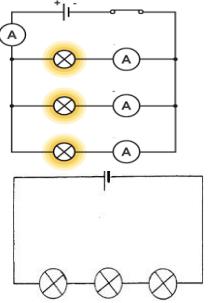


Electrons carry current.
Electrons are free to move in metal.

| | | | | | | | | | | | | |
|--------------------------|-----------------------------|-------------------------------------|---------------------------|------------------|-------------------------------|-----------------------|--------------------------------|--------------------------------|--------------------------------|-------------------------------------|-----------------------------|-----------------------------|
| Cell | Battery | Switch | Lamp | Ammeter | Volt meter | Diode | LED | LDR | Fuse | Resistor | Variable resistor | Thermistor |
| Store of chemical energy | Two or more cells in series | Breaks circuit, turning current off | Lights when current flows | Measures current | Measures potential difference | Current flows one way | Emits light when current flows | Resistance low in bright light | Melts when current is too high | Affects the size of current flowing | Allows current to be varied | Resistance low at high temp |



| | | |
|-----------------------------|---|--------------|
| Current | Flow of electrical charge | Ampere (A) |
| Potential difference (p.d.) | How much electrical work is done by a cell | Volts (V) |
| Charge | Amount of electricity travelling in a circuit | Coulombs (C) |

Circuit symbols

Charge and Current

Current, potential difference and resistance

Series and parallel circuits

| | | | |
|------------------|---|---|---|
| Series circuit | Current is the same in all components. | Total p.d. from battery is shared between all the components. | Total resistance is the sum of each component's resistance. |
| Parallel circuit | Total current is the sum of each component's current. | p.d. across all components is the same. | Total resistance is less than the resistance value of the smallest individual resistor. |

| | |
|-------------------------|----------------------------------|
| Series | Parallel |
| A circuit with one loop | A circuit with two or more loops |

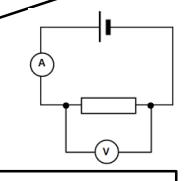
Total p.d. If cells are joined in series, add up individual cell values

Charge = Current X time $Q = I \times t$

Controlling current

Change the p.d. of the cells

Add more components



$R = V \div I$

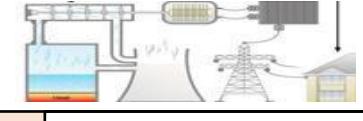
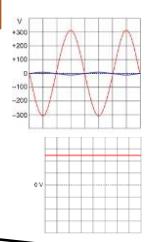
Resistance = Potential difference \div Current

| | |
|-----------|----------------------------------|
| Ammeter | Set up in series with components |
| Voltmeter | Set up parallel to components |

| | |
|--|---|
| Resistance (Ω) | A measurement of how much current flow is reduced |
| The higher the resistance, the more difficult it is for current to flow. | |
| Increasing resistance, reduces current. | |
| Increasing voltage, increases current. | |

| | |
|--|--|
| Thermistor | LDR |
| Resistance varies with temperature | Resistance varies with light intensity |
| Resistance decreases as temperature increases. | Resistance decreases as light increases. |

| | |
|---|---|
| Alternating current | Direct current |
| p.d. switches direction many times a second, current switches direction | p.d. remains in one direction, current flows the same direction |
| Generator. | Cell or battery. |



National Grid Distributes electricity generated in power stations around UK

Power (W) = potential difference X current $R = V \times I$

Power = (current)² X resistance $P = I^2 \times R$

Energy transferred = Power X time $E = P \times t$

| | |
|--|------------------------------------|
| Step-up transformers | Step-down transformers |
| Increase voltage, decrease current | Decrease voltage, increase current |
| Increases efficiency, reduces heat loss. | Makes safer for houses. |

Domestic uses and safety

| | |
|----------------|---------|
| Like charges | Repel |
| Unlike charges | Attract |

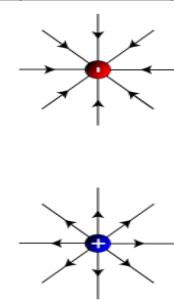
Static electricity **PHYSICS only**

Static electric Electrical charge is stationary

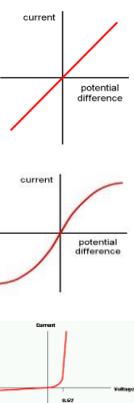
When two insulating material are rubbed together, electrons move from one material to the other.

Shocks Walking on carpet causes friction. Electrons move to the person and charge builds up. When the person touches a metal object, the electrons conduct away, making a spark.

Electric fields Charged objects create electric fields around them. Strongest closest to the object. The field direction is the direction of force on a positive charge. Add more charge increases field strength.



| | |
|------------------|--|
| Ohmic conduct or | At a constant temperature, current is directly proportional to the p.d. across the resistor. |
| Filament lamp | As current increases, the resistance increases. The temperature increases as current flows. |
| Diode | Current flows when p.d. flows forward. Very high resistance in reverse. |



Current - Potential difference graphs

'Earthing' a safety device; Earth wire joins the metal case.

| | |
|--------------|----------------------|
| Mains supply | Frequency 50Hz, 230V |
|--------------|----------------------|

| | | |
|----------------------------------|---|-----------------------------------|
| Live - Brown | Carries p.d from mains supply. | p.d between live and earth = 230V |
| Neutral - Blue | Completes the circuit. | p.d. = 0V |
| Earth - Green and Yellow stripes | Only carries current if there is a fault. | p.d. = 0V |