KS3 Science
Year 8 - Electromagnets

Key words: Magnet, force, magnetism, magnetic field, attract, repel, non-contact force, domains, permanent, temporary, induced, compass, magnetic north, poles, solar winds, magnetosphere, navigation, electromagnets, current, solenoid, core, coils, armature,

What is a magnet?

Bar magnets
Most materials are not magnetic, but some are.
A magnetic material can be **magnetised** or will be attracted to a magnet.
These metals are magnetic:

- iron
- cobalt
- nickel

Steel is mostly iron, so steel is magnetic too.

A bar magnet

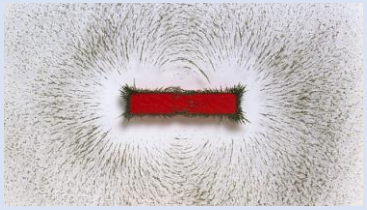
A bar magnet is a **permanent** magnet. This means that its magnetism is there all the time and cannot be turned on or off.
A bar magnet has two magnetic poles:
north pole (or north-seeking pole)
south pole (or south-seeking pole.

Video link

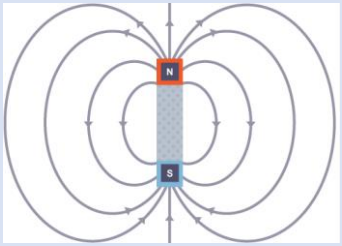
Magnetic fields

A magnet creates a **magnetic field** around it. You cannot see a magnetic field, but you can observe its effects.
We can see magnetic fields around a bar magnet using iron filings sprinkled onto paper or by plotting the lines using a small compass.

The force is a **non-contact force** because the magnet and the material do not have to touch each other.



Magnetic force diagrams
Use arrows to show the Direction that the force Is acting.
The closer together the Lines the stronger the force.
The force is strongest At the poles.

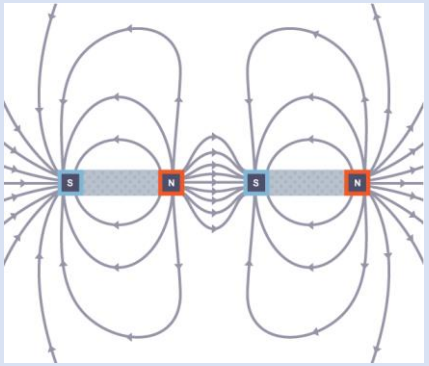


How magnetic fields interact

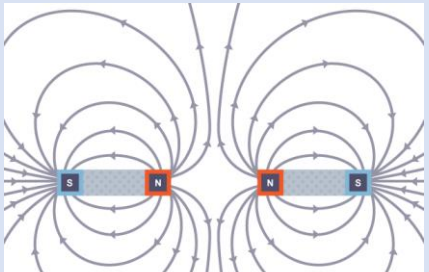
If you bring two bar magnets together, there are two things that can happen, **attraction** and **repulsion**:

if you bring a north pole and a south pole together, they attract and the magnets stick together
if you bring two north poles together, or two south poles together, they repel and the magnets push each other away

We say that colliding opposite magnetic fields **attract:**



Poles that are the same, repel when they collide;



Testing for magnets

How can you test if a piece of metal is actually a magnet?

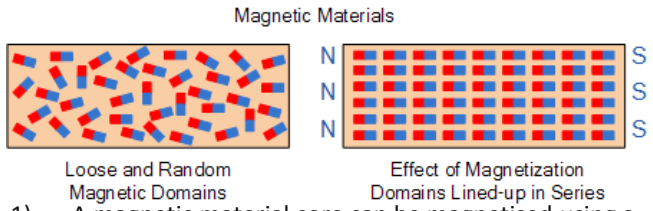
Seeing if it sticks to a magnet is not a good test, because unmagnetised iron, steel, cobalt and nickel objects will also do this. So you can only show that an object is a magnet if it **repels** a known magnet.

Hold the piece of metal next to a compass. As **compass** needles have a small magnet on the tip of the arrow head, if the metal is magnetic the compass

Temporary magnets

There are 2 types of temporary magnet;

1) A magnetic material can be magnetised by lining up the domains; Domains are groups of millions of atoms.This is done by gently stroking a magnetic material slowly in one direction.



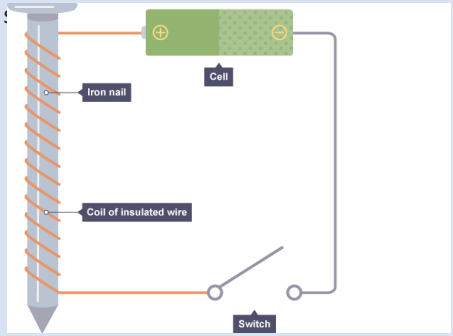
1) A magnetic material core can be magnetised using a current of electricity running through wire coiled

KS3 Science Year 8 - Electromagnets

Key words: Magnet, force, magnetism, magnetic field, attract, repel, non-contact force, domains, permanent, temporary, induced, compass, magnetic north, poles, solar winds, magnetosphere, navigation, electromagnets, current, solenoid, core, coils, armature,

Electromagnets

When an electric current flows in a wire, it creates a magnetic field around the wire. This effect can be used to make an **electromagnet**. A simple electromagnet comprises a length of wire turned into a coil and connected to a battery or power s



Making electromagnets stronger

You can make an electromagnet stronger by doing these things:

- wrapping the coil around a piece of iron (such as an iron nail)
- adding more turns to the coil
- increasing the current flowing through the coil

There is a limit to how much current can be passed safely through the wire because the resistance of the wire causes heating.

The magnetic field around an electromagnet is just the same as the one around a bar magnet. It can, however, be reversed by reversing the current (turning the battery around).

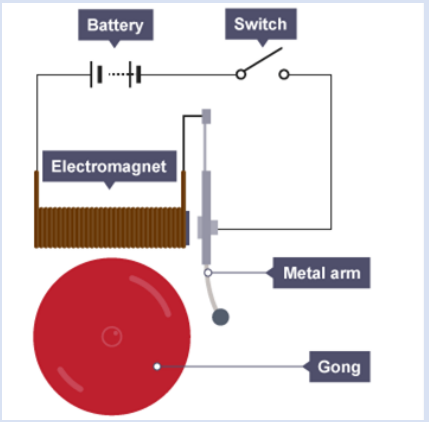
Video link

Uses of electromagnets

Electromagnets have some advantages over permanent magnets. For example:

- they can be turned on and off
- the strength of the magnetic field can be varied

Many objects around you contain electromagnets. They are found in electric motors and loudspeakers.

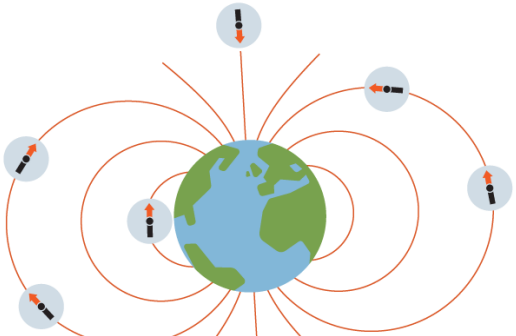


Electric bells luse electromagnets in the following way:

1. The switch is open and the metal arm is away from the gong.
2. The switch is closed. An electric current flows through the electromagnet, producing a magnetic field.
3. The metal arm is attracted to the electromagnet. It hits the gong which makes a sound. The circuit is broken and the

Earth's Magnetic field

The Earth behaves as if it contains a giant magnet. It produces a magnetic field in which the field lines are most concentrated at the poles. This magnetic field can be detected using magnetic materials or magnets



Magnetosphere, Solar winds and navigation

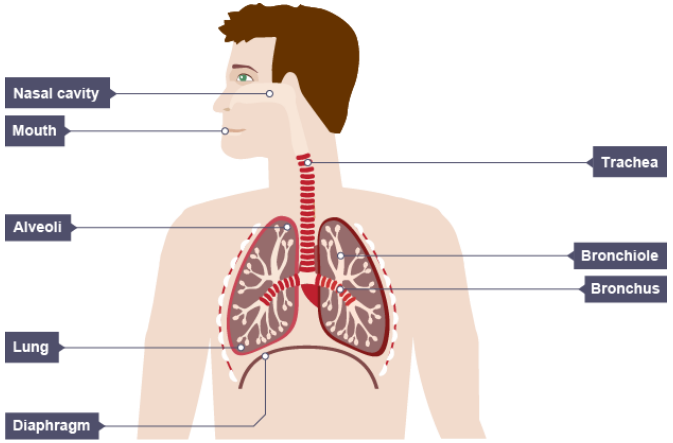
The Earth's magnetic field produces the magnetosphere.
The magnetosphere protects the Earth from the Sun's radiation and from highly charged particles thrown off during solar storms.
As Earth's magnetosphere is strongest at the poles, this is where the greatest deflection occurs. As a result of the deflection, we see the Northern and Southern lights in the sky.
Many animals use the Earth's magnetic field for navigation. E.g. homing pigeons, turtles and whales and dolphins. If the magnetiosphere is disrupted by solar winds animals can find themselves off course.

KS3 Science
Year 8 - Organisms

Additional keywords:
Trachea, lungs, bronchus, bronchi, bronchioles, alveoli, gaseous exchange, diaphragm, inhalation, exhalation, capillaries, diffusion, semi-permeable

Structure of the Lungs

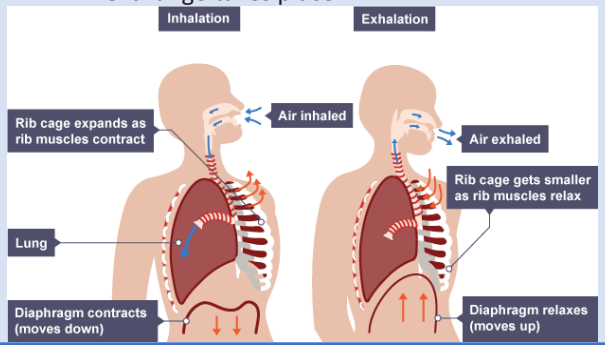
Video link



The respiratory system includes the lungs which contain a system of branching tubes which carry oxygen from the air into our blood and remove the waste gas carbon dioxide from our body as we breathe out.

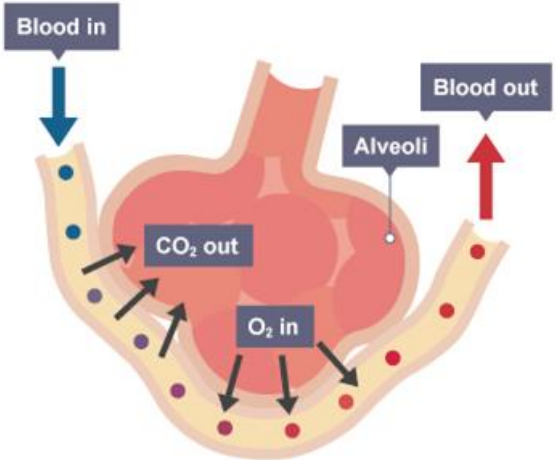
Breathing Mechanism

- Air enters the body and is warmed as it travels through the mouth and nose to the **trachea**.
- The trachea divides into two **bronchi**. One **bronchus** enters each lung.
- Each bronchus branches out into smaller tubes called **bronchioles**. Air travels through these bronchioles.
- At the end of the bronchioles, the air enters one of the many millions of **alveoli** where gaseous exchange takes place.



Adaptations of the respiratory system

- The alveoli are surrounded by **capillaries** so oxygen and carbon dioxide **diffuse** between the air in the alveoli and the blood in the capillaries.
- Capillaries surround the alveoli in the lungs. Both the capillaries and alveoli walls are very **thin** - just one cell thick.
- Alveoli and capillaries are made of **semi-permeable membranes** which allow oxygen and carbon dioxide to pass through them.



Asthma and the respiratory system

Asthma is a condition in which the **airways narrow** and swell and produce extra **mucus**.
This can make breathing difficult and trigger **coughing**, **wheezing** and **shortness of breath**
Severe asthma attacks can be life-threatening. Signs of an asthma emergency include:

- Rapid worsening of shortness of breath or wheezing
- No improvement even after using a quick-relief inhaler, such as albuterol
- Shortness of breath when doing minimal physical activity.

Prevention and long-term control are key in stopping asthma attacks.

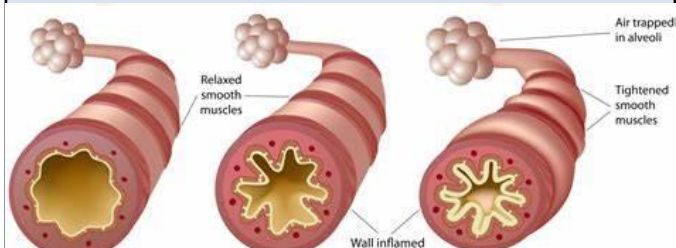
Exercise and the respiratory system

The cardio-respiratory system works together to get oxygen to the muscles and remove carbon dioxide from the body.

During exercise the muscles need **more oxygen** in order to **contract** and they produce more carbon dioxide as a waste product.

To meet this increased demand by the muscles, the following happens:

Breathing depth and rate increase – this gets more



KS3 Science Year 8 - Matter

Additional keywords: Cilia, mucus, heart disease, cancer, nutrient, absorb, medicine, recreational drug, bolus, chyme, duodenum, ilium, pancreas.

Smoking

Smoking is very harmful to health. Smoking damages the ciliated lining of the trachea, bronchi and bronchioles. Cilia usually removes mucus from the airways. Smokers cough to remove the mucus because the cilia are damaged.

Tobacco smoke contains many harmful substances.

- **Tar -** damages the alveoli making gas exchange difficult. Causes coughing and leads to cancer.
- **Nicotine -** increases heart rate and blood pressure, leading to heart disease. Is highly addictive.
- **carbon monoxide -** replaces oxygen in the red blood cells. Causing circulatory system to work harder to deliver enough oxygen. Leading to heart disease.

Health - Recreational drugs and well-being

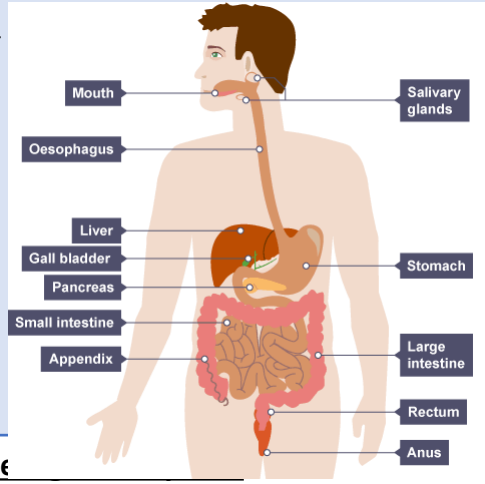
A **drug** is a substance that has an effect on the body:

- **medicines** are drugs that help people suffering from pain or disease
- recreational drugs are taken by people because they like the effects they have on their bodies.
- Some recreational drugs are legal, such as **tobacco** and **alcohol**, although there are restrictions on who can buy them. **Caffeine**, found in coffee, is another recreational drug. Most other recreational drugs are **illegal**, and these include **cannabis**, **ecstasy** and **heroin**.

Recreational drugs can be classified as a **depressant** or a **stimulant**. Most recreational drugs can be addictive.

Journey through the GI tract

1. **Mouth -** chews food and forms a bolus. Mixes food with saliva rich in enzymes.
2. **Oesophagus -** peristalsis moves the bolus downwards towards the...
3. **Stomach**
4. **Small intestine**
5. **Large intestine**
6. **Rectum**
7. **Anus**



Video link

A

Digested food molecules are absorbed in the **small intestine**. This means that they pass through the wall of the small intestine and into our bloodstream. Once there, the digested food molecules are carried around the body to where they are needed.

Only small, **soluble** substances can pass across the wall of the small intestine. Large **insoluble** substances cannot pass through. To maximise absorption the body has the following adaptations:

- Large surface area - maximises absorption of essential nutrients.
- Thin walls - allows fast and efficient exchange of nutrients into the blood.
- Long distance - allows time for all nutrients to be absorbed.

Health - Diet

A nutrient is a substance needed by organisms to stay alive and healthy. A healthy human **diet** involves seven different kinds of nutrient:

Different groups of people require different diets to support their health.

Nutrient	Use in the body	Good sources
Carbohydrate	To provide energy	Cereals, bread, pasta, rice and potatoes
Protein	For growth and repair	Fish, meat, eggs, beans, pulses and dairy
Lipids (fats and oils)	To provide energy. Also to store energy in the body and insulate it against the cold.	Butter, oil and nuts
Minerals	Needed in small amounts to maintain health	Salt, milk (for calcium) and liver (for iron)
Vitamins	Needed in small amounts to maintain health	Fruit, vegetables, dairy
Dietary fibre	To provide roughage to help to keep the food moving through the gut	Vegetables, bran
Water	Needed for cells and body fluids	Water, fruit juice, milk