**Electricity & Energy**

**Electric Circuits**

**Summary**

Electrical **charge** is a property of particles. Electrons have negative charge and protons have positive charge.

Objects with similar charges **repel** each other. Objects with opposite charges **attract** each other.

**Electric fields** exist round electrical charges. (The arrows show the direction in which positive charges experience a force)

**Charge, Current & Time**

C

A

s

*I*

*Q*

*t*

Charge is measured in **coulombs** (C).

Electric charges experience a force in an electric field.

When electric charges move there is said to be an electric **current.**

Current is the rate of flow of electric charge.

Current is measured in **amperes** (A).

Current can pass through a conductor because there are charges (e.g. electrons) that are free to move. Metals are good conductors of electricity.

Direct current (**d.c.**) is when the current is always in the same direction. Batteries supply d.c.

Alternating current (**a.c.**) is when the current changes direction every fraction of a section. The mains supply in the UK is 230 V a.c. with a frequency of 50 Hz.

The difference between a.c. and d.c. can be observed by connecting the supplies to an oscilloscope.



d.c.

a.c.

The **potential difference** (voltage) across a component is a measure of the energy transferred by each unit of charge.

Potential difference (voltage) is measured in **volts** (V).

Electrical components can be connected in either **series** or **parallel**.

**Measuring current**

In order to measure the current in a component an **ammeter** should be placed in **series** with the component.

**Measuring voltage**

In order to measure the voltage across a component a **voltmeter** should be connected in **parallel** with the component.

A

V

**Parallel circuits**

In a parallel circuit the sum of the currents in each branch of the circuit is equal to the current in the supply.

The voltages across parallel branches in the circuit are the same.

*Vs*

*Is*

*V2*

*I2*

*V1*

*I1*

*Vs*

*V2*

*V1*

*Is*

*I1*

*I2*

**Series circuits**

There is only one path for current in a series circuit, so the current is the same at all points.

The sum of the voltages across components in series is equal to the supply voltage.