Curriculum Map/Learning Journey

Year	Biology	Chemistry	Physics
7	Welcome to the Lab		
	Cells and Movement	Particle model	Energy Costs and Transfers
	Breathing and Digestion	Separating Mixtures	Forces and pressure
	Relationships within ecosystems	Elements	
8	Photosynthesis and Respiration	Acids, Alkalis. Metals and Non Metals	Waves, Light and Sound
	Reproduction	Earth Structure and the climate	Energy Revisited and the Energy Project
	Variation, Inheritance and Evolution *		Electricity and Magnetism
9	B1 Cells Part 1	9CR Reactions	Universe *
	B3 Infection Part 1 (disease)	C1a Atomic Structure	P1 Energy
	B2 Organisation Part 1 (digestive system)	C1b Periodic Table	
	B4 Bioenergetics Part 1 (Photosynthesis and Respiration)	C2 Bonding and Properties of matter	
	B1 Cells Part 2		
10	B3 Infection part 2 (Response)	C3 Quantitative Chemistry	P2 Electricity
	B2 Organisation Part 2	C4 Chemical Changes	P3 Particle Model and Matter (common with chem)
	B7 Ecology	C5 Energy Changes	P4 Atomic Structure (common with chem)
		C6 Rate and Extent of Chemical Change	P5 Forces
11	B5 Homeostasis and Response	C7 Organic Chemistry	P6 Waves
	B6 Inheritance, Variation and Evolution	C8 Chemical Analysis	P7 Magnetism and Electromagnetism
		C9 Chemistry of the Atmosphere	
		C10 Using resources	

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INSPIRING BEYOND MEASURE

Biology: Photysnthesis and Respiration

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

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- **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

- 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 deadpatches
magnesium	making chlorophyll	leaves will turn yellow

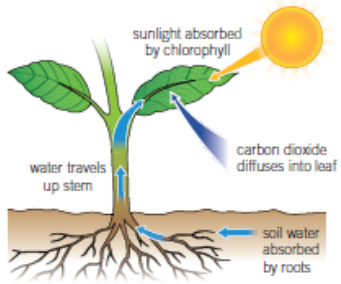
Fertilisers can be used to stop plants from suffering with mineral deficiencies

Photosynthesis

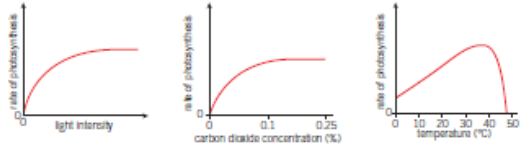
- **Photosynthesis** is the process which occurs in the chloroplasts to produce glucose using sunlight

water + carbon dioxide + sunlight → 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**

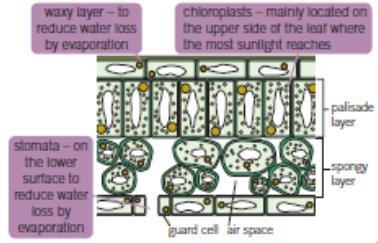


- The rate of photosynthesis can be affected by:
  - Light intensity – the higher the light intensity the higher the rate of photosynthesis up to a point
  - Carbon dioxide concentration – the higher the carbon dioxide concentration the higher the rate of photosynthesis up to a point
  - Temperature – 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

CHEMISTRY: Acids, Alkalis, Metals and non metals

Chemical reactions

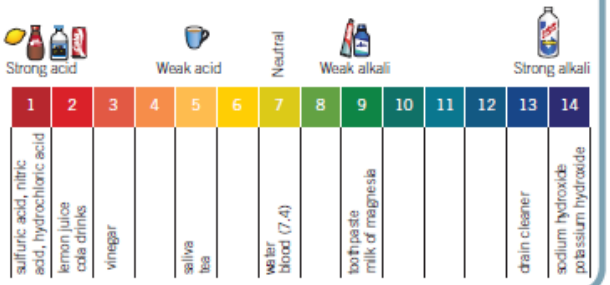
- A **chemical** reaction is a change in which atoms are rearranged to make new substances
- A **reversible** reaction is one where the products can react to get back the substances which you started with, most chemical reactions are not reversible
- You can look for signs that a chemical reaction has taken place such as flames, smells, heat change, a loud bang or gentle fizz

Acids and alkalis

- **Acids** and **alkalis** are the chemical opposites of one another
- Both acids and alkalis can be **corrosive** and **irritants**

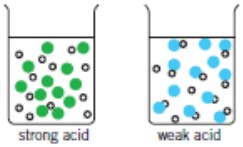
To see whether a substance is an acid or an alkali, we can use an **indicator**. Indicators show how acidic or how alkaline a solution is by showing its position on the **pH scale**, one example of this is **universal indicator**

- If the solution has a pH value of 1–6 it is **acidic**
- If the solution has a pH value of 8–14 it is **alkaline**
- If the solution has a pH value of 7 it is known as **neutral**



Acid strength

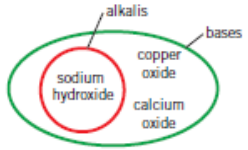
- The strength of an acid depends on how much of the acid has broken apart when it has dissolved in water
- Hydrogen chloride dissolves in water to form hydrochloric acid, this is a **strong acid** as all of the particles split up
- A **weak acid** will have particles that do not all split up



- The **concentration** of the acid is the amount of acid which has dissolved in 1 litre of water
- The more concentrated the acid, the lower the pH

Neutralisation

- **Neutralisation** reactions are any reaction in which acids react with a **base** to cancel out the effect of the acid
- These reactions form a neutral solution with a pH of seven
- A **base** is any substance which neutralises an acid
- An alkali is a base which has been dissolved in water



Salts

Salts are substances which are formed when an acid reacts with a metal or metal compound

Different acids form different types of salts:

- Hydrochloric acids form chloride
- Sulphuric acids form sulphates
- Nitric acids form nitrates

Metal reactions

When a metal reacts with an acid it will produce a salt and hydrogen gas, the fizzing that you see is the hydrogen gas being given off

metal + acid → salt + hydrogen
magnesium + hydrochloric acid → magnesium chloride + hydrogen

When a metal reacts with oxygen a metal **oxide** is formed, this process is known as **oxidation**

metal + oxygen → metal oxide
aluminum + oxygen → aluminum oxide

- When a metal reacts with water it forms a metal **hydroxide** and hydrogen gas.
- The alkali (group 1) metals react most vigorously, giving off a brightly coloured flame

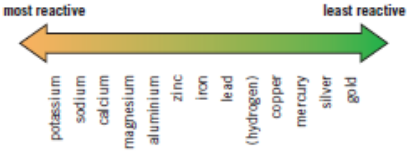
metal + water → metal hydroxide + hydrogen
sodium + water → sodium hydroxide + hydrogen

When a more reactive metal reacts with a compound containing a less reactive metal, it can take it's place, this is known as a **displacement** reaction

- If the metal on it's own is higher in the **reactivity series** than the metal in the compound a reaction will take place
- If the metal on it's own is lower in the reactivity series than the metal in the compound, a reaction will not take place

The reactivity series

- The **reactivity series** describes how reactive different metals are compared to one another
- The higher the metal is in the reactivity series the more reactive it will be this means that it will react much more vigorously



Key terms Make sure you can write definitions for these key terms.

acid acidic alkali alkaline base chemical chemical reaction concentration concentrated corrosive displacement hydroxide indicator irritant neutral neutralisation oxide oxidation pH scale reversible reactivity reactivity series salt strong acid universal indicator weak acid

Biology: Reproduction

Variation

- The differences in characteristics of living things is known as **variation**
- There is a large amount of variation between different **species**, but within species many more characteristics are shared
- Even though two organisms may look the same, they will always have variation between them

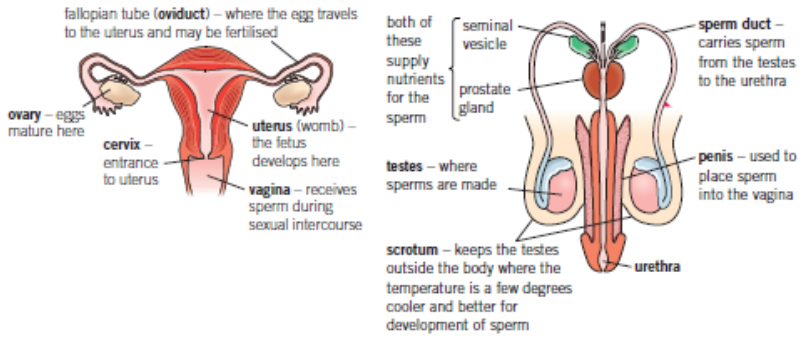
Inherited variation	Environmental variation
• Is anything that comes directly from your parents, anything that you inherit • Examples can include lobe less or lobed ear lobes and eye colour	• Is any type of variation that is caused by your surroundings • Factors that can cause environmental variation include diet, education and lifestyle

- Environmental factors can also impact inherited factors, for example a poor diet can affect height or your exposure to the sun can affect skin tone
- Characteristics which are inherited and not affected by environmental variation include natural eye colour, blood group and genetic diseases

Adaptations

- **Adaptations** are characteristics which organisms have developed to best survive in their surroundings
- Organisms with the best suited adaptations can breed and pass these on
- Those who are not best adapted will die out and not be able to pass on their genes

Reproductive systems

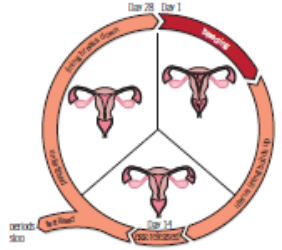


Adolescence

- **Adolescence** is the process in which a child changes into an adult, it involves both physical and emotional changes
- The physical changes alone in this time are known as **puberty**, these are caused by **sex hormones**

The menstrual cycle

- The **menstrual cycle** is the process in which an egg is released from an ovary and leaves through the vagina
- Day 1: blood from the uterus lining leaves through the vagina, which is known as a **period**
- Day 5: the bleeding stops and the uterus lining starts to re-grow
- Day 14: an egg is released from one of the ovaries during **ovulation**
- If the egg is **fertilised** than the menstrualcycle stops until the baby is born



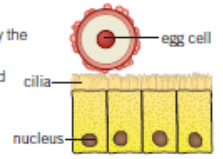
Fertilisation, implantation and gestation

- Egg cells and sperm cells are also called **gametes**, and each contains half the genetic information needed to form a complete organism.

Egg cells

An egg is released by the ovaries every month

The egg cell is moved along the oviduct towards the uterus by **cilia**



Sperm cells

Sperm cells are produced in the testicles/testes

Sperm are mixed with nutrients and fluid from the glands to form **semen**

During sexual intercourse a man will release semen into the vagina (**ejaculation**)

If a sperm meets the egg **fertilisation** may happen

The fertilised egg may then **implant** in the uterus lining and form an **embryo** (ball of cells)

- During **gestation** the developing **fetus** needs nutrients from the mother, these are passed through the **placenta** which is connected to the fetus by the **umbilical cord**
- Nutrients are passed from the mother to the baby and waste products are passed back from the baby to the mother
- The baby is protected from bumps to the mother by the **amniotic sac** which acts as a shock absorber

Just a dot		1 week – cells beginning to specialise
3 mm long		4 weeks – spine and brain forming, heart beating
3 cm long		9 weeks – tiny movements, lips and cheeks sense touch, eyes and ears forming
7 cm long		12 weeks – fetus uses its muscles to kick, suck, swallow, and practise breathing

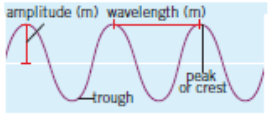
Key terms Make sure you can write definitions for these key terms.

adaptation adolescence amniotic sac cervix cilia egg cell embryo environmental variation fertilisation fetus gamete gestation implantation inherited variation menstrual cycle ovary oviduct ovulation penis period placenta puberty reproductive system scrotum semen sex hormones species sperm cell sperm duct testicles umbilical cord urethra uterus vagina variation

Physics: Waves, Light and Sound

Properties of waves

- A **wave** is an **oscillation** or **vibration** which transfers energy from one place to another
- **Amplitude** – the distance from the middle to the top of bottom of the wave
- **Wavelength** – the distance between a point on the wave to the same point on the next wave
- **Trough** – The bottom of the wave
- **Peak** – The top of the wave
- **Frequency** – How many waves pass a fixed point per second, measured in Hertz (Hz)



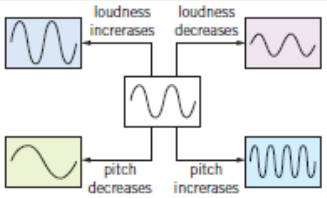
There are two main types of waves:

Transverse waves, e.g. light
- Travel at 90ºdirection of energy transfer
- Do not need a medium to travel through

Longitudinal waves, e.g. sound
- Travel in the direction of energy transfer
- Need a medium to travel through

Sound waves

- Sound waves are caused by the vibration of particles, sound travels quicker in a solid than a gas as the particles are closer together
- **Oscilloscopes** display sound waves on a screen
- Humans can hear between 20–20000 **hertz** (Hz), but other animals have different ranges of hearing
- Sound waves above 20000Hz are known as **ultrasound**, thesesound waves are too high pitched for humans to hear



Hearing

- The **pinna** directs sound along the **auditory canal** to the **eardrum** which will vibrate
- The vibration from the ear drum moves onto the ossicles which amplifies the sound
- This passes the sound to the cochlea where tiny hairs detect the vibrations and passes this along to the **auditory nerve** as electrical signals for our brain

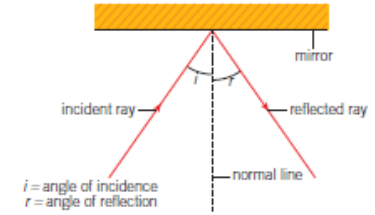
Colour

- Light can be split using a prism and is made up from different colours of light
- **Primary colours** can be mixed in order to form **secondary colours**

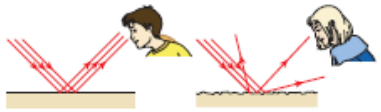
- Objects appear a certain colour as they absorb all other colours of light, but reflect the colour of light which they appear.

Reflection

- The **law of reflection** states that the **angle of incidence** will be equal to the **angle of reflection**

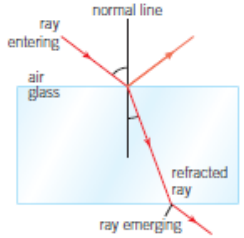


- For light reflecting off a smooth surface will form an image is called **specular reflection**
- Reflection off of a rough surface will not form an image and is know as **diffuse scattering**



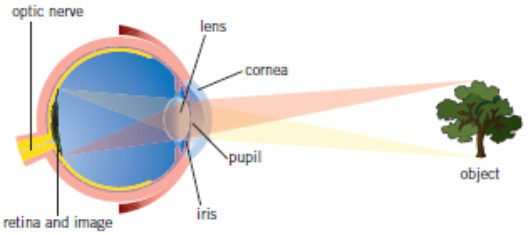
Refraction

- **Refraction** occurs when a wave passes between two different substances
- This happens as the wave will travel at different speeds in the different materials
- When the wave passes into a more dense material from a less dense material it will bend towards the **normal**, e.g. air into glass
- When the wave passes into a less dense material from a more dense material it bends away from the normal e.g. glass to air



Light and the eye

- Light entering your eye is refracted by the **lens**, focusing it on the retina and creating an inverted image
- **Photoreceptors** detect the light hitting your retina and send an electrical impulse to your brain
- If the light is not focussed on the retina or the eye, people cannot see properly



- Long sighted people have the light focus behind the eye, short sighted people have the light focus in front of the retina.
- Lenses can be used to refract the light in a way in which it will focus on the retina.

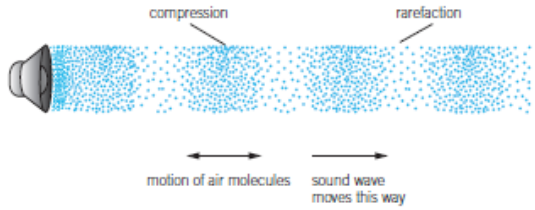
Key terms Make sure you can write definitions for these key terms.

amplitude · angle of incidence · angle of reflection · auditory canal · auditory nerve · diffuse scattering · eardrum · frequency · hertz · law of reflection · lens · longitudinal · normal · oscillation · oscilloscope · peak · photoreceptors · primary colour · refraction · secondary colour · specular reflection · transverse · trough · ultrasound · wave · wavelength

Physics: Waves, Light and Sound

Sound waves

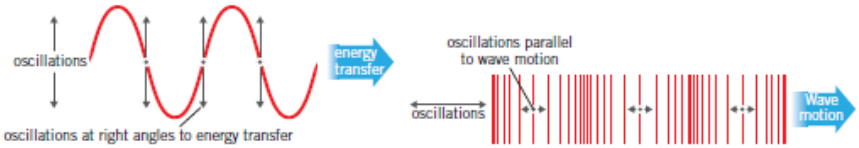
- Any **wave** transfers energy from one place to another
- Sound waves cause particles to vibrate backwards and forwards in the direction of the wave, this produces areas of high pressure (**compression**) and low pressure (**rarefaction**)
- As there are areas where the air pressure is different in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



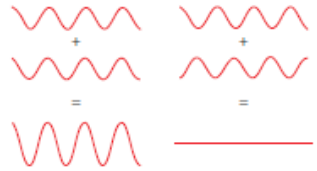
- Sound can be detected with a **microphone**, the microphone will change air pressure into a changing potential difference
- Sound can be produced with a **loudspeaker**, the changing potential difference causes changes in air pressure
- Changes in air pressure will be caused by the diaphragm of the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



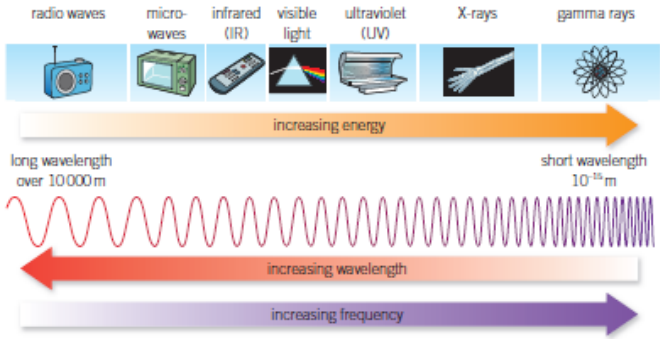
- When waves are put together they **superpose**, this means they will either add together or cancel each other out
- When the waves are in line with one another they add together, increasing the amplitude of the wave
- When the waves are not in line, they will cancel each other out, decreasing the amplitude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



Ultrasound

- Humans can hear sounds with a frequency between 20–20 000 Hz.
- **ultrasound** is any sound with a frequency of higher than 20 000 Hz
- 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

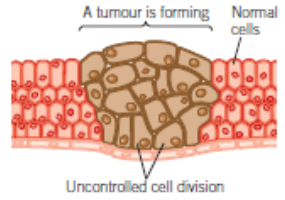


Uses of the electromagnetic spectrum

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*

Physics: Energy

Energy

- **Energy** is needed to make things happen
- It is measured in **joules** or **kilojoules**

- The **law of conservation of energy** says that energy cannot be created or destroyed, only transferred
- This means that the total energy before a change if always equal to the total energy after a change

Energy can be in different energy **stores**, including:

- **Chemical** – to do with food, fuels and batteries
- **Thermal** – to do with hot objects
- **Kinetic** – to do with moving objects
- **Gravitational potential** – to do with the position in a gravitational field
- **Elastic potential** – to do with changing shape, squashing and stretching

Food and energy

- Food has energy in a chemical energy store
- Different foods contain different amounts of energy
- Different activities require different amounts of energy
- Different people need different amounts of energy depending on what they do each day

Power and energy

- **Power** is a measure of how much energy is transferred per second
- Power is measured in **watts** (W)
- Each appliance has it's own power rating to tell us how quickly it uses energy
- We can calculate power with the equation:

$$\text{power (W)} = \frac{\text{energy (J)}}{\text{time (s)}}$$

Non-renewable energy

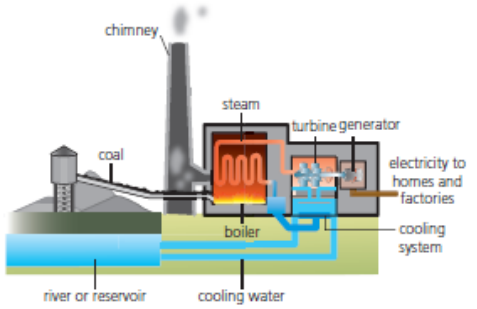
- **Non-renewable** energy cannot be replaced within your lifetime
- Non-renewable **energy resources** include coal, oil, natural gas and nuclear resources
- Coal, oil and natural gas are also known as **fossil fuels**, they release carbon dioxide when burned which contributes to global warming

Renewable energy

- **Renewable** energy can be replaced within your lifetime
- Renewable energy resources include wind, tidal, wave, biomass, solar, hydroelectric and geothermal
- Renewable energy resources do not produce much carbon dioxide, meaning that they have a smaller effect on global warming

Power stations

Thermal power stations burn coal, oil and natural gas, which are all non-renewable energy resources



Fuel is burned underneath water → Water is heated and turns into steam → The steam turns a turbine which turns a generator → Electricity is generated

Dissipation of energy

- We say that energy is **dissipated** when it is transferred to a nonuseful store, it cannot be used for what it was intended for
- Energy can be wasted through friction, heating up components or heating the surroundings
- **Efficiency** is a measure of how much of the energy has been used in a useful way, we can calculate this with the equation:

$$\text{efficiency (\%)} = \frac{\text{useful energy output}}{\text{energy input}} \times 100$$

Key terms Make sure you can write definitions for these key terms.

chemical · dissipated · efficiency · elastic potential · energy · energy resources · fossil fuels · gravitational potential · joules · kinetic · kilojoules · law of conservation of energy · non-renewable · power · renewable · thermal · watts

Biology: Variation, Inheritance and Evolution

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

Organisms show variation in characteristics caused by their genes → Organisms with the best adaptations survive and reproduce, weaker organisms die out and do not pass on their genes → Genes from the successful organisms are passed onto the next generation, passing on their successful characteristics → Over a long period of time the best adaptations continue to be passed on which can lead to a new species being formed

- 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

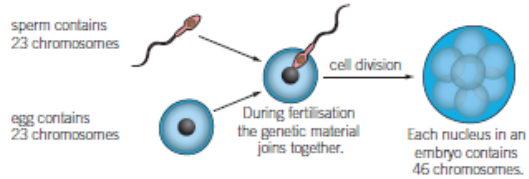
Possible alleles from mother	B (dominant allele for browneyes)	b (recessive allele for blue eyes)
b (recessive allele for blue eyes)	**Bb** Offspring will have brown eyes as B is dominant	**bb** Offspring will have blue eyes as both alleles are recessive
b (recessive allele for blue eyes)	**Bb** Offspring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

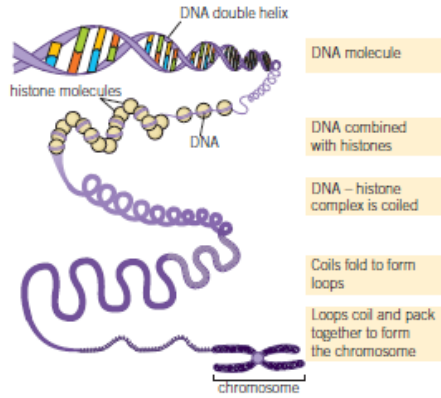
Inheritance

- **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



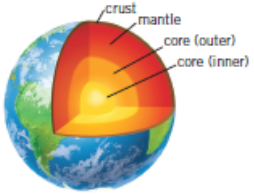
Genetics

- 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

The Earth



The Earth has three main layers:

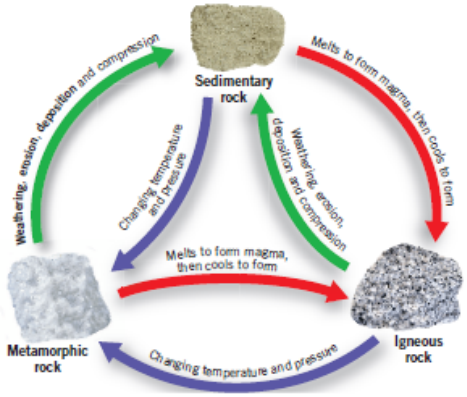
- The **crust** is rocky and solid
- The **mantle** is made from mainly solid rock but this can flow
- The **outer core** is liquid metal and the **inner core** is solid

Types of rock

Type of rock	How it is formed	Properties	Uses
sedimentary rock	• sediment piles up in one place and, over many years, sticks together by compaction or cementation • **compaction:** weight of sediments above squeeze them into rocks • **cementation:** another substance sticks the sediments together	• **porous:** made of small grains stuck together so there are holes that water can pass through • soft: easy to break apart the sediments	building materials (e.g. *sandstone* and *limestone*)
igneous rock	• when liquid rock cools it turns into igneous rocks these are made of crystals locked tightly together • **magma:** liquid rock underground cools slowly and forms large crystal • **lava:** liquid rock above the ground cools quickly and forms small crystals	• **durable** and hard (difficult to damage): the crystals are locked tightly together • not porous: there is no space between crystals	pavement rail tracks
metamorphic rock	• other rocks under that Earth are heated and put under pressure • over time, these rocks become metamorphic	• not porous: there is no space between crystals	marble used for kitchens slate used for roofing tiles

The rock cycle

The **rock cycle** shows how rocks change and how their materials are recycled over millions of years

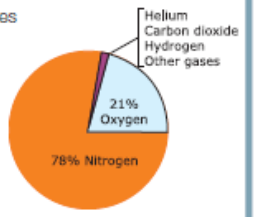


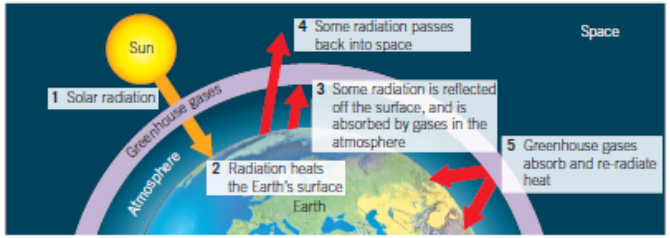
Key terms Make sure you can write definitions for these key terms.

asteroid belt, artificial satellite, axis, crust, deposition, durable, dwarf planet, galaxy, gas giants, igneous rock, lava, inner core, magma, mantle, metamorphic rock, milky way, natural satellite, outer core, orbit, phases of the moon, planet, porous, rock cycle, season, sediment, sedimentary rock, solar system, star, sun, universe, year

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



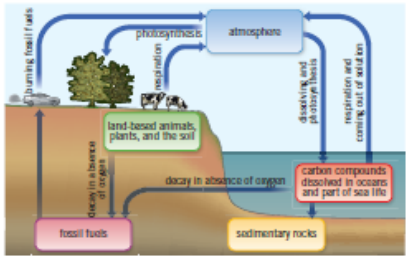


Global warming

- **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:

  carbon + metal oxide → metal + carbon dioxide

  carbon + copper oxide → copper + 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
• Resources will last longer • It uses less energy than extracting new materials • It reduces waste and pollution	• Separating rubbish can be seen as a nuisance • The lorries collecting recycling produce pollution • Some materials are easier to recycle than others

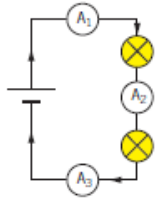
Key terms Make sure you can write definitions for these key terms.

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

Physics: Electricity and Magnetism

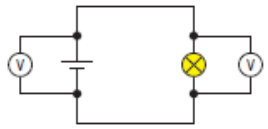
Current

- **Current** is the amount of **charge** flowing per second
- The charges that flow in a circuit are **electrons**, they are negatively charged
- **Electrons** leave the negative end of the **cell** and travel around the circuit to the positive end of the cell
- Current has the unit of Amps (A) and is measured with an **ammeter** (which is placed in series or in the main circuit)



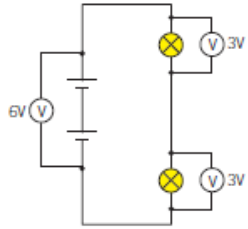
Potential difference

- **Potential difference** is the amount of energy transferred by the cell or **battery** to the charges
- The value of potential difference tells us about the force applied to each charge and then the energy transferred by each charge to the component which it passes through
- Potential difference has the unit of volts (V) and is measured with a **voltmeter** (which is placed in parallel to the circuit)



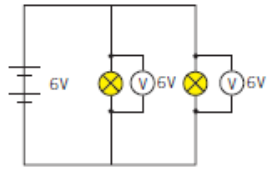
Series circuits

- **Series** circuits only have one loop
- If one component breaks, the whole circuit stops working
- Current is the same everywhere in a series circuit
- The total potential difference from the battery is shared between the components in a series circuit
- Adding more bulbs decreases the brightness of the bulbs



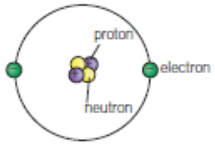
Parallel circuits

- **Parallel** circuits have more than one loop
- If one component breaks, the rest of the circuit will still work
- Current is shared between the different loops in the circuit
- The potential difference is the same everywhere in the circuit
- Adding more bulbs does not affect the brightness of the bulbs



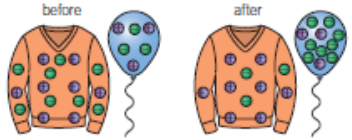
The atom

- The **atom** consists of a central nucleus with electrons orbiting around the outside in shells
- **Electrons** have a negative charged
- **Protons** are inside the nucleus and have a positive charge
- **Neutrons** are inside the nucleus and have a neutral charge



Static electricity

- Static electricity is the caused by the rubbing together of two **insulators**
- This causes electrons to be transferred, leaving one object with a positive charge, and one object with a negative charge



- Like charges will **repel**, opposite charges will **attract**

Resistance

- **Resistance** is a measure of how easy or how hard it is for charges to pass through a component in a circuit
- Resistance has the unit of ohms (Ω)
- Resistance is calculate by measuring potential difference and current and using the following equation:

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

- Materials with a high resistance are said to be **insulators**
- Materials with a low resistance are said to be **conductors**

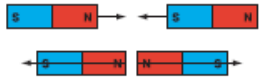
Key terms Make sure you can write definitions for these key terms.

ammeter atom attract battery cell conductors current electrons electric charge insulator neutral neutrons parallel potential difference protons repel resistance series voltmeter

Physics: Electricity and Magnetism

Magnets

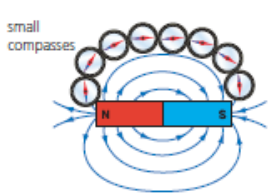
- A **magnet** has two poles, a north and a south pole
  - North poles **attract** south poles
  - South poles **attract** north poles
  - South poles **repel** south poles
  - North poles **repel** north poles



- **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

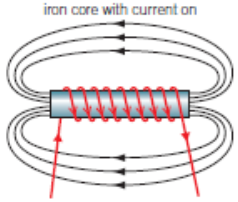
- A **magnetic field** is an area where a magnetic material will experience a force
- A **permanent magnet** will have it's own magnetic field
- **Magnetic field lines** represent the field, these always travel out of the north pole of the magnet, and into the south pole
- The closer together the magnetic 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

↓

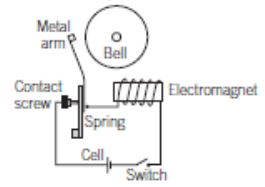
The coil and core are no longer magnetic meaning the spring is no longer attracted and returns to its original position

↓

The bell is rung once

↓

The circuit is complete again, restarting the process

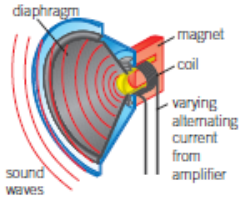


Circuit breakers

- 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