

Year 8 Knowledge Organiser: Forces



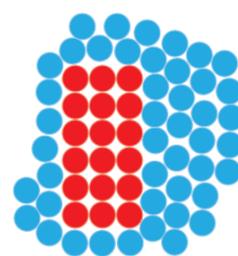
Friction and drag

- **Friction** is a force which will slow down a moving object due to two surfaces rubbing on one another
- The greater the friction, the faster an object will slow down, or the greater the force it will need to overcome the force of friction. For example, it is easier to push a block on ice than on concrete, as the ice is smoother and causes less friction

- When an object is moving through a fluid, either liquid or gas, the force which slows it down is known as **drag**
- The fluid particles will collide with the moving object and slow it down, meaning that more force is needed to overcome this
- Both drag and friction are **contact forces** as the two surfaces in friction, and the object and fluid particles in drag, come into contact with one another
- Both drag and friction are forces so they are measured in **Newtons (N)**



A solid moves through a gas.

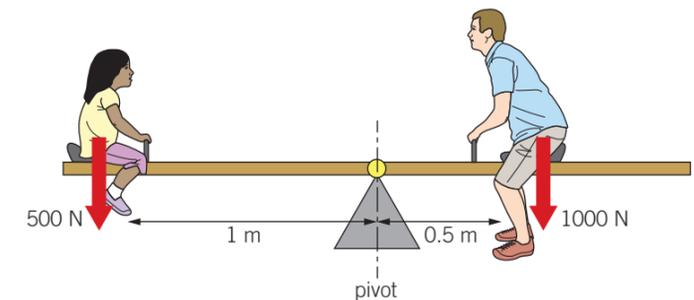


A solid moves through a liquid.

Turning forces

- A **moment** is the turning effect of a force, it is measured in Newton meters
- We can calculate a moment with the equation:
moment (Nm) = force (N) × distance from the pivot (m)

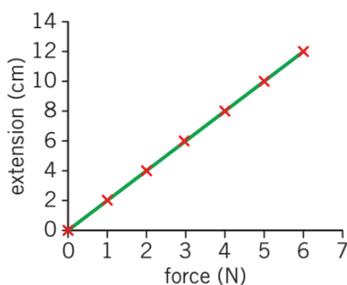
- The size of the moment will increase as the distance from the **pivot** or the size of the force increases
- When an object, such as a seesaw, is balanced, the clockwise and the anticlockwise moments will be equal and opposite, which is known as **equilibrium**
- When forces are equal and opposite to each other, there is no **resultant force**



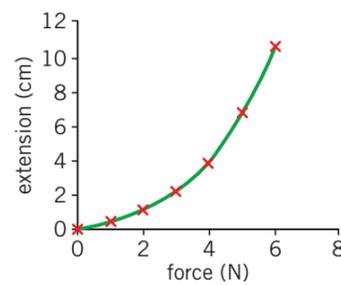
$$\begin{aligned} \text{clockwise moment} &= \text{force} \times \text{distance on the right} \\ &= 1000 \text{ N} \times 0.5 \text{ m} \\ &= 500 \text{ Nm} \\ \text{anticlockwise moment} &= \text{force} \times \text{distance on the left} \\ &= 500 \text{ N} \times 1 \text{ m} \\ &= 500 \text{ Nm} \end{aligned}$$

Hooke's law

- Some objects, like springs, can be stretched, the amount that they stretch is known as their **extension**
- A force needs to be applied to the spring for it to be stretched, we can achieve this by adding masses which exert the force weight
- A spring will continue to stretch until it passes its **elastic limit**
- If an object obeys **Hooke's law** it will have a **linear relationship**: if the force applied to the spring is doubled, the extension will double too
- If an object does not obey Hooke's law, it will not have a linear relationship



This graph shows how the extension of a spring changes as you pull it



This graph shows the relationship between force and extension

Gas pressure

- **Gas pressure** is caused by the particles of a gas colliding with the wall of the container which they are in
- The more often that the particles collide with the wall of the container, the higher the pressure of the gas will be
- Gas pressure can be increased by:
 - Heating the gas so the particles move more quickly and collide with the container with a higher energy
 - Compressing the gas so there are the same amount of particles within a smaller volume meaning that there are more collisions
 - Increasing the amount of particles within the same volume so there are more collisions
- **Atmospheric pressure** is the pressure which the air exerts on you all of the time, nearer the ground there are more particles weighing down on you so the pressure is greater
- The higher you go, the smaller the atmospheric pressure, this is because there will be less particles weighing down on you

Pressure in solids

- The pressure which is exerted on a solid is known as **stress**
- The greater the area over which the force is exerted over, the lower the pressure, this is why snowshoes have a large area to prevent you sinking into the snow
- **Pressure** can be calculated using the following equation:

$$\text{pressure} = \frac{\text{force}}{\text{area}}$$

Pressure in liquids

- Liquids are **incompressible**
- The particles in a liquid are already touching, meaning that there is little space between them to compress
- Liquids will transfer the pressure applied to them, this is seen in hydraulic machines
- As the ocean gets deeper, the pressure will increase, this is because the pressure depends on the weight of the water above
- The greater the number of water molecules above, the higher the pressure will be



Key terms

Make sure you can write definitions for these key terms.

air resistance atmospheric pressure contact force drag elastic limit equilibrium extension friction gas pressure Hooke's law incompressible
linear relationship moment newton pivot pressure resultant force stress

Year 8 Knowledge Organiser: Matter



Elements and atoms

- An **element** is a substance that only contains one type of atom, it is found on the **Periodic Table**
- Each element has its own unique chemical symbol which is the same in every language, these are also found on the Periodic Table
- An **atom** is the smallest part of which an element can be broken down into
- As there are around 100 types of elements that can occur naturally, there are around 100 different atoms

Groups and periods

- Groups** are the columns in the Periodic Table, they go downwards
- Periods** are the rows in the Periodic Table, they go sideways
- Elements in the same group normally follow the same trends in properties such as melting point, boiling point and reactivity
- By placing these elements into these groups, scientists can make predictions about their properties

Compounds

- Compounds** are formed when two or more different elements chemically bond together
- The compound will have different **physical properties** to the elements which make up the compound, for example water is a liquid, but it made from oxygen and hydrogen which are both gases
- Compounds are hard to separate and need a chemical reaction to do this

- When naming a compound, we always mention the metal first and the non metal second
- The name of the metal will not change but the name of the non metal will, for example oxygen can change to oxide
- Chemical formulae tells us how many atoms of each element are in the compound in relation to each other



- The small number tells us the number of each element which is in front of the number

Polymers

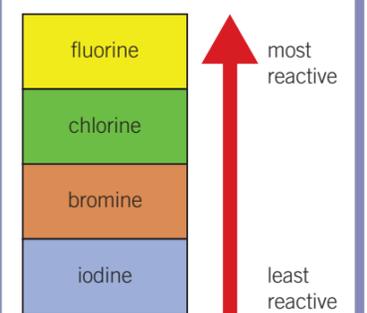
- Polymers** are long chains of groups of atoms which are repeated many times
- Natural polymers are not man-made and include wool, cotton, starch and rubber
- Synthetic polymers are man-made and include polythene, polystyrene and nylon

												H													
												1	2											group number	0
		Li	Be											B	C	N	O	F	He	Ne					
		Na	Mg											Al	Si	P	S	Cl	Ar						
		K	Ca	Sc	Ti	V	Cr	Mn	Fe	Co	Ni	Cu	Zn	Ga	Ge	As	Se	Br	Kr						
		Rb	Sr	Y	Zr	Nb	Mo	Tc	Ru	Rh	Pd	Ag	Cd	In	Sn	Sb	Te	I	Xe						
		Cs	Ba	La	Hf	Ta	W	Re	Os	Ir	Pt	Au	Hg	Tl	Pb	Bi	Po	At	Rn						
		Fr	Ra																						

Group 0

- Group 0** elements are known as the **noble gases**
- They are all non metals with low melting and boiling points, meaning all are gases at room temperature
- The boiling point decreases going down the group
- All of the group 0 elements are unreactive
- When electricity is passed through the gas, they emit a brightly coloured light, this can be seen in neon signs

Halogens



Group 1

- Group 1** elements are also known as the **alkali metals**
- They share similar properties with other metals such as:
 - Being shiny when freshly cut
 - Being good conductors of electricity and heat
- Group 1 metals are much softer than other metals and also have much lower melting and boiling points
- Group 1 elements react with water to form alkali solutions

$$\begin{array}{l} \text{lithium} + \text{water} \rightarrow \text{lithium hydroxide} + \text{hydrogen} \\ \text{metal} + \text{water} \rightarrow \text{metal hydroxide} + \text{hydrogen} \end{array}$$
- The further down the group that the metal is, the more vigorous the reaction will be. This is called a **trend**
- Another trend seen in Group 1 is with the boiling and melting points: the further down the group, the lower the boiling and melting points are

Group 7

- Group 7** elements are also known as the **halogens**
- They share similar properties with other non metals such as:
 - Having low melting and boiling points
 - Not conducting electricity
 - Moving down the groups the elements have an increased melting and boiling point
- The halogens also react in a similar way to one another, for example with iron:

$$\begin{array}{l} \text{iron} + \text{chlorine} \rightarrow \text{iron chloride} \\ \text{iron} + \text{bromine} \rightarrow \text{iron bromide} \end{array}$$
- Halogens can undergo **displacement reactions**, this is where a more reactive halogen will take the place of a less reactive halogen
- The most reactive halogens are at the top of the group, and the least reactive halogens are at the bottom of the group
- If the most reactive halogen is on its own, it will take the place of the less reactive halogen in a compound

$$\text{calcium bromide} + \text{chlorine} \rightarrow \text{calcium chloride} + \text{bromine}$$

Key terms

Make sure you can write definitions for these key terms.

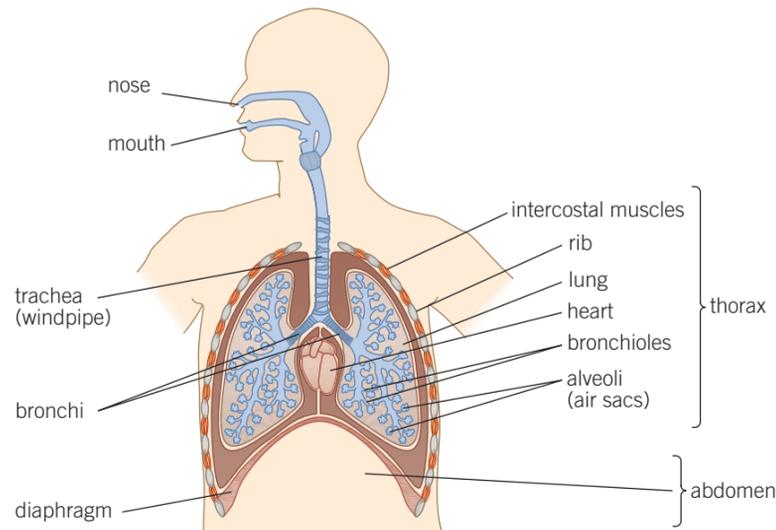
atom alkali metals compound displacement reaction element group Group 1 Group 7 Group 0 halogen
noble gas period Periodic Table physical properties polymer trend

Year 8 Knowledge Organiser: Organisms

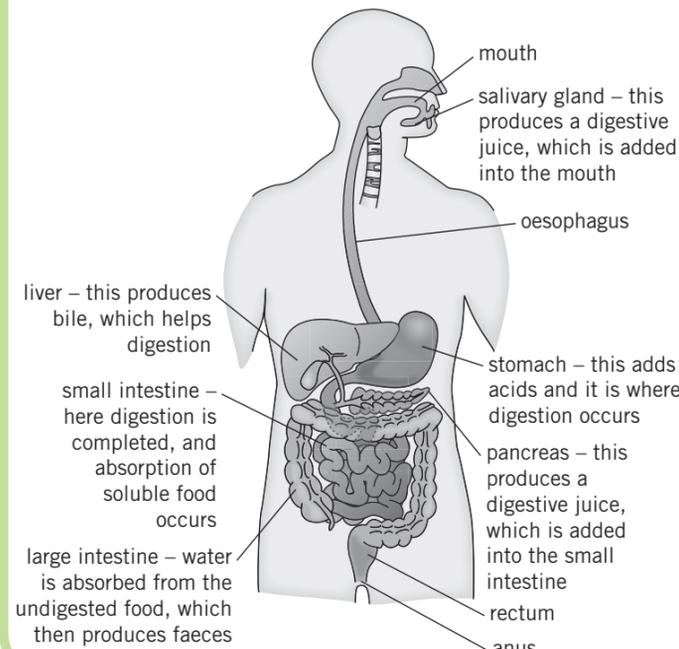


Gas exchange and breathing

- **Gas exchange** is the process of taking in oxygen and giving out carbon dioxide
- This occurs in the **respiratory system**
- The proportions of gases in the air we **inhale** and **exhale** changes due to using oxygen in **respiration** and producing carbon dioxide

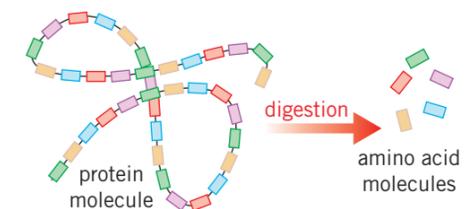


The digestive system



Enzymes

- **Enzymes** are biological **catalysts**, they speed up the digestion of **nutrients**
 - Each enzyme is specific to each nutrient
 - The way the enzyme and nutrient bind with each other is called a lock and key model
-
- **Carbohydrases** break **carbohydrates** down into simple sugars
 - **Proteases** break **proteins** down into amino acids
 - **Lipase** breaks **lipids** (fats) down into fatty acids and glycerol



What happens when you breathe in and out

when you breathe in (inhale)

- muscles between the ribs contract
- ribs are pulled up and out
- diaphragm contracts and flattens
- volume of the chest increases
- pressure inside the chest decreases
- air rushes into the lungs

when you breathe out (exhale)

- muscles between ribs relax
- ribs are pulled in and down
- diaphragm relaxes and moves up
- volume in the chest decrease
- pressure inside the chest increases
- air is forced out of the lungs

Drugs

- **Drugs** are chemicals that affect the way that our body works
 - **Medicinal drugs** are used in medicine, they benefit health
 - If medicinal drugs are not taken in the correct way they can harm health
 - Examples include antibiotics and pain killers
-
- **Recreational drugs** are taken by people for enjoyment
 - Recreational drugs normally have no health benefits and can be harmful for health
 - Examples include alcohol and tobacco
-
- Drug **addiction** is when your body gets so used to a drug, it feels it cannot cope without it
 - If someone who has an addiction stops taking the drug, they will experience **withdrawal symptoms**

Nutrients

- A **balanced diet** involves eating the right amount of nutrients for your body to function
- Not eating enough of a nutrient means you have an unbalanced diet, and this can lead to a **deficiency**

Nutrient	Role in your body
carbohydrates	main source of energy
lipids	fats and oils provide energy
proteins	growth and repair of cells and tissues
vitamins and minerals	essential in small amounts to keep you healthy
water	needed in all cells and body fluids
fibre	provides bulk to food to keep it moving through the gut

Key terms

Make sure you can write definitions for these key terms.

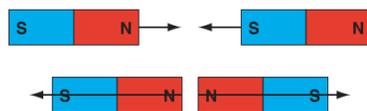
addiction balanced diet carbohydrate carbohydrases catalyst deficiency drug enzyme exhale fibre gas exchange inhale lipid
 medicinal drug mineral nutrient protease protein recreational drug respiration respiratory system vitamin withdrawal symptoms

Year 8 Knowledge Organiser: Electromagnets



Magnets

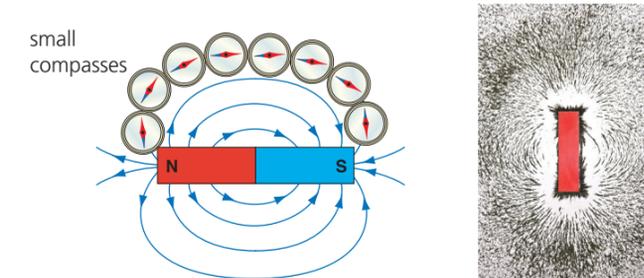
- A **magnet** has two poles, a north and a south pole
- North poles **attract** south poles
- South poles **attract** north poles
- South poles **repel** south poles
- North poles **repel** north poles



- **Magnetic materials** will experience a magnetic force when placed near a magnet, this is a type of non-contact force as the materials do not have to touch for the force to be apparent
- The three magnetic metals are iron, nickel and cobalt

Magnetic fields

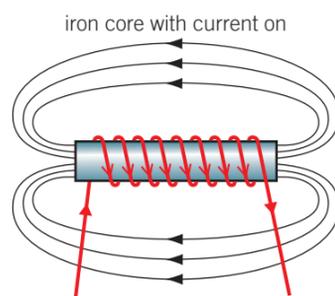
- A **magnetic field** is an area where a magnetic material will experience a force
- A **permanent magnet** will have its own magnetic field
- **Magnetic field lines** represent the field, these always travel out of the north pole of the magnet, and into the south pole
- The closer together the magnetic field lines are, the stronger the magnetic field will be
- We can find out the shape of a magnetic field in two ways:
 - Using plotting compasses
 - Using iron filings



- The Earth has its own magnetic field, which acts like a giant bar magnet inside the centre of the Earth
- This magnetic field allows compasses to work when navigating around the Earth

Electromagnets

- **Electromagnets** are made by wrapping a coil of wire around a magnetic **core**
- Electromagnets only work when electricity is flowing through the coil, which means that they can be turned on and off
- Electromagnets are also stronger than **permanent** magnets
- The electromagnet will produce the same magnetic field shape as a bar magnet

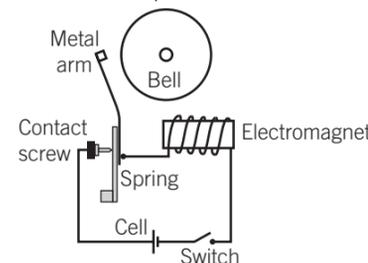


- You can increase the strength of an electromagnet by:
 - Increasing the number of turns on the coil around the core of the electromagnet
 - Increasing the current which is flowing through the coil of wire
 - Using a more magnetic material for the core, e.g. iron rather than aluminium

Using electromagnets

Electric Bells

The electromagnet attracts the iron armature
 ↓
 When it moves, it breaks the circuit, no longer allowing current to flow
 ↓
 The coil and core are no longer magnetic meaning the spring is no longer attracted and returns to its original position
 ↓
 The bell is rung once
 ↓
 The circuit is complete again, restarting the process

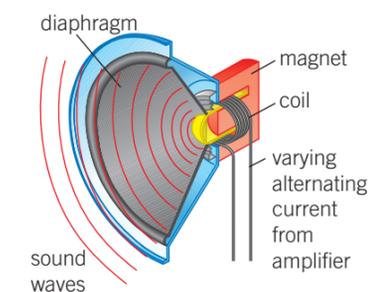


Circuit breakers

- Circuit breakers detect large changes in current in a house, and will break a circuit
- When a large current flows, the electromagnet becomes strong enough to attract an iron catch which will break a circuit
- They can then be reset and used again
- This makes them suitable as an electrical safety device in a home

Loudspeakers

- Loudspeakers use an electromagnet in order to generate sound
- A current passes through the coil and creates an electromagnet, this repels another permanent magnet which moves the cone in and out creating sound



Key terms

Make sure you can write definitions for these key terms.

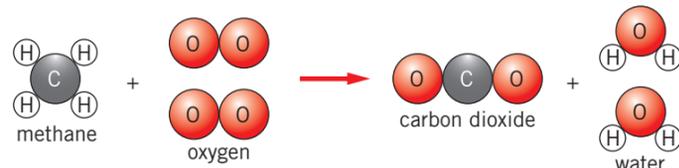
attract core circuit breaker electromagnet electric bell loudspeaker magnet magnetic pole magnetic field lines magnetic material permanent magnet repel

Year 8 Knowledge Organiser: Reactions



Chemical reactions

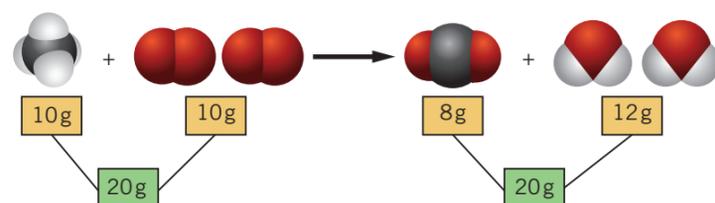
- Word equations can represent a **chemical reaction**:



- The **reactants** are on the left side of the arrow and the **products** are on the right side of the arrow
- We use an arrow instead of an equals sign as it represents that the reactants are changing into a new substance
- In a reaction, the amount of each type of atom stays the same, however they are rearranged to form a new product

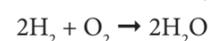
Conservation of mass

- In a reaction the mass will be **conserved**, this means that the total mass of the reactants will be equal to the total mass of the products
- If it appears that some of the mass has been lost, this means that a gas has been produced and escaped, accounting for the lost mass



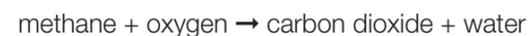
Balanced symbol equations show the amounts of all of the individual atoms in a reaction

- The symbols used are from the Periodic Table
- They also show:
 - Formulae of reactants and products
 - How the atoms are rearranged
 - Relative amounts of reactants and products



Combustion

- Combustion** is the burning of a **fuel** in oxygen
- A fuel is a substance which stores energy in a chemical store
- Examples of fuels include petrol, diesel, coal and hydrogen
- When a carbon based fuel undergoes combustion, it will produce water and carbon dioxide



- Hydrogen can also be used as a fuel, this is much better than traditional fossil fuels as it does not produce carbon dioxide:



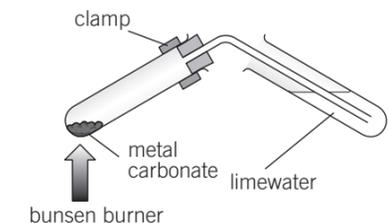
Thermal decomposition

- A **thermal decomposition** reaction is one where the reactants are broken down (decomposition) using heat (thermal energy)

- An example of this is with metal carbonates:



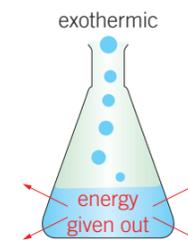
- We can test for this carbon dioxide by bubbling the gas through limewater, if the limewater turns cloudy, the gas is carbon dioxide



Exothermic and endothermic reactions

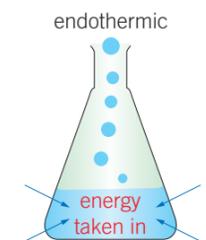
Exothermic reactions involve a transfer of energy from the reactants to the surroundings

- As energy is transferred to the surroundings this will show an increase in temperature
- Examples of exothermic reactions include combustion, freezing, and condensing



Endothermic reactions involve a transfer of energy from the surroundings to the reactants

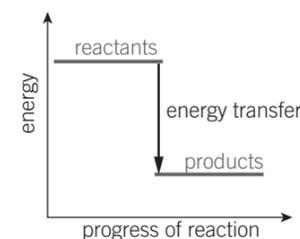
- As energy is taken into the reactants a decrease in temperature will be shown
- Examples of endothermic reactions include thermal decomposition, melting, and boiling



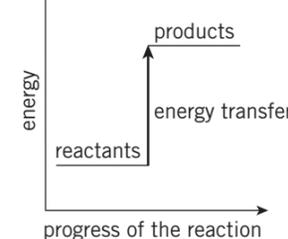
Energy level diagrams

Energy level diagrams show the values of energy between the reactants and the products in a reaction

- If the energy is greater in the reactants than the products then the reaction is exothermic as energy has been given out to the surroundings
- If the energy is lower in the reactants than the products then the reaction is endothermic as energy has been taken in from the surroundings



Exothermic



Endothermic

Bond energies

- Energy must be used to break **chemical bonds**, meaning that this reaction is endothermic
- Energy is given out when chemical bonds are made, meaning that this reaction is exothermic
- To see if a reaction is endothermic or exothermic, you must find the difference in the energy needed to break and to make the bonds in the reaction
- If the energy needed to break the bonds is less than the energy given out when making the bonds, the reaction is exothermic
- If the energy needed to break the bonds is more than the energy released when making the bonds, the reaction is endothermic

Key terms

Make sure you can write definitions for these key terms.

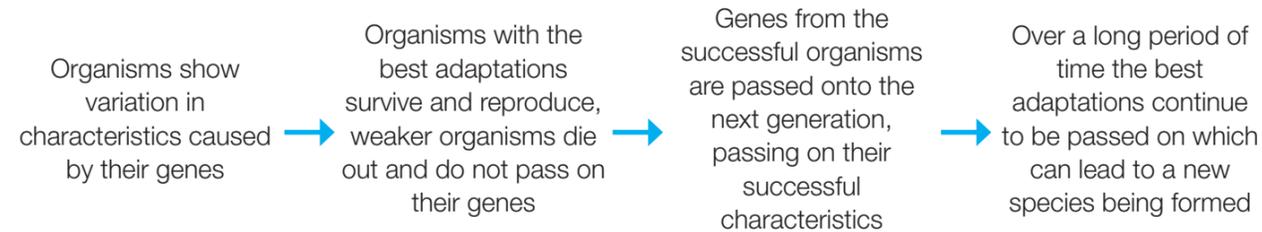
balanced symbol equation chemical bond chemical reaction combustion conserved conservation of mass decomposition fuel endothermic
energy level diagram exothermic products reactants thermal decomposition

Year 8 Knowledge Organiser: Genes



Natural selection

- Scientists believe that the organisms which we see on Earth today have gradually developed over millions of years, this is known as **evolution**
- Charles Darwin came up with the concept of **natural selection**, he said that only the best adapted animals will survive to pass on their **genes**, weaker animals will die out



- One example of natural selection can be seen in giraffes, only the giraffes with the longest necks would be able to eat from trees, the ones with shorter necks would not be able to eat and die out
- This would mean that only the gene for long necks would be passed on, leading to all giraffes having long necks

Extinction

- A species will become **extinct** when all of a species die out
- The **fossil record** shows us that animals have existed in the past which have now become extinct
- Extinction can be caused by:
 - Changes to the environment
 - Destruction of habitat
 - New diseases
 - Introduction of new predators
 - Increased **competition**
- When a species becomes extinct, the variety of species within an ecosystem is reduced, this is also known as a reduction in **biodiversity**
- The more diverse a **population** is, the more likely they are to survive environmental changes

Punnet squares

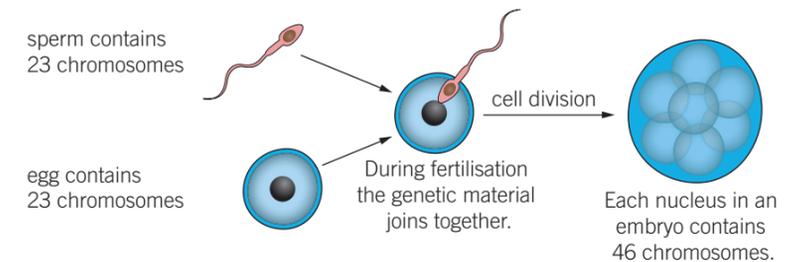
		Possible alleles from father	
		B (dominant allele for brown eyes)	b (recessive allele for blue eyes)
Possible alleles from mother	b (recessive allele for blue eyes)	Bb Offspring will have brown eyes as B is dominant	bb Offspring will have blue eyes as both alleles are recessive
	b (recessive allele for blue eyes)	Bb Offspring will have brown eyes as B is dominant	bb Offspring will have blue eyes as both alleles are recessive

Genetic modification

- Genetic modification** is the process which scientists can use in order to alter the genes of an organism
- Examples of this include altering cotton to produce higher yields, altering bacteria genes to produce medicines and altering crops to produce their own insecticides

Inheritance

- Characteristics** are passed along from parents to their offspring
- Half of the genetic information comes from each parent, this is passed on through the sex cells in the process of fertilisation

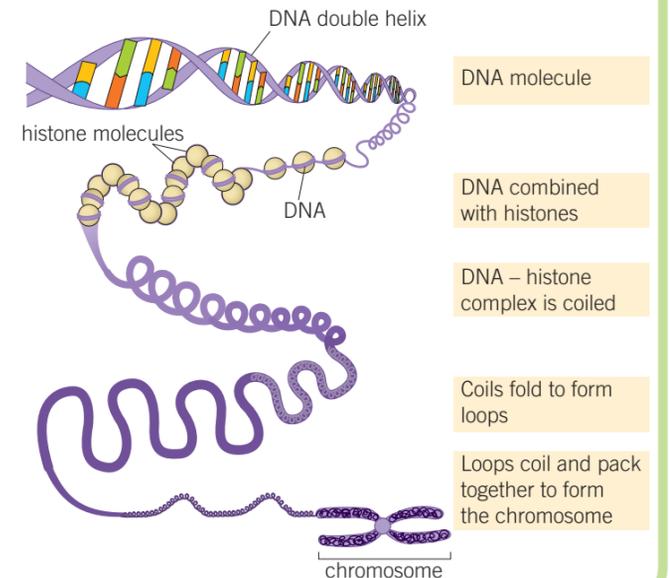


- DNA** is the material which contains all of this genetic information

DNA – in the shape of a double helix

Genes – a section of DNA which hold the information for a particular characteristic

Chromosomes – long strands of DNA which hold many genes, humans have 46 of these in the nucleus of cells



Genetics

- For every characteristic an organism will have two **alleles**, this is two different genes which can code for the same characteristic, one is inherited from each parent
- Dominant** alleles will cause the characteristic to be displayed even if they are with another allele, this is represented by a capital letter
- Recessive** alleles will not be displayed as characteristics unless there are two of the same allele, they are the characteristic least likely to be shown, this is represented by a small letter
- We can predict the inheritance of characteristics using a **Punnet square**

Key terms

Make sure you can write definitions for these key terms.

allele biodiversity characteristics chromosome competition DNA dominant evolution extinct fossil record gene genetic modification mutation
 natural selection population punnet square Punnet square recessive

Year 8 Knowledge Organiser: Energy



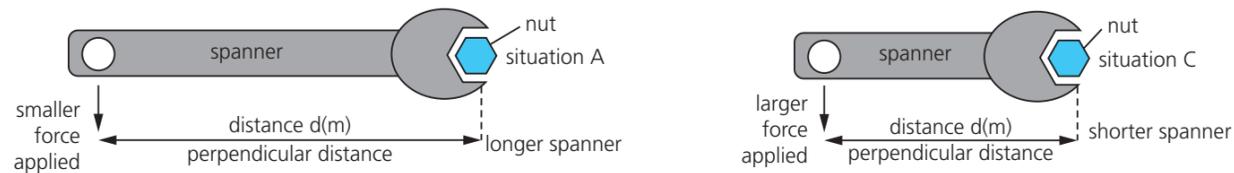
Work

- In physics, **work done** is the energy transferred when a force is used to move an object a certain distance
- Like energy, work is measured in **Joules (J)**
- Work can be done in a range of situations e.g. lifting a book work is done against gravity, when you slide a book along a table work is done against friction
- We calculate work with the equation:

$$\text{work done (J)} = \text{force (N)} \times \text{distance moved (m)}$$

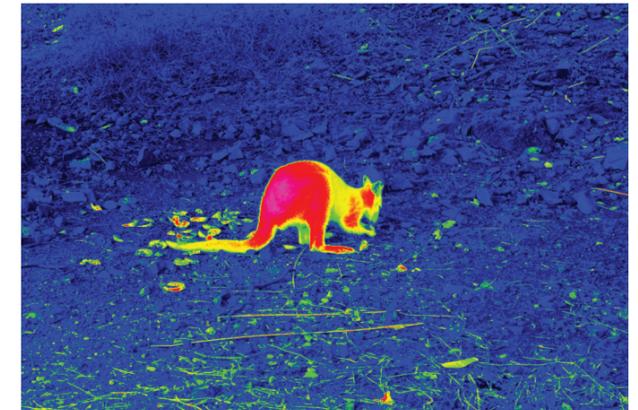
- A **simple machine** makes it easier to lift things, they reduce the force needed
- A **force multiplier** uses a smaller **input force** (what you apply) to generate a larger **output force** (what is created)
- If you increase the distance from the pivot, less input force is needed to be used for the same output force as before
- A **lever** is an example of a force multiplier, a longer lever will require a less input force than a shorter lever to produce the same output force

The physics of unscrewing a tight nut with a spanner



Radiation

- Radiation** is a method of transferring energy without the need for particles
- An example of radiation is thermal energy being transferred from the Sun to us through space (where there are no particles)
- This type of radiation is known as **infrared radiation**, it is a type of wave just like light
- The hotter an object is the more infrared radiation it will emit (give out)
- The amount of radiation emitted and absorbed depends on the surface of the object:
 - Darker matte surfaces absorb and emit more infrared radiation
 - Shiny and smooth surfaces absorb and emit less infrared radiation, instead reflecting this
- The amount of infrared radiation being emitted can be viewed on a **thermal imaging camera**

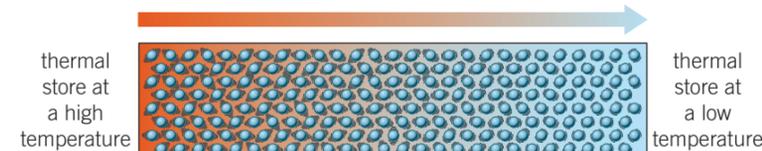


Energy and temperature

- The **temperature** of a substance is a measure of how hot or cold it is
- Temperature is measured with a **thermometer**, it has the units of degrees Celsius (°C)
- The **thermal energy** of a substance depends on the individual energy of all of the particles, it is measured in Joules (J)
- As all particles are taken into account, a bath of water at 30 °C would have more thermal energy than a cup of tea at 90 °C as there are many more particles
- The faster the particles are moving, the more thermal energy they will have
- When particles are heated they begin to move more quickly
- The energy needed to increase the temperature of a substance depends on:
 - the mass of the substance
 - what the substance is made of
 - how much you want to increase the temperature by

Conduction

- Conduction** is the transfer of thermal energy by the vibration of particles, it cannot happen without particles
- This means that every time particles collide they transfer thermal energy
- Conduction happens effectively in solids as their particles are close together and can collide often as they vibrate around a fixed point
- Metals are also good **thermal conductors** as they contain electrons which are free to move
- In conduction the thermal energy will be transferred from an area which has a high **thermal energy store** (high temperature) to an area where there is a low thermal energy store (low temperature)
- Gases and liquids are poor conductors as their particles are spread out and so do not collide often, we call these **insulators**



Convection

- Convection** is the transfer of thermal energy in a liquid or a gas, it cannot happen without particles
- As the particles near the heat source are heated they spread out and become less dense, this means that they will rise
- More dense particles will take their place at the bottom nearest the heat source creating a constant flow of particles
- This is known as a **convection current**
- Convection cannot happen in a solid as the particles cannot flow, they can only move around a fixed point



Key terms

Make sure you can write definitions for these key terms.

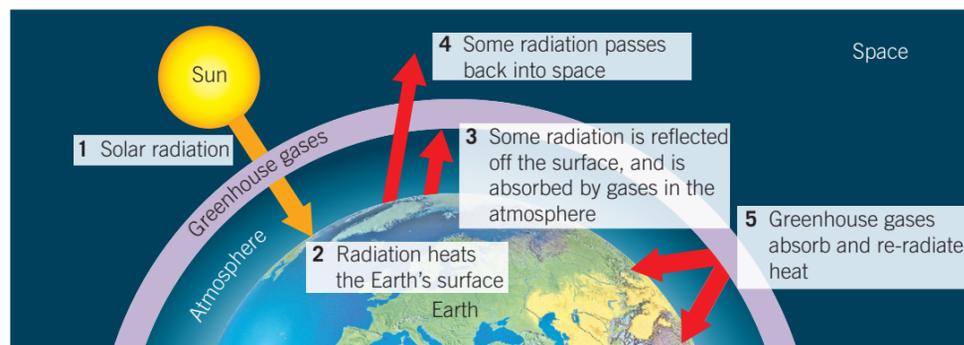
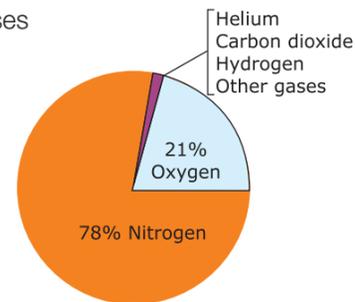
conduction convection convection current force multiplier input force insulator infrared radiation lever output force simple machine temperature
 thermometer thermal conductor thermal energy store thermal imaging camera work done

Year 8 Knowledge Organiser: Earth



The atmosphere

- The air around us all of the time is known as the **atmosphere**, it is made up of a mixture of gases
- When the Sun heats the Earth's surface, some of the radiation is absorbed and some is reflected back into space
- Some of the gases in the atmosphere absorb radiation that is about to be reflected into space, this keeps the Earth at a warmer temperature than it would be without the atmosphere, this is needed as otherwise it would be too cold for life
- The gases in the atmosphere which absorb and trap this radiation are known as **greenhouse gases**, the most commonly known greenhouse gases are carbon dioxide and methane

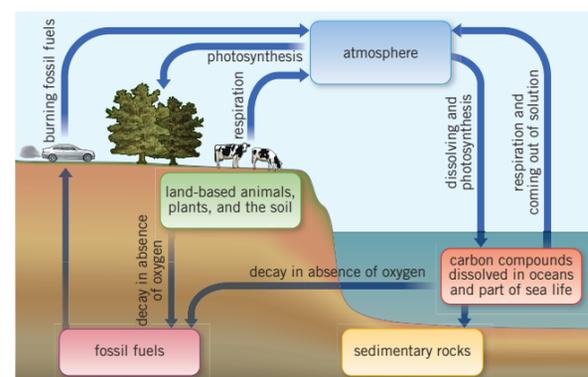


Global warming

- Global warming** is the gradual increase in temperature of the Earth
- This is closely linked to the rise in carbon dioxide levels in the atmosphere

The carbon cycle

- The **carbon cycle** is the processes by which carbon is naturally transferred to different stores through a range of natural processes
- Carbon is released into the atmosphere through **combustion of fossil fuels**, and animal **respiration**
- It is then reabsorbed by plants during **photosynthesis**



Climate change

- Long term changes to weather patterns are known as **climate change**
- This can cause the ice caps to melt, leading to sea levels rising and flooding of low level land
- Graphs alone cannot confirm that humans are the cause, but the majority of scientists now believe that human activity is a very likely cause
- We can help to prevent climate change by:
 - Using renewable energy resources
 - Using cars less
 - Buying and wasting less resources

Extracting metals

- Metals are a **natural resource**, with most being found joined with other elements in compounds
- Naturally occurring metals and their compounds are known as **minerals**
- An **ore** is a naturally occurring rock which contains enough of a mineral to be worth extracting
- An example of an ore is Bauxite, which contains aluminium hydroxide

- When metals are extracted they first have to be separated from other minerals in the ore, then they need to undergo a chemical reaction to separate them from the other element that they are joined to in a compound
- If a metal is below carbon in the reactivity series, it can be extracted by reacting it with carbon in a displacement reaction
- As carbon is more reactive it will take the place of the metal in the compound, leaving the metal on its own:
 - $\text{carbon} + \text{metal oxide} \rightarrow \text{metal} + \text{carbon dioxide}$
 - $\text{carbon} + \text{copper oxide} \rightarrow \text{copper} + \text{carbon dioxide}$
- If the metal is above carbon in the reactivity series, **electrolysis** can be used, this involves separating the metal by using electricity

Reactivity series

magnesium
aluminium
carbon
zinc
iron
lead
copper

Recycling

- Recycling** is the collecting and processing of materials that have been used so that the resources can be used again
- Recycling can have both advantages and disadvantages:

Advantages	Disadvantages
<ul style="list-style-type: none"> Resources will last longer It uses less energy than extracting new materials It reduces waste and pollution 	<ul style="list-style-type: none"> Separating rubbish can be seen as a nuisance The lorries collecting recycling produce pollution Some materials are easier to recycle than others

Key terms

Make sure you can write definitions for these key terms.

atmosphere carbon cycle climate change combustion electrolysis fossil fuel global warming greenhouse gas mineral
natural resource ore photosynthesis recycling respiration

Year 8 Knowledge Organiser: Ecosystems



Respiration

- Respiration is the process in which energy is released from the molecules of food which you eat
 - Respiration happens in the mitochondria of the cell
 - **Aerobic respiration** involves oxygen, it is more efficient as all of the food is broken down to release energy
glucose + oxygen → carbon dioxide + water
 - The glucose is transported to the cells in the blood **plasma**
 - The oxygen is transported to the cells in **red blood cells**, by binding with **haemoglobin**
 - Carbon dioxide is a waste product and is transported from the cells to the lungs to be exhaled
-
- **Anaerobic respiration** is a type of respiration which does not use oxygen, it is used when the body cannot supply the cells with enough oxygen for aerobic respiration
 - Anaerobic respiration releases less energy than aerobic respiration
glucose → lactic acid + carbon dioxide
 - The **lactic acid** produced through anaerobic respiration can cause muscle cramps
 - Lactic acid will build up if there is not enough oxygen present in the blood supply to break it down. This is known as an **oxygen debt**



Fermentation

- **Fermentation** is a type of anaerobic respiration which occurs in yeast
- Instead of producing lactic acid, yeast produces ethanol, which is a type of alcohol
glucose → ethanol + carbon dioxide
- This process can be used to form alcohol to drink or to allow bread and cakes to rise

Plant minerals

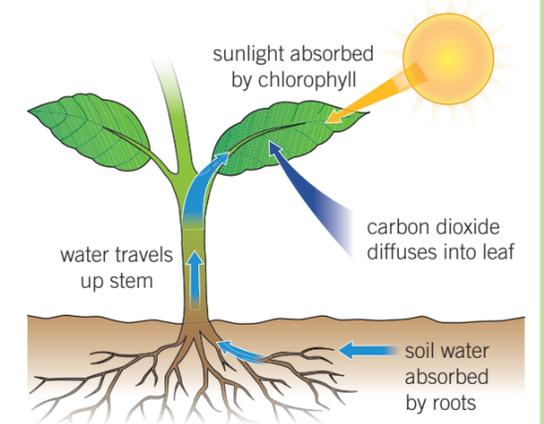
Plants need minerals for healthy growth, if they do not have enough of these minerals this is known as a **mineral deficiency**

Mineral	What is it used for?	What happens if there is not enough?
nitrates (contain nitrogen)	healthy growth	poor growth and older leaves yellow
phosphates (contain phosphorus)	healthy roots	poor growth, younger leaves look purple
potassium	healthy leaves and flowers	yellow leaves with dead patches
magnesium	making chlorophyll	leaves will turn yellow

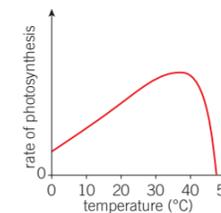
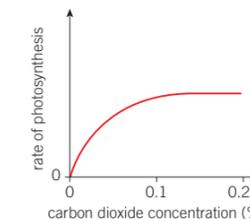
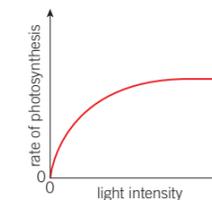
Fertilisers can be used to stop plants from suffering with mineral deficiencies

Photosynthesis

- **Photosynthesis** is the process which occurs in the chloroplasts to produce glucose using sunlight
glucose + carbon dioxide → glucose + oxygen
- Any organism that can use photosynthesis to produce its own food is known as a **producer**, these are not just limited to plants but can include other organisms such as **algae**

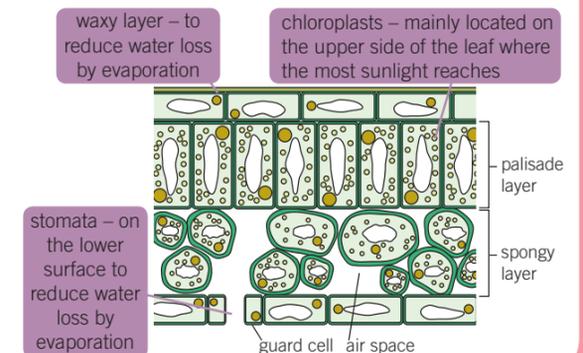


- The rate of photosynthesis can be affected by:
 - Light intensity – the higher the light intensity the higher the rate of photosynthesis up to a point
 - Carbon dioxide concentration – the higher the carbon dioxide concentration the higher the rate of photosynthesis up to a point
 - Temperature – the optimum temperature is the temperature at which photosynthesis occurs at the highest rate, before and after this the rate will be less



Leaves

- To best adapt for photosynthesis leaves have a number of adaptations
- They are thin to allow the most light through
- There is a lot of **chlorophyll** to absorb light
- They have a large surface area to absorb as much light as possible



Key terms

Make sure you can write definitions for these key terms.

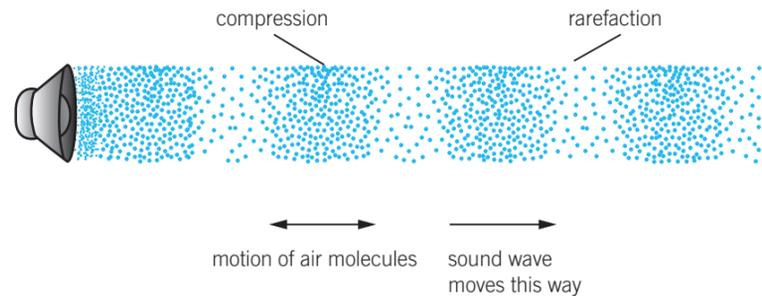
aerobic respiration algae anaerobic respiration chlorophyll mineral deficiency fermentation fertiliser haemoglobin lactic acid magnesium
nitrates oxygen debt phosphates photosynthesis plasma potassium producer red blood cells

Year 8 Knowledge Organisers: Waves



Sound waves

- Any **wave** transfers energy from one place to another
- Sound waves cause particles to vibrate backwards and forwards in the direction of the wave, this produces areas of high pressure (**compression**) and low pressure (**rarefaction**)
- As there are areas where the air pressure is different in a sound wave, we can call sound waves a type of **pressure wave**

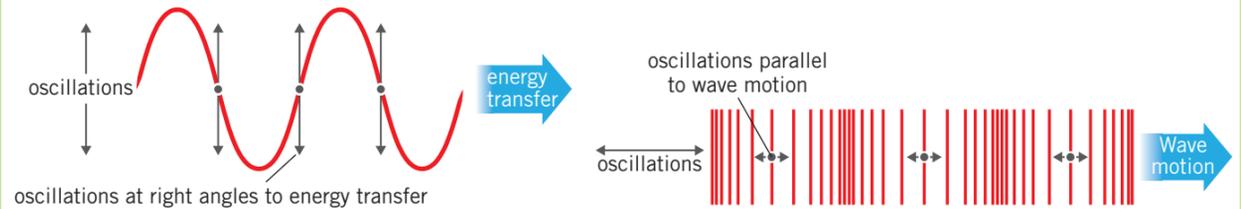


- Sound can be detected with a **microphone**, the microphone will change air pressure into a changing potential difference
- Sound can be produced with a **loudspeaker**, the changing potential difference causes changes in air pressure
- Changes in air pressure will be caused by the diaphragm of the loudspeaker vibrating and causing the movement of the air particles

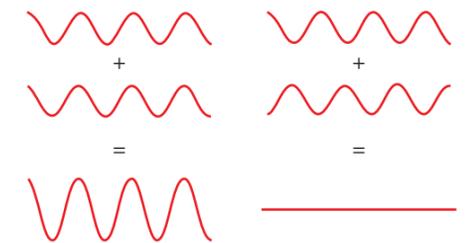


Types of waves

- Transverse waves** vibrate at 90° to the direction at which they are travelling, they move up and down as well as forward
- Longitudinal waves** vibrate in the direction in which they are travelling



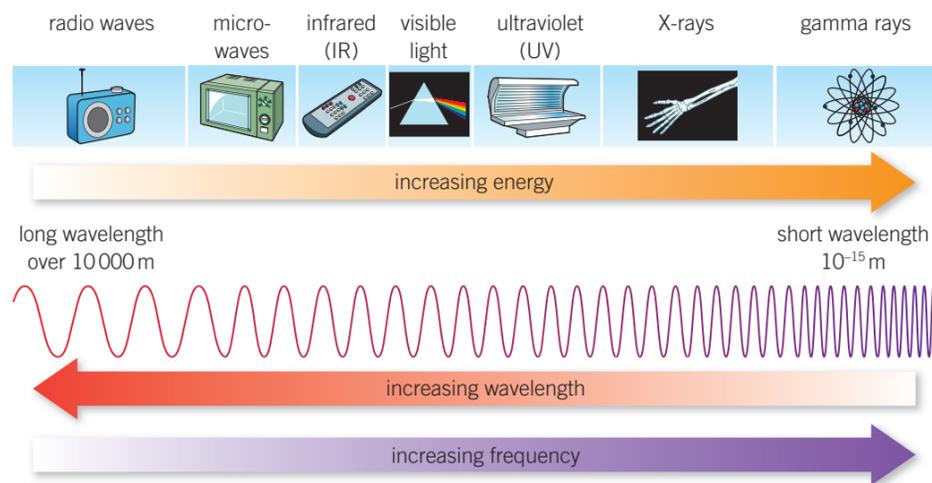
- When waves are put together they **superpose**, this means they will either add together or cancel each other out
- When the waves are in line with one another they add together, increasing the amplitude of the wave
- When the waves are not in line, they will cancel each other out, decreasing the amplitude of the wave



Ultrasound

- Humans can hear sounds with a frequency between 20–20000Hz.
- ultrasound** is any sound with a frequency of higher than 20000Hz
- As ultrasound has a high frequency it causes the particles it interacts with to vibrate more quickly, this means that it can be used in:
 - Ultrasonic cleaning – dirt particles are 'shaken' off of objects
 - Physiotherapy – the ultrasound waves causes liquid particles in the body to move more quickly and hence get warmer

Electromagnetic spectrum

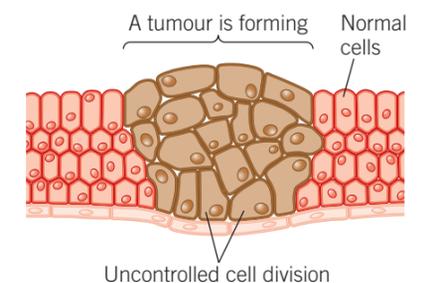


Uses of the electromagnetic spectrum

Radio waves	TV signals
Microwaves	Mobile phones
Infrared	Heating and cooking
Visible light	Photography
Ultraviolet waves	Detecting forgeries, sunbeds
X-rays	Imaging broken bones
Gamma rays	Killing cancer cells

Ionisation

- The higher the frequency of the wave, the higher the energy
- High energy waves can lead to **ionisation**, where electrons are knocked off of atoms in cells
- This can cause mutations in cells if the DNA is affected and this can lead to cancerous tumours forming
- The ionising waves in the electromagnetic spectrum are gamma, X-rays and ultraviolet rays



Key terms

Make sure you can write definitions for these key terms.

compression electromagnetic spectrum gamma rays infrared ionisation longitudinal wave loudspeaker microphone microwaves
 pressure wave radio waves rarefaction superpose transverse wave ultrasound ultraviolet visible light wave X-rays