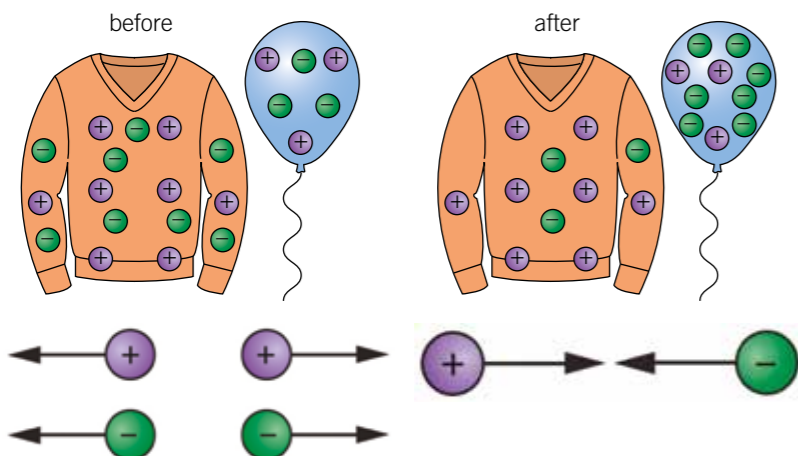


# P2 Chapter 1: Electricity and magnetism

## Knowledge organiser

### Charging up

**Static electricity:** by rubbing **insulators** together **electrons** are transferred, which gives the objects electric charges.



Charged objects have **electric fields** around them. If you put a charged object in an electric field, a force acts on the object.

### Potential difference

- Potential difference is the amount of energy transferred by the charges in the circuit.
- It is measured with a **voltmeter** (connected in parallel). The unit is the **volt (V)**.

### Circuits and currents

- Current is the amount of charge flowing per second.
- It is measured with an **ammeter** (connected in series).
- The unit for current is the **amp (A)**.

### Resistance

The **resistance** is a measure of how easy it is for current to pass through a component.

**conductors** – low resistance

**insulators** – high resistance

Resistance is calculated by measuring the potential difference and the current.

The unit for resistance is the **ohm (Ω)**.

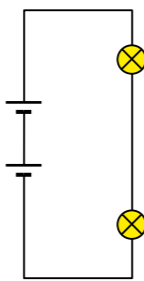
$$\text{resistance } (\Omega) = \frac{\text{potential difference (V)}}{\text{current (A)}}$$

### Series and parallel circuits

In a series circuit all of the components are connected in one loop. If one component or wire breaks, **current** stops flowing everywhere.

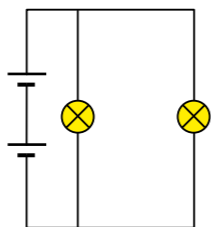
#### Series circuits

- contain only one loop
- the current is the same everywhere
- the **potential difference** across each component adds up to the potential difference across the battery



#### Parallel circuits

- contain multiple branches
- currents in all the branches add up to make the total current
- the potential difference across each component is the same as the potential difference across the battery

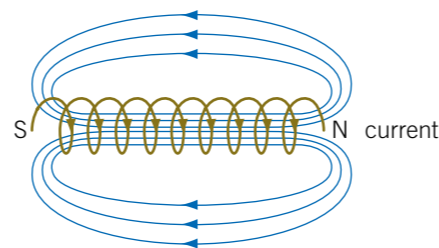


### Electromagnets

- **Electromagnets** are only magnetic when they have a flow of current, so they can be turned off.
- They are made by running a current through a coil of wire.
- They usually have an iron core in the middle of the coil, which makes them stronger.

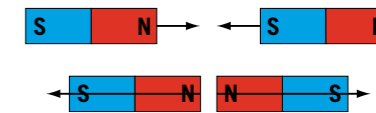
You can make an electromagnet stronger by:

- adding more turns of wire on the coil
- using more current.



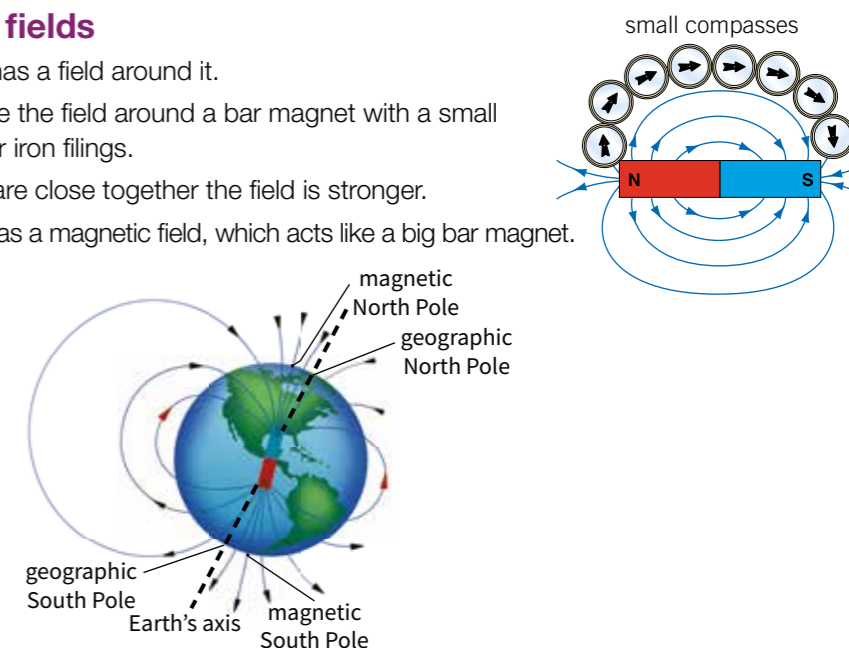
### Magnets

- **Magnets** have north and south poles.
- Opposite poles attract, and the same poles repel:



#### Magnetic fields

- A magnet has a field around it.
- You can see the field around a bar magnet with a small compass or iron filings.
- If the lines are close together the field is stronger.
- The Earth has a magnetic field, which acts like a big bar magnet.



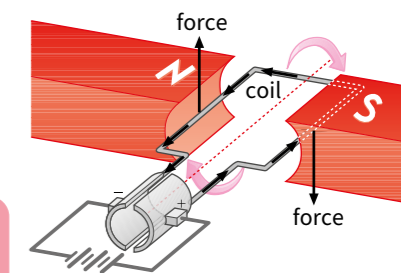
### Uses of electromagnets

- moving cars or other metal objects
- sorting iron and steel from aluminium
- making motors and speakers
- making levitating trains, which travel much faster as there is no friction

#### How motors work

Applying a current to a coil of wire makes it electromagnetic.

This causes a force between the coil of wire and the permanent magnet nearby, which makes the wire spin. This is a motor.



### Key words

Make sure you can write definitions for these key terms.

ammeter attract conductor current electron electric field electromagnet insulator repel magnet magnetic field line motor north pole ohm parallel potential difference resistance series static electricity south pole volt voltmeter