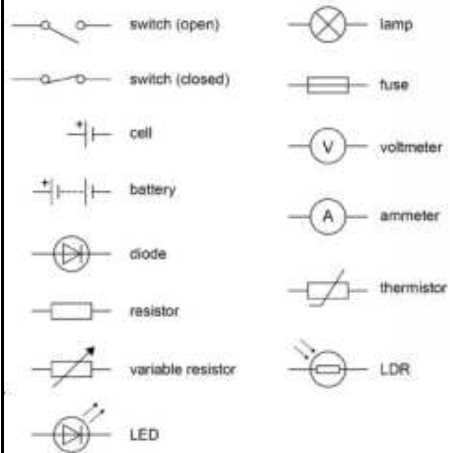
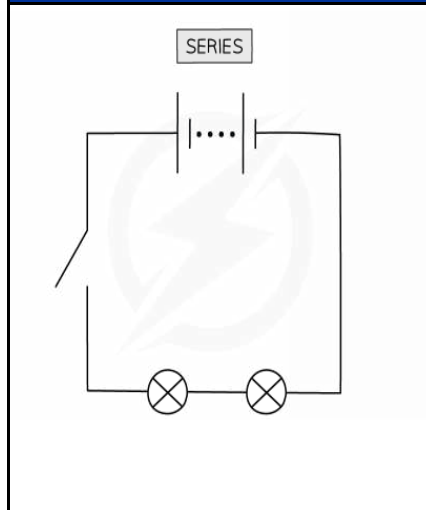


Circuits

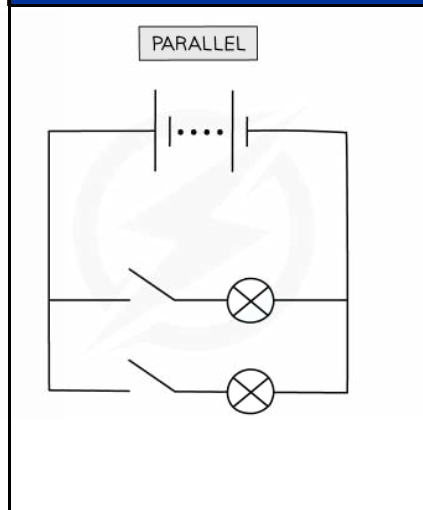
Circuit diagrams use standard symbols.



Series Circuits



Parallel Circuits

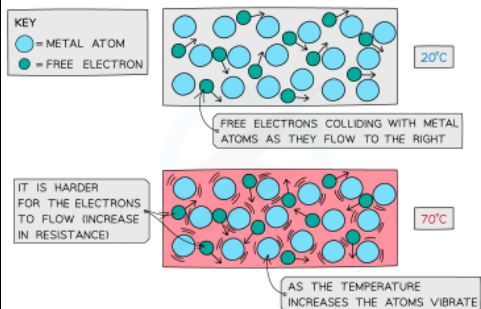


Series and Parallel Circuits

	Series	Parallel
Circuit		
Voltage	$V_{in} = V_1 + V_2 + V_3$	$V_{in} = V_1 = V_2 = V_3$
Current	$I_{in} = I_1 = I_2 = I_3$	$I_{in} = I_1 + I_2 + I_3$
Resistance	$R_{total} = R_1 + R_2 + R_3$	$R_{total} < R_1 + R_2 + R_3$

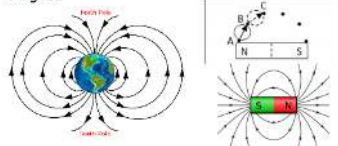
Resistance

Resistance is the opposition to current



Magnetic fields

Use a compass to plot a magnetic field:
 Magnetic field of the Earth and a magnet:



Power

- The power transfer in any circuit device is related to the potential difference across it and the current through it, and to the energy changes over time:
 - power = potential difference \times current
 - $P = VI$
 - power = current $^2 \times$ resistance
 - $P = I^2 R$
- Power (P): in watts (W)
 potential difference (V): in volts (V)
 Current (I): in amperes (A)
 Resistance (R): in ohms (Ω)

Magnets

- Magnets**
 (a) Magnets have a north and south pole.

 Opposite poles attract

 Same poles repel
- (b) The magnetic field is strongest at the poles
 Permanent – Always magnetic
 Induced magnet – Can be turned on or off
- (c) **Electromagnets** can be turned on and off and are created by wrapping a coil of wire (solenoid) around an iron core.
- (d) **Electromagnets** can be strengthened by the 3Cs (larger CIRCUMFERENCE, more COILS, more CURRENT)

- Currents and Magnetism**
- An **alternating magnetic field** can induce a **current**
 - An **alternating current** can induce a **magnetic field**

Electricity in the Home

Most electrical appliances are connected to the mains using **three-core cable**. The insulation covering each wire is colour coded for easy identification:
live wire – brown
neutral wire – blue
earth wire – green and yellow stripes.
 The **live wire** carries the **alternating potential difference** from the supply. The **neutral wire** **completes the circuit**. The **earth wire** is a **safety wire** to stop the appliance becoming live.

The **potential difference** between the **live wire** and **earth (0 V)** is about **230 V**. The **neutral wire** is at, or close to, **earth potential (0 V)**. The **earth wire** is at 0 V, it only carries a current if there is a **fault**. A **live wire** may be **dangerous** even when a switch in the mains circuit is open.

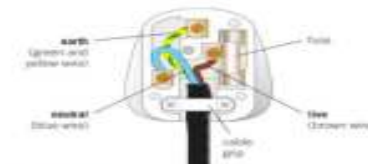


Figure 2 Inside a three-pin plug

Mains electricity is an ac supply. In the United Kingdom the domestic electricity supply has a frequency of 50 Hz and is about 230 V. Direct current flows in one direction only. Alternating current constantly changes direction.