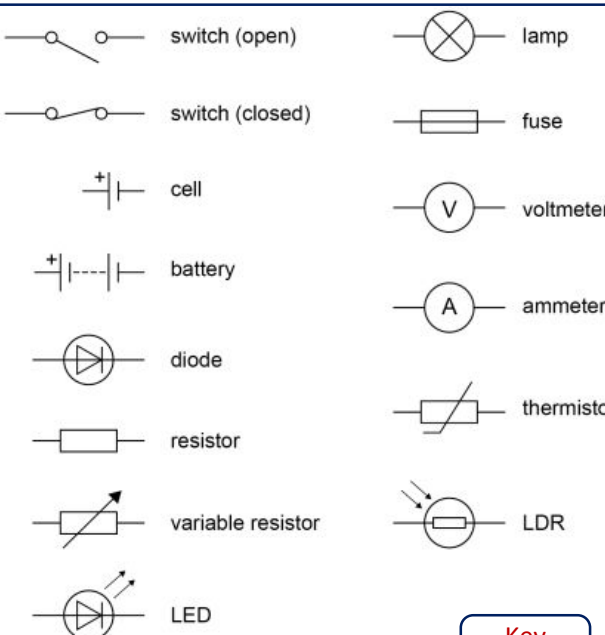




El: Electricity

Keyword	Definition
Charge	Fundamental property of matter held by electrons and protons measured in coulombs
Current	The rate of flow of charge measured in amperes Conventional current flows from + to -
Potential difference	The 'push' in a circuit which causes current to flow measured in volts
Resistance	Restriction of the flow of current measured in ohms
Alternating	When a potential difference (or current) changes polarity from + to - (or reverses flow direction)
Directly proportional	Results which when graphed give a straight line through the origin
Electric field	Area around a charged object that can have an effect on other charged objects



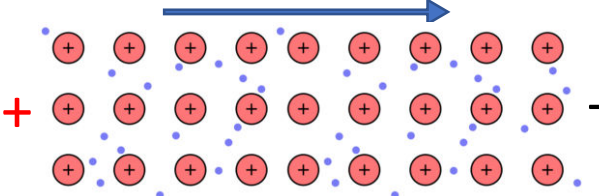
El 08 Resistance

C

Key Points



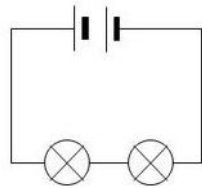
Resistance makes it harder for current to flow. A greater potential difference will cause more current to flow.



Electrons in a wire must move past the metal ions. They collide with the ions and transfer energy to them, heating the wire up. The hotter a wire is the more the metal ions vibrate. This makes it harder for the electrons to move past them.
The hotter a wire is, the greater its resistance.

El 03-06, 08 Series & Parallel Circuits

D



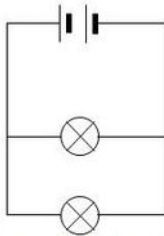
In a series circuit

Components make one continuous path

The current is the same at all points

The potential difference is shared by the components in proportion to their resistance

The total resistance is the sum of all the individual resistances



In a parallel circuit

Components are placed in more than one path

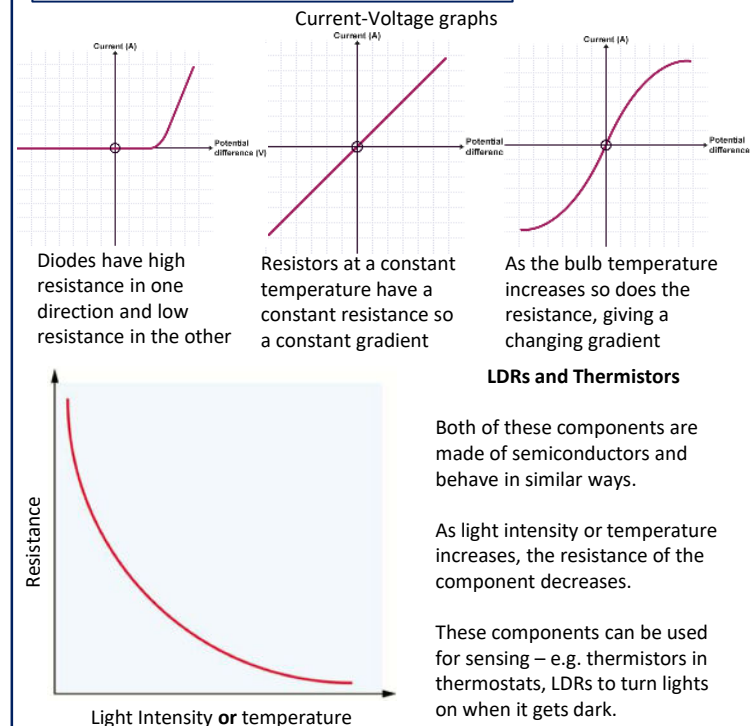
The current is shared between the paths in proportion to the path resistance

The potential difference is the same in each path

The total resistance is less than that of the path with the smallest resistance

The same components arranged in parallel will always have a lower resistance as there are more paths for the current to flow down

El 07, 09 Component Characteristics

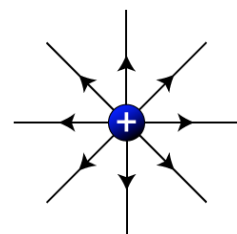


El 01-02 Static Electricity (Phys Only)

H

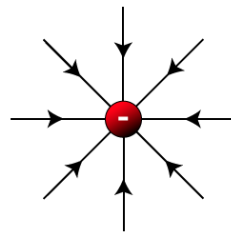


A static charge is produced when two different insulators rub together. The friction causes **electrons** to transfer from one material to another. **The material that gains the electrons becomes negative, the material that loses electrons becomes positive. The size of the charges is equal.**



Fields

When an object becomes charged it is surrounded by an electric field. The field radiates out from the positively charged object and in to the negatively charged object. The field is strongest close to the object.

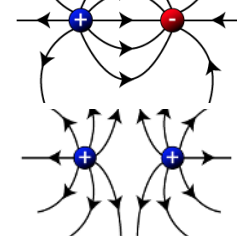


Sparking

When an object gains a static charge it gains a potential difference. If the charged object is brought close to an object at a lower potential difference, or one which is Earthed a spark can jump between them. A spark is the electrons moving from a high potential difference to a low potential difference



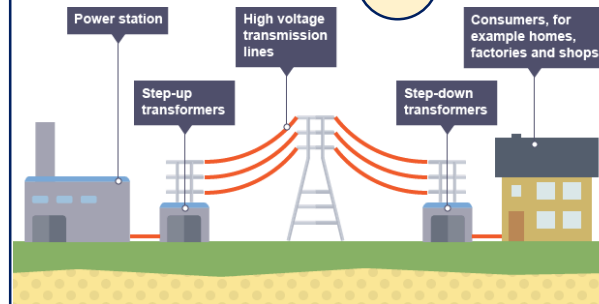
Attract and repel



When two charged objects are brought near to each other they attract or repel. Objects with opposite charges attract – this is due to the electric field lines from the two objects joining up. Objects with the same charges repel – this is due to the field lines not joining up between the object. The larger the charge on the objects and the smaller the distance between them, the bigger the force they will experience.

El 14 National Grid

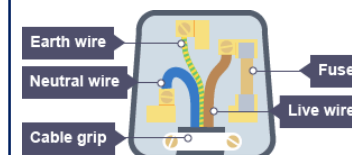
F



The national grid is the system of **transformers and cables** which take electricity from power stations to consumers. **Step Up Transformers** increase the potential difference to up to 400 kV. This lowers the current, heating the wires less, making the transmission more efficient. **Step Down Transformers** decrease the potential difference to safer levels – for homes this is **230V**. Transformers only work using alternating current, the frequency of the national grid is **50Hz**.

El 13 Plugs, Fuses & Safety

F



Live wire: +/- 230V
Neutral wire: 0V
Earth wire: 0V

Fuse ratings available:
1A, 2A, 3A, 5A, 7A, 10A, 13A

The fuse rating should be just above the current required

Key Points

Earth, fuse and safety
If the case of an appliance becomes live due to a fault the Earth wire provides a low resistance path for the current to flow down.

This draws a large current which causes the fuse to melt, breaking the circuit and making the object safe.

Required Practicals:

Resistance of a wire
Current/voltage characteristics of components



Mathematical Skills:

You will need to be able to manipulate equations to solve problems around current, power, potential difference, resistance and charge. You will also need to analyse graphs and identify directly proportional relationships

Equations to know

$$\text{Power (W)} = \text{Current (A)} \times \text{Potential Difference (V)}$$
$$P = I \times V$$

$$\text{Power (W)} = \text{Current (A)}^2 \times \text{Resistance (}\Omega\text{)}$$
$$P = I^2 \times R$$

$$\text{Potential Difference (V)} = \text{Current (A)} \times \text{Resistance (}\Omega\text{)}$$
$$V = I \times R$$

$$\text{Energy (J)} = \text{Potential Difference (V)} \times \text{Charge (C)}$$
$$E = V \times Q$$

$$\text{Charge (C)} = \text{Current (A)} \times \text{Time (s)}$$
$$Q = I \times t$$

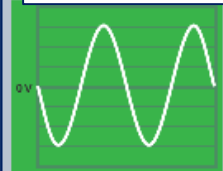
$$\text{Energy (J)} = \text{Power (W)} \times \text{Time (s)}$$
$$E = P \times t$$

Equations to select and use

$$\text{Potential Difference (V) in primary} \times \text{Current (A) in primary} = \text{Potential Difference (V) in secondary} \times \text{Current (A) in secondary}$$
$$V_p \times I_p = V_s \times I_s$$

El12 AC & DC

E



AC

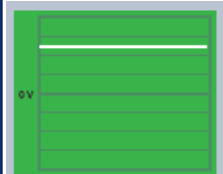
Alternating current is produced by a potential difference which changes polarity from + to - This means the the current changes direction of flow. The national grid uses AC

HT – Frequency is 1/time period

Time period is found by squares for one complete wave x time for one square

The peak potential difference is measured from the centre 0V position

DC



Direct current does not change as the potential difference producing it is constant. The current flows one way only through the circuit. Battery operated devices use DC

Relevant Modules:

- Energy Changes in systems
- Atomic Structure

Useful
YouTube
links:

