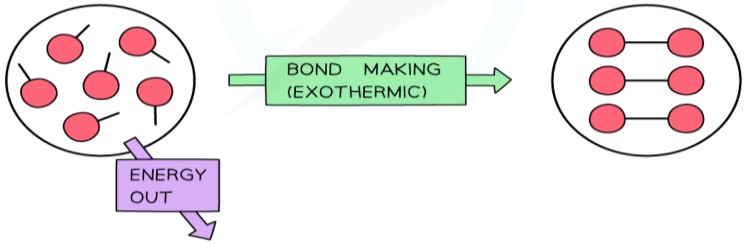
KS3 Energetics

Exothermic Reactions

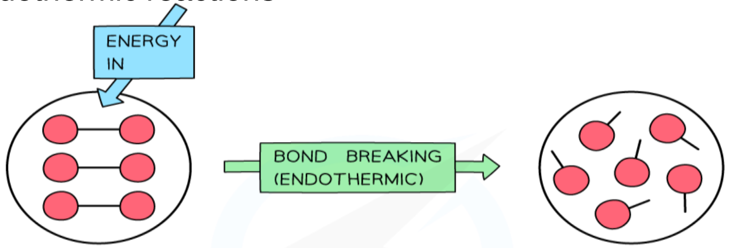
In an exothermic reaction, thermal energy is **given out** to the surroundings, therefore there is a **temperature increase.**
Combustion, oxidation and neutralisation are all examples of exothermic reactions



The reaction is exothermic because the energy **needed** to break the bonds is less than the energy **released** in making new bonds.

Endothermic Reactions

In an endothermic reaction, thermal energy is **taken in** from the surroundings, therefore there is a **temperature decrease.**
Thermal decomposition and photosynthesis are examples of endothermic reactions

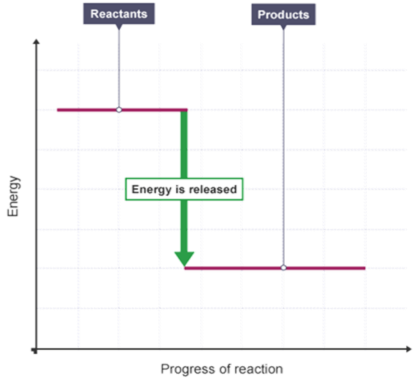


If a reaction is endothermic then the energy **needed** to break the bonds is more than the energy **released** in making new bonds.

Energy Level Diagrams

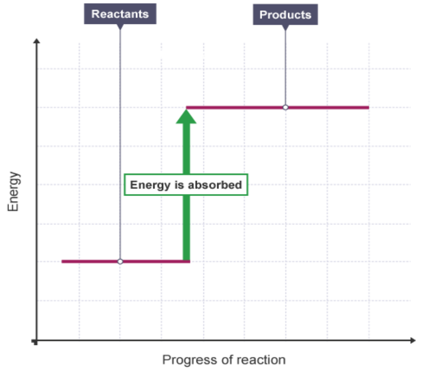
Energy level diagrams are used to model energy changes during reactions. They show the relative energy levels of the products and reactants

Exothermic



The energy level decreases in an exothermic reaction. This is because energy is given out to the surroundings. The downward arrow shows that energy is given out

Endothermic



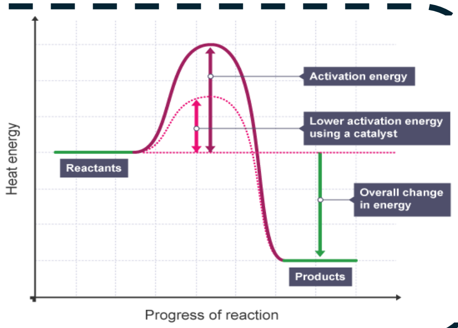
The energy level increases in an endothermic reaction. This is because energy is taken in from the surroundings.
An upwards arrow shows that energy is taken in

Keywords

- Endothermic
- Exothermic
- Oxidation
- Combustion
- Thermal decomposition
- Reactivity series
- Catalyst
- Activation Energy
- Displacement

Catalysts

A catalyst is a substance that
- Speeds up the rate of a chemical reaction
- Does not alter the products of a reaction
- Is unchanged chemically and in mass at the end of a reaction.
- Catalyst provide an alternative pathway that has a lower activation energy than the uncatalysed reaction.



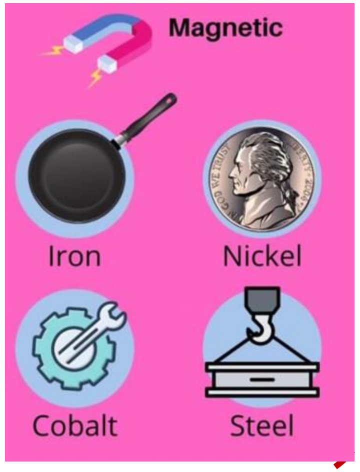
KS3 Electromagnetism: Magnetism

Bar magnets

Magnets attract and repel other objects by a non-contact force.

A bar magnet is a permanent magnet. This means it always causes a force to be exerted on other magnetic materials.

There are four magnetic materials.



Earth's Magnetic Field

Due to the Earth's core spinning, a magnetic field exists around the Earth. This is part of the Magnetosphere.

The Earth's Geographic North Pole is the magnetic South pole.

It protects Earth from harmful cosmic radiation from the Sun.

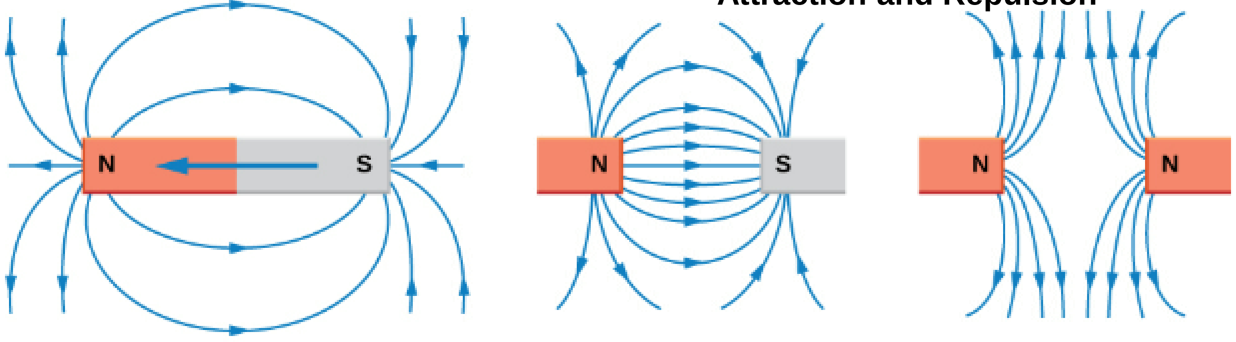
The Earth's magnetic field is also used by animals to help with migration.

Humans use a compass that aligns with the magnetic South pole for navigation. Compasses always point North when free to move.

Keywords

- Permanent magnet
- Pole
- Attraction
- Repulsion
- Magnetic Field
- Magnetosphere
- Compass
- Molten
- Electromagnet
- Solenoid
- Motor effect
- Direct Current

Attraction and Repulsion



Magnetic field lines of a bar magnet (a)

Magnetic field lines between unlike poles (b)

Magnetic field lines between like poles (c)

A magnetic field is a region around a magnet where other magnetic objects experience a force.

A magnetic field lines:

- never cross
- run North to South (arrowheads)
- are continuous

- A uniform field exists in attraction
- A space between magnets appears in repulsion

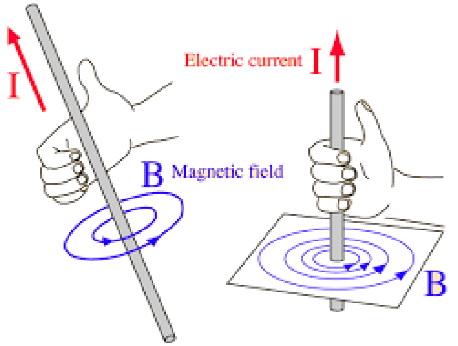
KS3 Electromagnetism: Magnetism

Magnetic field and Current

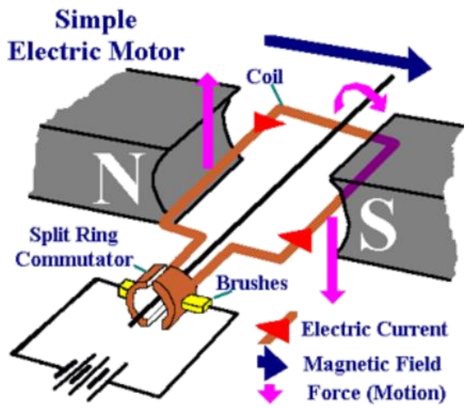
Current is a flow of negative charges.

As these charges move, they induce a magnetic field that is at right angles to the flow of charges.

The right hand rule is used to show the magnetic field.



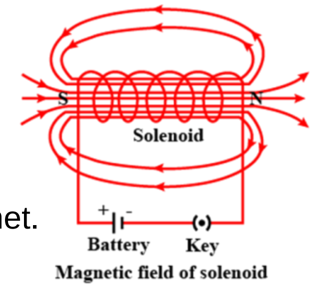
The Motor Effect



A simple Direct Current motor using the idea of a current breaking a magnetic field to forces a conductor (wire) to move. A motor has a split ring commutator to allow the current to change direction, allowing the coil to spin around.

Solenoids

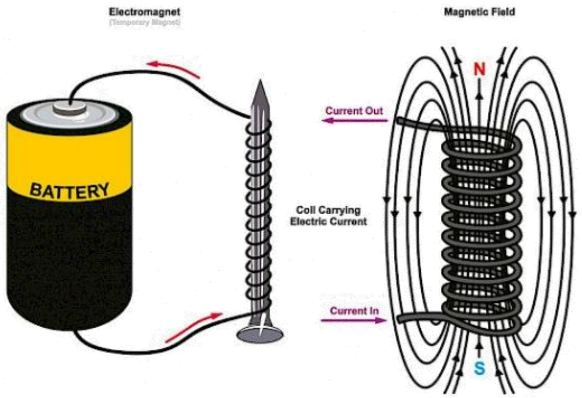
If current is sent through a coil of wire the magnetic field becomes stronger and the field lines appear like they do in a bar magnet.



Electromagnets

If a magnetic core is added to the solenoid and a current is switched on, the magnetic field becomes even stronger (field lines move closer).

Electromagnets are temporary magnets that can be switched off when the current is stopped.



Keywords

- Permanent magnet
- Pole
- Attraction
- Repulsion
- Magnetic Field
- Magnetosphere
- Compass
- Molten
- Electromagnet
- Solenoid
- Motor effect
- Direct Current

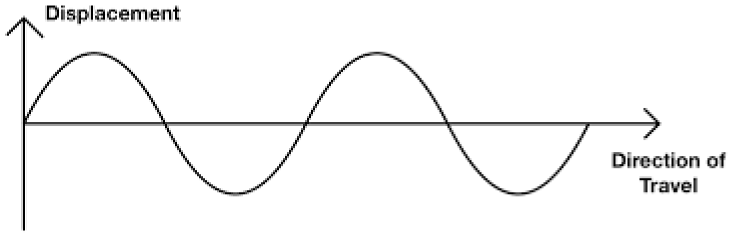
To make electromagnet stronger:

- Increase number of coils
- Increase the current flow

KS3 Waves

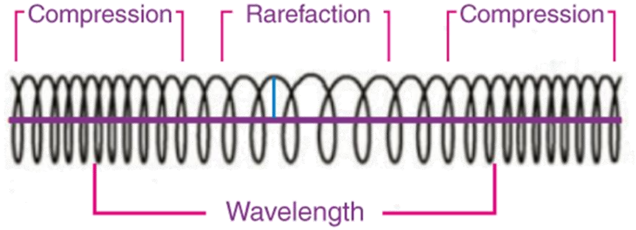
Waves

This is a transverse wave.



A transverse wave carries energy at right angles to the motion of the particles.

Light is a transverse wave. Water surface waves are also transverse waves.



Longitudinal wave energy move side to side, in parallel, to the particles.

Sound is an example of a longitudinal wave.

Communication

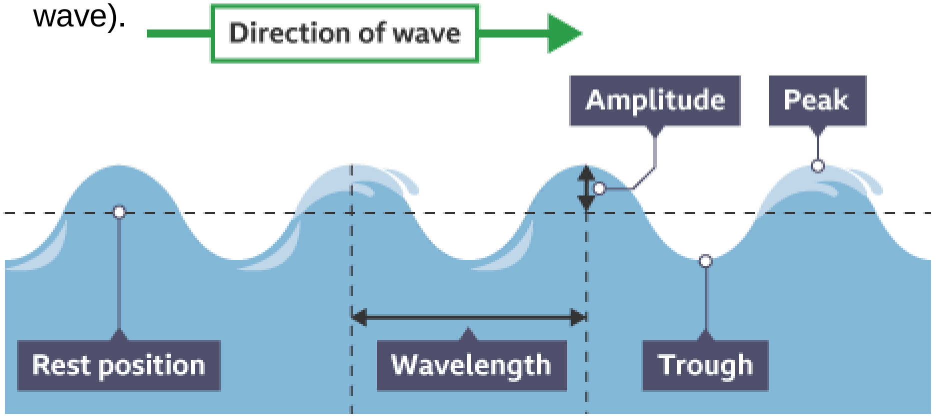
Some waves can be used in communication.

Radio waves, microwaves, infrared radiation and visible light are all waves that can be used to communicate.

Water waves

Water waves are ripples that travel through water. Water waves are transverse waves.

Water waves have amplitude (height of wave), wavelength (length of wave), frequency (how many waves every second), peaks (highest part of wave) and troughs (lowest part of wave).



Keywords

- Transverse
- Longitudinal
- Frequency
- Wavelength
- Amplitude
- Energy
- Sound
- Light
- Ultrasound
- Colour
- Superposition
- Reflection
- Refraction
- Transmission
- Absorption

KS3 Waves

Sound waves

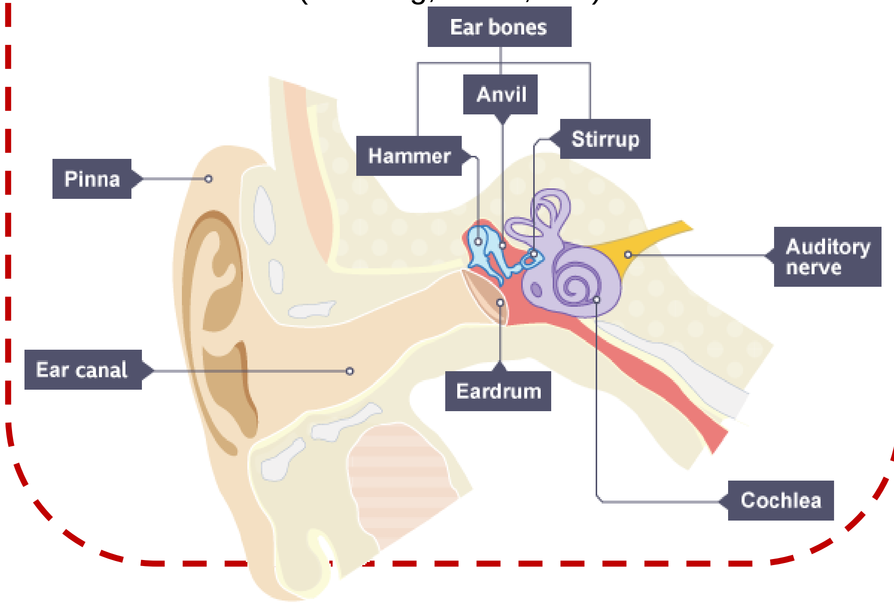
Sound is produced by vibrations and travels at 300m/s. Sound can only travel in a medium (where particles exist), this means sound cannot be heard in space (a vacuum).

Sound can be reflected to produce an echo; it can be transmitted (radio) and can be absorbed.

Sound energy travels through the air where it collides with the ear drum which then vibrates. This sends electrical signals to the brain.

Humans can only hear between 20Hz and 20 000Hz.

Ultrasound (higher than 20K Hz) is used medicine and other industries (cleaning, sonar, etc.).

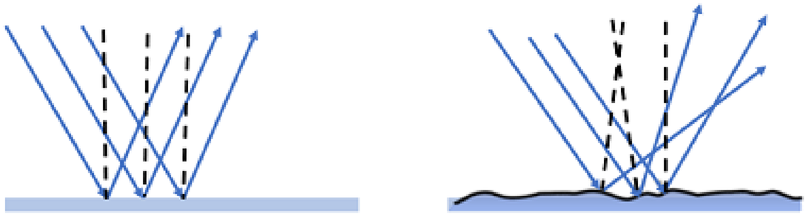


Light

Light is an electromagnetic wave. It is a transverse wave.

Light travels in all mediums and in vacuums. Is does not need particles to move. Light travels at 300 000 000m/s in a vacuum.

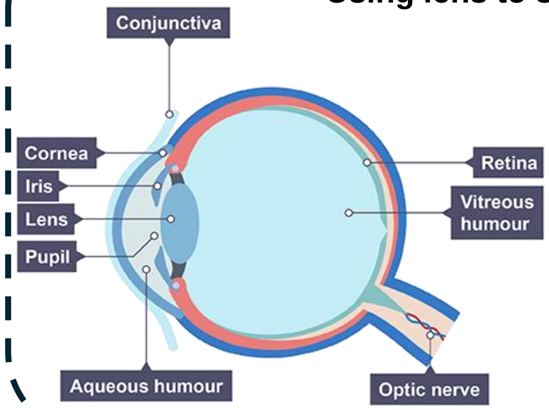
Light can be reflected

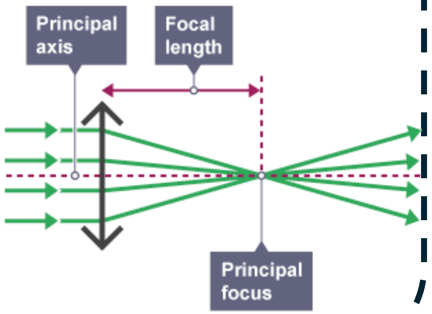


specular reflection *diffuse reflection*

The surface will determine which type of reflection will be seen. Specular reflection produces sharp images. Diffuse reflection produces scattering.

Using lens to see images





Colour

White light is made up of different colours based on their individual frequencies. Red has the highest frequency.

Some coloured objects absorb some colours and reflect/transmit others.

Seeing

We see objects because light reflects off the objects into our eyes.