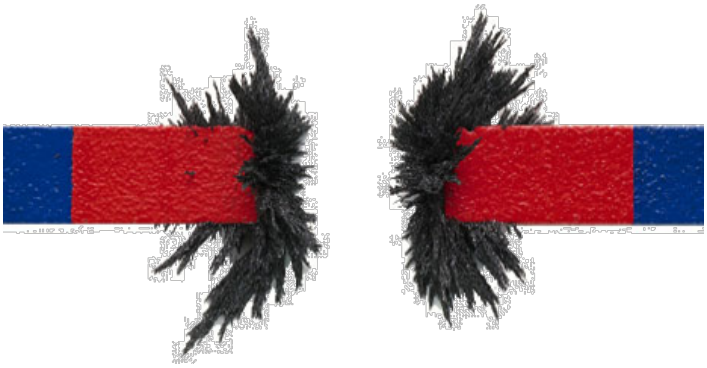
Magnets attract some metals but not others

Some objects attract iron and steel. They are called magnets. **Magnetic materials have the ability to attract some materials but to attract and repel each other**

Only iron, cobalt, nickel, and some iron alloys like steel can act as magnets. The particles that they consist of can align themselves so that all their negative ends are facing the same direction. Aluminium cans are not magnetic whereas 'tins' are largely made of iron and are magnetic.

It is sometimes difficult to distinguish between a magnet and a magnetic material. When two magnets are put together there is either attraction or repulsion, but when a magnet and a magnetic material are put together there is just attraction.

The Law of Repulsion and Attraction



Like poles will repel each other. e.g. north and north.
Unlike poles will attract each other. e.g. north and south

A magnet is an object that has a magnetic field around it and attracts objects made of iron. A **magnetic** field is a region around a magnet where iron objects have a force on them and can be made to move.

The ends of a magnet are called **poles**, one end is the **N** or **North** pole, the other is the **S** or **South** pole.

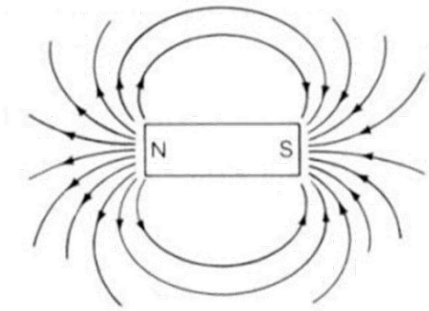
Examples of Magnets

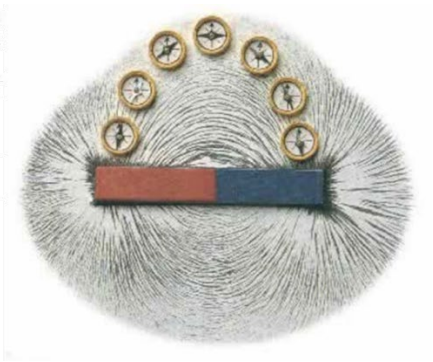
Magnets have a variety of uses. Examples of uses of permanent magnets in the home include fridge magnets, cupboard door latch, magnetic knife holder, magnetic screwdriver etc.

The Maglev train uses magnets to 'float' the train above the rail, reducing most friction and allowing it to travel very fast

Magnetic fields are arranged in fixed patterns

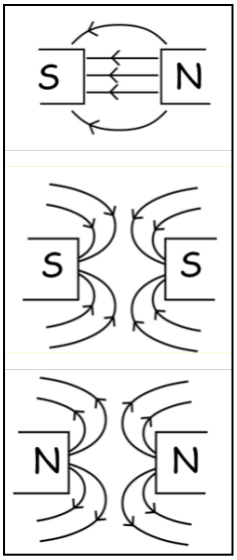
A magnet has a magnetic force field around it. When another magnet or an iron object enters the field, it experiences a **force** as either a push or a pull. Field patterns produced by bar magnets can be visualized using iron filings.





This is the **magnetic field**. The field lines move out from the N end of a magnet and into the S end. Compasses, which contain a movable magnet, can also be used to show magnetic fields. The needles will align in the direction of the field.

Magnetic field interactions

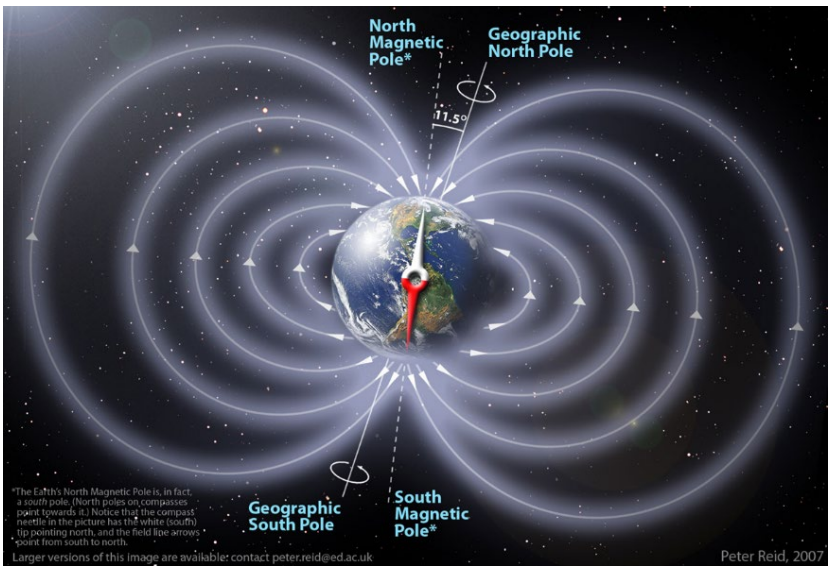


A strong field is produced between **unlike poles**, moving in the direction between North to South., shown by arrows

Between the middle of **like poles** the net magnetic force is zero due to the fields cancelling out. This is shown by a blank space between.

The field lines move out from a North pole (and into a South pole).

The Earth is surrounded by a magnetic field - EXTENSION



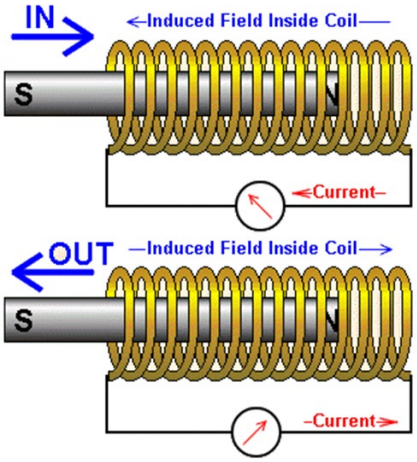
The Earth has a magnetic field. The outer core of the Earth is liquid iron and as heat from the very hot solid iron inner core moves through it then electrical currents are produced. Current Scientific theory suggests that this in turn produces an electric field that stretches far beyond Earth.

This magnetic field produces a North and South Pole, although they are not exactly in the same place as the geographical North and South Pole.

The North of a needle compass is attracted to the South, so the North Pole is actually the South Pole!

An electric current itself has a magnetic field - EXTENSION

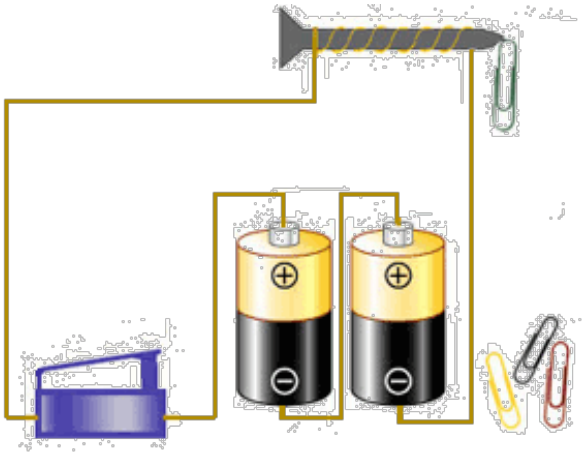
Electromagnetism describes the relationship between magnetism and electricity. When electrical charges are moving, they create or **induce** magnetic fields.



A changing magnetic field will create an electric current and an electric current will induce a magnetic field.

This is called **electromagnetic induction**, it is the principle used to drive generators, motors, transformers, amplifiers and many more electrical devices.

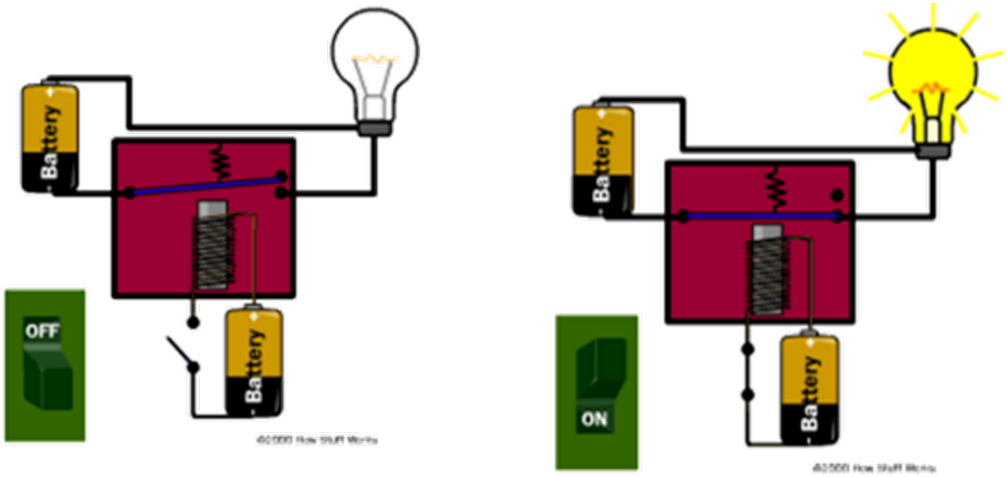
Electrical currents moving around a magnet can produce an electromagnet



A magnetic field can be made stronger with a coil of conductive wire wrapped around it and an electric current flowing through the wire. This is called an **electromagnet.** An electromagnet can be made stronger by increasing the number of turns (how many times the wire is wound) and by increasing the current. A coil of wire is called a solenoid.

Electromagnets are used when a stronger magnet is required such as for picking up cars at a wrecker and has the advantage of being "switched off" when the current is stopped.

Using a relay to switch on a light bulb

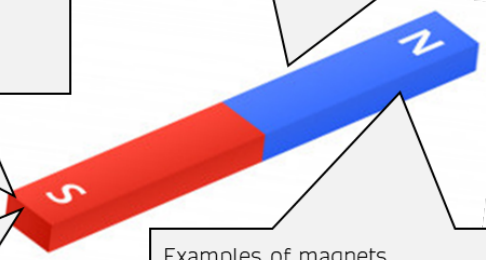


A relay is an electrically operated switch. It works on the principle of a magnet attracting iron when a current is flowing, closing the switch and creating a complete circuit and releasing it when the current is no longer flowing therefore opening the switch. The relay has a coil containing a sliding iron core to turn on the light bulb. When the current flows, the coil becomes magnetised and pulls soft iron core to the left. The head of the core touches the two metal contacts thereby completing the light bulb circuit.

1. Complete the summary chart about the properties of magnets

Definition of a magnet

Magnetic substances



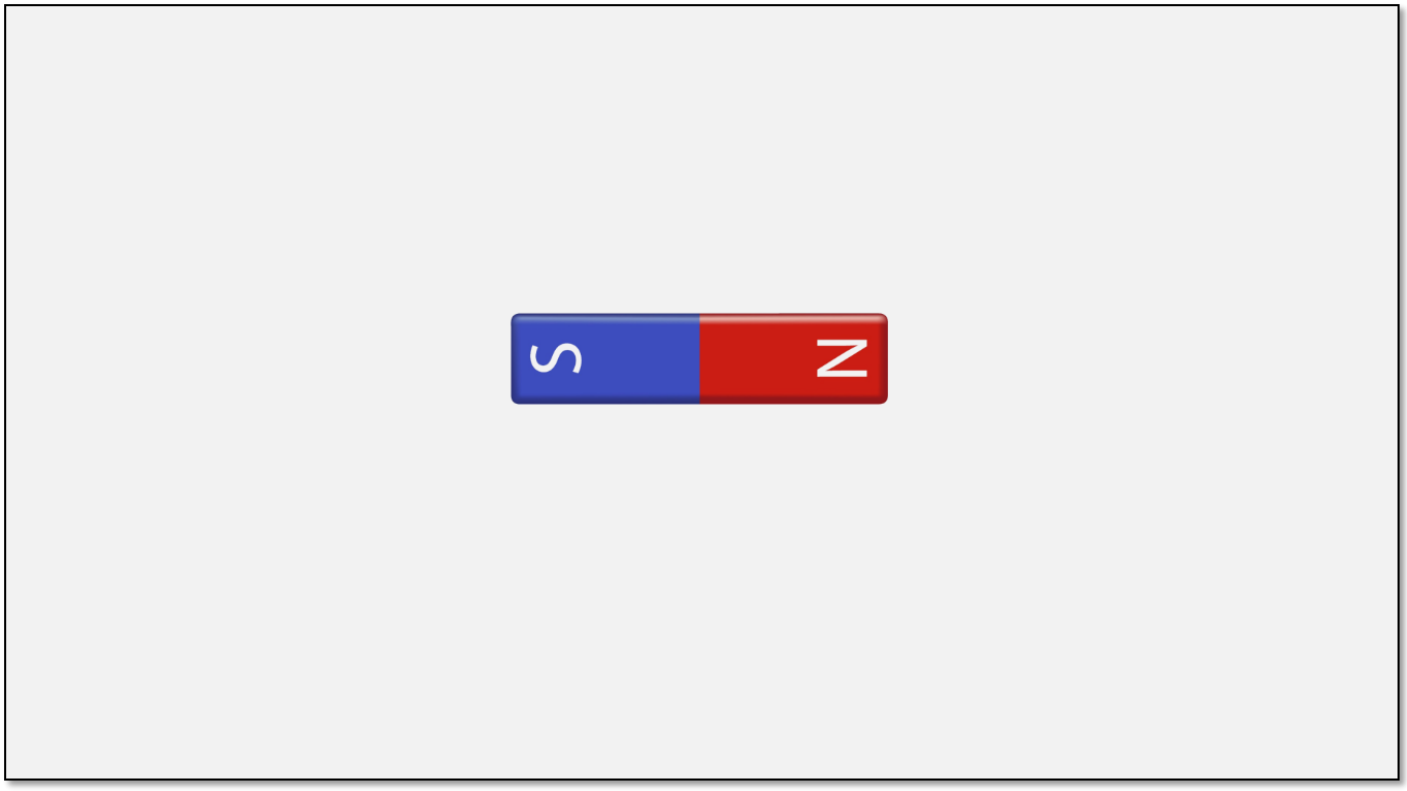
Law of attraction and repulsion

Examples of magnets

2. Will these magnets attract or repel? Complete chart

3. Draw the magnetic field lines around this magnet



4. You are asked to prepare a presentation about the magnetic field around earth. It is important to research from several sources that are **reputable** – that means valid sources that use scientifically correct claims. Complete the presentation outline below, listing both interesting facts and the reputable source it came from.

The magnetic field of Earth

Interesting fact	source