KNOWLEDGE

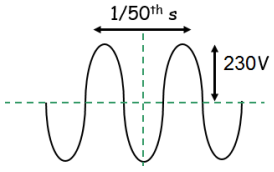
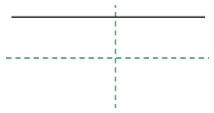
Physics Topic P5
Particles at Work – Electricity in the home

ORGANISER

Section 1: Key Terms

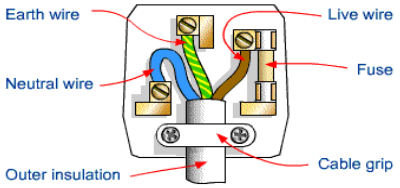
Electric current	**Flow** of electric **charge**. Units amperes, A
Alternating Current **AC**	The **current alternates** (changes direction) **e.g. mains electricity**
Direct Current **DC**	The **current** flows in **one direction only e.g. cells or batteries.**
Mains Electricity	Electricity provided by the national grid (is an **alternating current** of **230V** and a frequency of **50Hz**.)
National Grid	A series of **cables** and **transformers** linking power stations to consumers.
Step-up Transformer	**Increases the potential difference** for **transmission** across power cables. This makes the National Grid **efficient**.
Step-down Transformer	**Reduces the potential difference** from the cables to 230V for use by consumers.

Section 2: Alternating current

Alternating Current **AC**	 The **current alternates** (changes direction.)
Direct current **DC**	 Direct current flows **in one direction**

Section 3: plugs, sockets & cables

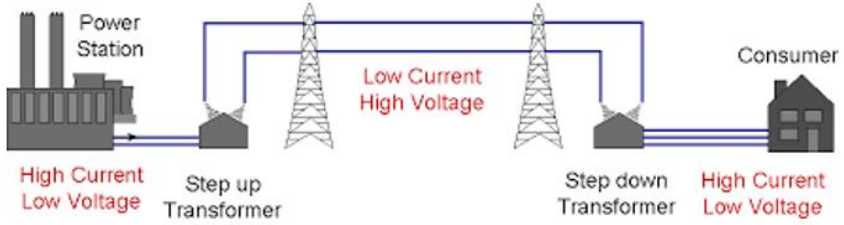
Three pin electrical plug

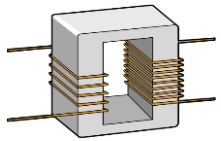
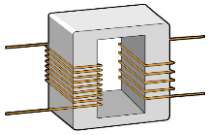


Live wire	Carries the current (**brown** wire). Connects to fuse. About 230V.
Neutral wire	Completes the circuit (**blue** wire). Around 0V
Earth	Prevents electric shock (**green & yellow** wire). Is connected to the longest pin in a plug and carries current safely to earth if there is a fault.
Fuse	Contains a thin wire that melts and cuts off the current if too much current passes through it.
Sockets and plug cases	made of **plastic** because it's a good electrical **insulator**.
Mains cable	made up of two or three insulated copper wires surrounded by an outer layer of plastic.

Section 4: 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**.



Step-up transformer	Step-down transformer
	
More turns on secondary coil than on primary, therefore **increases voltage**. Increasing voltage **decreases the current** in the wires which means **less resistance**. Less resistance means **less energy lost as heat**, therefore it is **more efficient** to transmit electricity at high voltage.	Fewer turns on secondary coil than on primary, therefore **decreases voltage**. Reducing the voltage makes it **safer** to use in the **home**.

Section 5: Equations to learn

Equation	Units
Charge flow = current x time Q = I x t	Charge flow - coulomb (C) Current – amperes (A) Time – seconds (s)
Power = potential difference x current P = V x I	Power – watt (W) Potential difference – volts (V) Current – amperes (A)
Power = current^2 x resistance P = I^2 x R	Power – watt (W) Current – amperes (A) Resistance – ohms (Ω)
Energy transferred = power x time E = P x t	Energy = joules (J) Power – watt (W) Time – seconds (s)

Section 6: Choosing appliances

Clockwork radio	Battery radio
Store **elastic potential energy** in a **spring** when someone winds them up. They are **free** to use. **Better for the environment**.	Stores **chemical energy** and turns it into **electrical energy**. **Expensive to buy** and have to be replaced when used up. A **lot of energy and harmful chemicals** go into making batteries.