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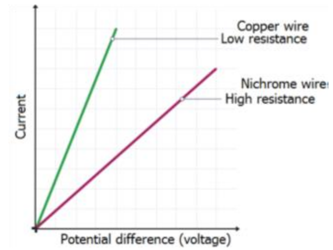
Section 1: Key Terms and Definitions

1	Electric Current	The rate of flow of electric charge. Measured in Amperes (A)
2	Potential Difference	The potential difference between two points in an electric circuit is the work done when a coulomb of charge passes between the points. Potential difference causes charge to flow. Measured in Volts (V)
3	Resistance	Resistance is the measure of the opposition to the flow of electric charge. It is measured in Ohms (Ω)
4	Charge	The electrical state of an object, which can be positively or negatively charged. In circuits it is measured in Coulombs (C). 1 Coulomb is the equivalent of the amount of charge carried by 6.25 x 10^{18} electrons.
5	Series	A circuit with only one route around the circuit for the charge to take.
6	Parallel	A circuit with more than one route around the circuit for the charge to take.

Section 3: Resistance in a Wire

Length of Wire	The longer the length of a wire, the greater the resistance of the wire. Electrons passing through the wire are more likely to collide with the nuclei of the atoms the wire consists of.
Thickness of Wire	As the cross-sectional area of the wire increases, the resistance of the wire decreases. The larger the area, the more electrons can flow through the wire.
Temperature	As the temperature increases, the nuclei of the wire vibrates more, making it more likely electrons with collide with it. This increases the resistance.

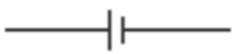
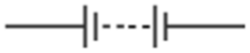
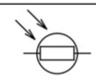
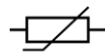
Section 4: Current-Potential Difference Graphs



Increasing Potential Difference allows a greater Current to flow around a circuit. Resistance of a wire can be determined from plotting a current-potential difference graph for different wires.

The greater the gradient of the line, **the lower the resistance** of the wire.

Section 2: Circuit Symbols

						
A Switch enables the current in the circuit to be switched on or off.	A cell is required to push electrons around a complete circuit.	A Battery is multiple cells working together in a circuit.	A lamp emits light when a current passes through it.	A voltmeter is used to measure potential difference (i.e. voltage) within a circuit	An ammeter is used to measure current within a circuit	A fixed resistor limits the electric current flowing in a circuit.
						
A diode only allows current to flow through it in one direction.	An Light Emitting Diode (LED) behaves like a diode but also emits light when a current passes through it.	A Variable Resistor allows the current in the circuit to be varied.	A fuse is designed to melt and therefore "break" the circuit if the current through it gets too high.	A heater is designed to transfer the energy from an electric current to heat the surroundings.	A Light Dependent Resistor has a very high resistance in the dark, but less when the resistor is lit.	A thermistor is a temperature dependent resistor. Its resistance decreases if the temperature increases.

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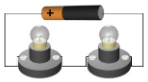
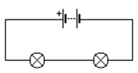
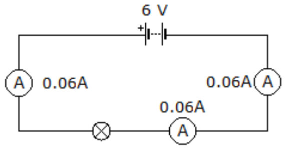
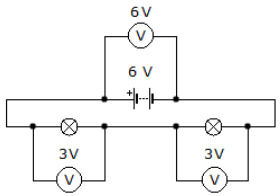
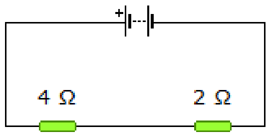
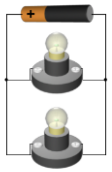
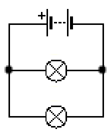
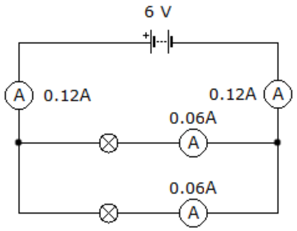
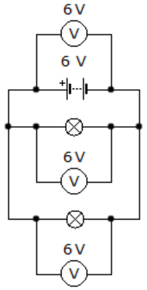
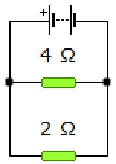
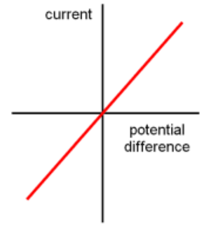
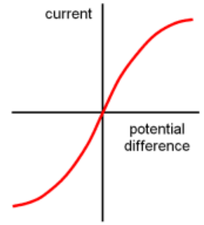
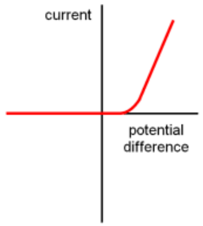
Section 5: Series and Parallel Circuits

Circuit type…	Current	Potential Difference	Resistance
Series  	The **current** is the **same at every point in the circuit** and in every component. 	The total **potential difference** of the power supply **is shared between the components**. 	The **more resistors, the greater the resistance**. The **total** resistance is the **sum** of the **resistance of all the individual components**. $R_{Total} = R_1 + R_2 + ...$ 
Parallel  	The **total current** through the whole circuit is the **sum of the current through the separate components or routes** in the circuit 	The **potential difference** across each route is the **same**. 	Adding more resistors in parallel decreases the resistance. The **total resistance** of two resistors is **less than** the **resistance** of the **smallest** individual **resistor**. 

Section 6: IV Graphs

Graph	Example	Explanation
	Fixed Resistor – Ohmic Conductor	Current and potential difference are directly proportional. Resistance is constant
	Filament Lamp Non-ohmic Conductors	Resistance of a filament lamp is not constant. As temperature increases, resistance increases. Ions within the lamp vibrate more, increasing collisions with electrons.
	Diodes and LEDs	The current through the diode flows in one direction only. The diode has a very high resistance in the reverse direction.

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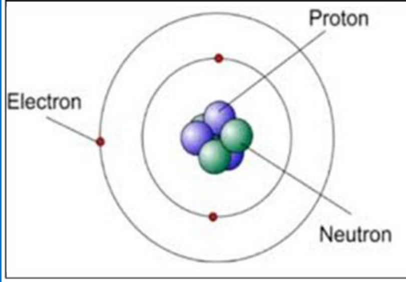
Section 7: Key Terms for Static Electricity

1	Static Electricity	**Static electricity** is an imbalance of **electric** charges within or on the surface of a material. The **charge** remains until it is able to move away by means of an **electric** current or **electrical discharge.**
2	Conductor	A material that **allows** a flow of electric **charge to pass** easily through it.
3	Insulator	A material that **does not allow** a flow of electric **charge to pass** easily through it.
4	Earth	The electrical state of an object, which can be positively or negatively charged. In circuits it is measured in Coulombs (C). 1 Coulomb is the equivalent of the amount of charge carried by 6.25 x 10^{18} electrons.

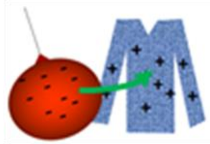
Section 8: Static Electricity – Structure of the Atom



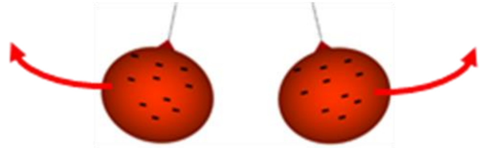
Particle	Charge	Relative mass
Proton	+1 (Positive)	1
Neutron	0 (Neutral)	1
Electron	-1 (Negative)	1/2000

Section 9: Static Electricity – Attraction and Repulsion

Attraction: Two objects **with opposite charges will attract** each other.

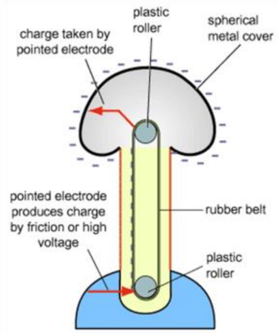


Repulsion: Two objects with the **same charge will repel** each other.



Section 11: Van Der Graaff Generator

The belt of the generator is driven by a motor, as the belt passes the electrode, electrons are passed to the belt. The electrons are then conducted to the metal cover at the top of the generator. This makes the top of the generator negatively charged.



Section 10: Principles of Static Electricity

1.	Role of Friction	When two insulating materials are rubbed together, electrons can be pulled off one material and transferred to the other by the force of friction.
2.	Electron Donor	The material that has electrons pulled off it, is the donor. It donates its electrons to the other materials and becomes positively charged.
3.	Electron Receiver	The material that pulls the electrons off from the other material is the electron receiver. It gains electrons and becomes negatively charged.
4.	Electrons Move	Only electrons move, the nuclei of the atoms do not move. This means for a positively charged material to become negative, it must gain electrons from another material.

Section 12: Examples and Uses of Static Electricity

Attracting Dust	Many objects around a house are insulating materials and get easily charged. Dust particles are attracted to anything that is charged. (TVs, Glass etc)
Clinging Clothes	When synthetic clothes are dragged over each other, electrons can be transferred leaving static electricity.
"Bad Hair" Days	Static builds up on hair, causing each strand to have the same charge and repel each other.
Electrostatic Paint Sprayers	Used to paint bikes and cars providing a fine even coat of paint.
Defibrillator	A shock from a defibrillator can restart a stopped heart.

Section 13: Dangers of Static Electricity

Lightning	Lightning is a sudden electrostatic discharge that usually occurs during a thunderstorm. Occurs between charged regions of a cloud, between two clouds or between a cloud and the ground.
Synthetic Clothes	Static charges on clothes can build up enough to cause a spark which can be dangerous if close to inflammable gases or fumes from fuels.
Paper Rollers and Fuel Pipes	Static can build up when paper drags over rollers or flow flows out of pipes. Can lead to a spark which might cause an explosion.
Solutions	Use of earthing cables to allow charge to discharge safely can prevent charge building up.

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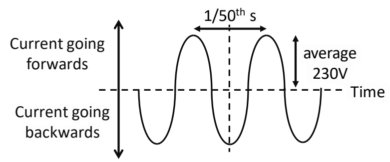
Section 14: Key Terms for Mains Electricity

1	Electric Current	The flow of electric charge. Measured in Amperes (A)
2	Alternating Current (a.c.)	The current alternates (regularly changes direction). Used for Mains Electricity.
3	Direct Current (d.c.)	Current flows in one direction only. Typically from cells or batteries.
4	Mains Electricity	Electricity provided to our homes is provided by the National Grid. It has an alternating current of 230V and a frequency of 50Hz

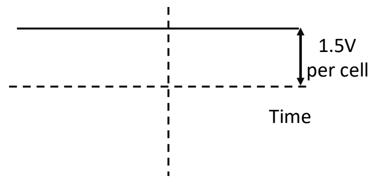
Section 15: Alternating and Direct Current

Alternating Current



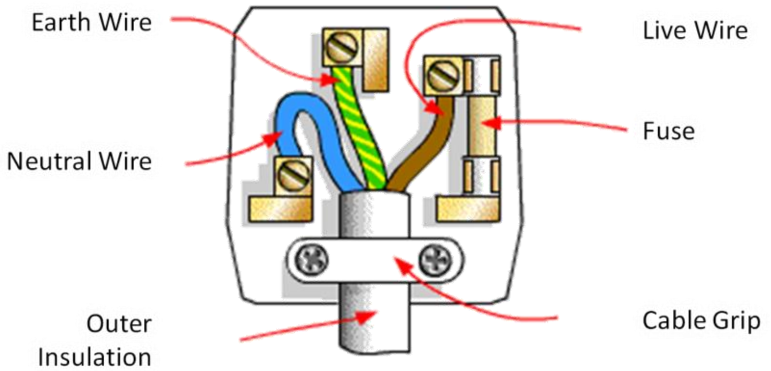
The current changes direction 50 times a second.

Direct Current



The current flows in the same direction all of the time.

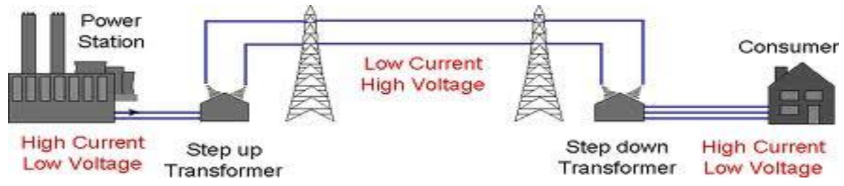
Section 16: Plugs, Sockets and Cables



Live Wire	Copper wire coated with brown plastic along which the current enters the device
Neutral Wire	Copper wire coated with blue plastic that also connects to the cable in the wall and completes the circuit
Earth Wire	Copper wire coated in striped plastic that provides a path for current to flow from the case of the device to the ground if there is a fault
Fuse	A glass or ceramic canister containing a thin wire that melts if the current gets too high
Cable Grip	This holds the cable tightly in place so that wires do not become loose
Outer Insulation	All three wires in the cable are bundled together and there is extra plastic insulation wrapped round them all for safety
Sockets and plug Cases	Always made of an insulator such as plastic to prevent the danger or receiving an electric shock.

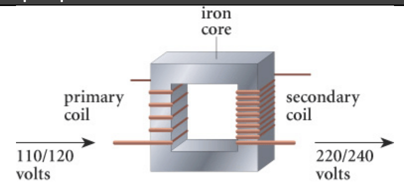
Section 17: The National Grid

The national grid supplies electricity from power stations via a series of cables and transformers to customers at high voltages to reduce energy loss.



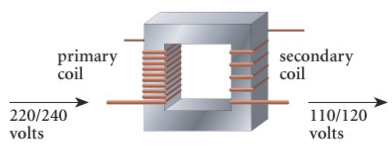
Transformers within the national grid change the potential difference of the current flowing through the grid. Current produces a heating effect so raising the potential difference reduces the current and therefore the amount of energy lost due to heating.

Step Up Transformers



More coils on secondary coil than on the primary coil which increases the potential difference.
Higher potential difference means lower current and therefore less resistance.

Step Down Transformers



More coils on primary coil than on the secondary coil which decreases the potential difference.
Lower potential difference means higher current and therefore more resistance.