the bulb.

The reading on the voltmeter is the voltage across the bulb.