Key Stage 3 – Year 7 Knowledge Organiser - Science

Term 1

Chemical Changes
C1.3 & C2.3

Cell Biology
B1.1

Particle Model of Matter
C1.1

Space
P1.4

Term 2

Chemical Analysis
C.2.2

Atomic Structure & The Periodic Table
C2.1

Organisation
B1.2

Waves
P1.2

Term 3

Magnetism
P2.1

Ecology
B2.2

Forces
P1.1 & P2.3

Key Stage 3 – Year 8 Knowledge Organiser - Science

Term 1

Energy
P2.2

Chemical Changes
C1.4
Homeostasis and Response
B1.3

Chemistry of the Atmosphere
C2.4

Electricity
P2.1

Term 2

Infection and Response
Numeracy Skills

Quantitative Chemistry
Numeracy Skills

Bioenergetics
B2.2

Rate of Reaction
Numeracy Skills

Waves
P1.3

Term 3

Inheritance, Variation and Evolution
B2.3

Using Resources
C2.3

Forces
P1.1 & P2.3

Key Stage 3 – Year 9 Knowledge Organiser - Science

Term 1

B1.1
C1.2
C1.3
C2.1
C2.2
P2.2

Term 2

B1.1
C1.4
C1.1
B2.1
B2.2
P2.3

Term 3

P2.2
B1.2
B2.1
C2.4
P1.3
B2.2

Key points to learn

Cells	Are the building blocks of life and are the smallest units in an organism
Microscopes	Are used to observe small objects in detail
Animal cells	Have an irregular shape and contain a nucleus, cytoplasm, cell membrane and mitochondria
Plants cells	Contain a nucleus, cytoplasm, cell membrane, mitochondria AND chloroplasts, a vacuole and a cell wall
Cytoplasm	Where chemical reactions take place in a cell
Cell membrane	A barrier that controls what moves in and out of a cell
Nucleus	Controls the cell and contains the genetic material needed to make new cells
Mitochondria	Where respiration takes place in the cell
Respiration	A chemical reaction in a cell where energy is transferred
Cell wall	Strengthens the cell and provides support
Vacuole	Contains a watery liquid called cell sap. It keeps the cell firm
Chloroplasts	Where photosynthesis takes place in a plant cell
Specialised cells	Cells that have changed their shape and structure so that they are suited to carry out a particular job
Examples of specialised cells	Nerve cells, blood cells, sperm cells, leaf cells and root hair cells
Diffusion	The movement of particles from a high-concentration area to a low-concentration area. For example, water and oxygen diffuse into cells
Unicellular organism	Contains only one cell
Amoeba	A unicellular organism consisting of a cell membrane, cytoplasm and a nucleus.
Euglenas	A unicellular organism found in fresh water. They appear green as they contain chloroplasts. Their eye spot locates light and they use their flagellum to swim towards it. In low light levels, they can engulf food.

KS3: B1.1 Cells Knowledge Organiser

Big Picture

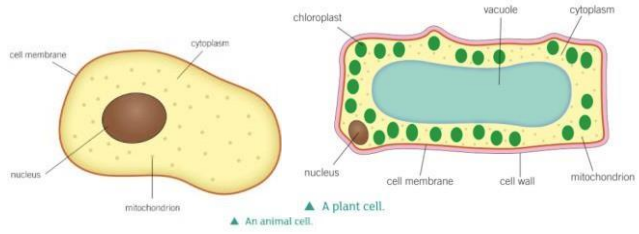
Biology

- 1.1 Cells
- 1.2 Structure and function of body systems
- 1.3 Reproduction
- 2.1 Health & lifestyle
- 2.2 Ecosystem processes
- 2.3 Adaptation and inheritance

Fantastic fact!

Cells are so small that about 100 animal cells would fit across the width of this tiny full stop.

Additional Information



▲ An animal cell. ▲ A plant cell.

Key points to learn

Multicellular organisms	Are made of many cells and are organised into the five levels: cells → tissues → organs → organ systems → organisms
Respiratory system	The gas exchange system in an organism
Gas exchange	Where oxygen is taken in and carbon dioxide given out; it takes place inside the lungs
Oxygen route through the body	Enters the body through the mouth and nose, travels down the windpipe through a bronchus, then a bronchiole and then into an alveolus where it diffuses into the blood
Exhaled air vs inhaled air	Exhaled air is warmer, contains more carbon dioxide and water vapour but less oxygen
Inhalation process	Muscles between your ribs and diaphragm contract. This increases the volume inside your chest. The pressure decreases and air is drawn into the lungs.

Key points to learn

Exhalation process	Muscles between your ribs and diaphragm relax. This decreases the volume inside your chest. The pressure increases and air is forced out of the lungs.
Skeleton	Is made up of bones and has four important functions – support the body, protect the organs, allow movement, and make blood.
Blood cells	Red and white blood cells are produced in bone marrow found in the centre of some bones
Joints	Occur where two or more bones join together
Cartilage	Found in joints and stop bones rubbing together
Ligaments	Hold bones together
Tendons	Attach muscles to bones
Antagonistic muscles	Pairs of muscles that work together at a joint. When one muscle contracts, the other muscle relaxes

KS3: B1.2 Body Systems Knowledge Organiser

Big picture

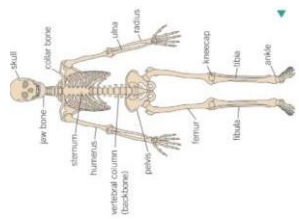
Biology

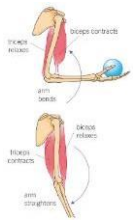
- 1.1 Cells
- 1.2 Structure and function of body systems
- 1.3 Reproduction
- 2.1 Health & lifestyle
- 2.2 Ecosystem processes
- 2.3 Adaptation and inheritance

Fantastic facts!

Your skin is the largest organ. It covers your entire body and has a surface area of about $2m^2$.
The skin on the bottom of your feet is the thickest.
The thinnest skin is found on your eyelids.
Around 2.5 million red blood cells are produced each second by bone marrow.

Additional Information





Key points to learn

Adolescence	The time when you change from a child to an adult
Puberty	The physical change the body goes through adolescence. It is caused by sex hormones which are chemical messengers that travel through the body in the blood.
Changes to both boys and girls during puberty	Both boys and girls have a growth spurt, and grow pubic and underarm hair
Changes to only boys during puberty	Boys voices break, the testes and penis get bigger, the testes start to produce sperm, shoulders widen and hair grows on the face and chest
Changes to only girls during puberty	Girls develop breasts, the ovaries release egg cells, and the hips widen. The menstruation cycle starts and monthly periods begin where the lining of the uterus breaks down.
Gametes	Gametes are reproductive cells that join together to create a new organism
Fertilisation in animals	Occurs when the nucleus of a sperm joins with the nucleus of an egg
Embryo	The fertilised egg divides several times to form a ball of cells called an embryo.
Implantation	The embryo attaches to the lining of the uterus and begins to develop into a baby. This is called implantation.

Key points to learn

Placenta	An organ through which the fetus receives nutrients and oxygen pass from the mother
Umbilical cord	This connects the fetus to the placenta
Contraception	Steps taken to avoid pregnancy are known as contraception. The two most common forms are the condom and the contraceptive pill.
Stamen	The stamen is the male reproductive part of a flower. It consists of the anther that produces pollen (the male gamete) and the filament that holds up the anther
Carpel	The carpel is the female reproductive part of a flower. It consists of the stigma which is sticky to 'catch' grains of pollen, style to hold up the stigma and the ovary that contains ovules, the female gamete.
Pollination	Occurs when pollen from the anther is transferred to the stigma
Fertilisation in plants	Occurs when the nucleus of a pollen grain joins with the nucleus of an ovule. The ovary becomes a fruit and ovules turn into seeds.
Seed dispersal	Seeds are dispersed either by wind, water, animals or explosion
Germination	When a seed starts to grow. To germinate a seed requires warmth, oxygen and water.

KS3: B1.3 Reproduction Knowledge Organiser

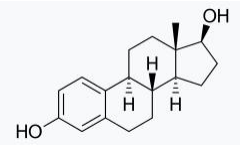
Big picture

Biology

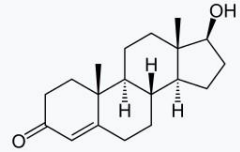
- 1.1 Cells
- 1.2 Structure and function of body systems
- **1.3 Reproduction**
- 2.1 Health & lifestyle
- 2.2 Ecosystem processes
- 2.3 Adaptation and inheritance

Additional Information

This is the chemical structure of the female sex hormone; oestrogen.



This is the chemical structure of the male sex hormone: testosterone.



Look how similar they are!

Key points to learn

Particle model	Materials are all made up of tiny particles
Substance	Is made up of just one type of material
Properties of a substance	Describes what it looks like and how it behaves; depend on what its particles are like and how they are arranged
States of matter	There are three states of matter – solid, liquid and gas. For a certain substance, the particles never change. But in different states, the particles move differently and have different arrangements
Solid state	In the solid state you cannot compress a substance or make it flow
Liquid state	In the liquid state you cannot compress a substance but you can make it flow
Gas state	In the gas state you can compress a substance and make it flow
Melting	The change in state from solid to liquid

Key points to learn

Melting point	The temperature at which a substance melts
Boiling	The change in state from liquid to gas
Boiling point	The temperature at which a substance boils
Condensing	The change in state from gas to liquid
Freezing	The change in state from liquid to solid
Subliming	Some substances change directly from solid state to gas state. This is subliming.
Evaporation	In a liquid some particles have more energy than others and can leave the liquid surface, spread out and mix with air particles. This is evaporation.
Diffusion	Is the random moving and mixing of particles
Gas pressure	Gas particles collide with walls of their container. The collisions cause gas pressure.

KS3: C1.1 Particles Knowledge Organiser

Big picture

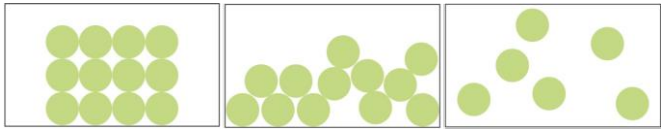
Chemistry

- **1.1 Particles and their behaviour**
- 1.2 Elements, atoms and compounds
- 1.3 Reactions
- 1.4 Acids and alkalis
- 2.1 The Periodic Table
- 2.2 Separation techniques
- 2.3 Metals and acids
- 2.4 The Earth

Fantastic fact!

If people were the same size as gold particles, the world's population would fit into a ball less than a thousandth of a millimetre across.

Additional Information



Solid Liquid Gas

Key points to learn

Materials	All materials are made up of one or more elements
Elements	Are substances that cannot be broken down. There are 92 elements that exist naturally.
Periodic Table	Lists all the elements
Chemical symbol	Every element has its own chemical symbol. For example, Hydrogen – H
Atom	Is the smallest part of an element that can exist
An Element	An element is made up of one type of atom. All the atoms of an element are the same but are different to the atoms of all other elements.
Properties of a substance	Are the properties of many atoms, not just a single atom
A Compound	Is a substance made up of atoms of two or more elements, strongly joined together
Properties of a compound	Are different to the properties of the elements that it is made from

Key points to learn

Molecule	Is made up of a group of two or more atoms that are strongly joined together
Chemical formulae	Shows the relative number of atoms of each element in a compound; for example, H_2SO_4 – 2 Hydrogen atoms, 1 Sulfur atom and 4 Oxygen atoms

KS3: C1.2 Elements, Atoms & Compounds
Knowledge Organiser

Big picture

Chemistry

- 1.1 Particles and their behaviour
- **1.2 Elements, atoms and compounds**
- 1.3 Reactions
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- 2.3 Metals and acids
- 2.4 The Earth

Fantastic fact!

You are made up of elements. A 50 kg person is 32.5 kg oxygen, 9 kg Carbon, 5 kg Hydrogen, 0.5 kg phosphorus and 1.5 kg other elements.

Additional Information

An oxygen molecule consists of two oxygen atoms.

A hydrogen molecule consists of two hydrogen atoms.

A water molecule has one oxygen atom joined to two hydrogen atoms.

Key points to learn

Chemical reaction	A change in which atoms are rearranged to create new substances
Physical change	Are reversible and include changes of state and dissolving
Reactants	The starting substances in a chemical reaction
Products	The substances made in a chemical reaction
Conservation of mass	In a chemical reaction, the total mass of reactants is equal to the total mass of products
Word equations	Represent reactions simply, showing reactants on the left and products on the right. The arrow means *reacts to make*
Symbol equation	An equation where chemical formulae represent the reactants and products.
Balanced symbol equations	A symbol equation that shows how many atoms are re-arranged. It gives the relative amounts of reactant and products

Key points to learn

Energy transfer	Chemical reaction always transfer energy to or from the surroundings
Oxidation reaction	A chemical reaction where substances join with oxygen to form oxides. Examples include burning (also known as combustion) and rusting
Thermal decomposition	A chemical reaction where a compound breaks down when it is heated into simpler compounds and elements
Exothermic reaction	A chemical reaction where energy is transferred to the surroundings
Endothermic reaction	A chemical reaction where energy is transferred from the surroundings
Hazard	A possible source of danger
Risk	The chance of damage or injury from a hazard

KS3: C1.3 Reactions Knowledge Organiser

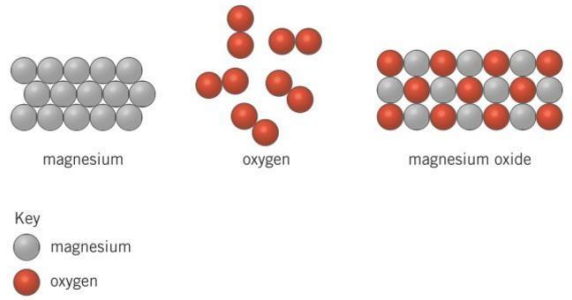
Big picture

- Chemistry
  - 1.1 Particles and their behaviour
  - 1.2 Elements, atoms and compounds
  - **1.3 Reactions**
  - 1.4 Acids and alkalis
  - 2.1 The Periodic Table
  - 2.2 Separation techniques
  - 2.3 Metals and acids
  - 2.4 The Earth

Foul fact!

In Cirencester, Gloucester, methane made from chicken poo burns in a power station to generate electricity.

Additional Information



Key points to learn

pH scale	A scale that shows how acidic or alkaline a solution is
Acids	Have pH's below 7 and the lower the pH the more acidic the solution
Alkalis	Have pH's above 7 and the higher the pH the more alkaline the solution
Neutral solutions	Are neither acidic or alkaline and have a pH of exactly 7
Concentrated vs dilute solutions	A concentrated solution has more particles per litre than a dilute solution
Indicator	A substance that changes colour to show whether a solution is acidic or alkaline
Universal indicator	An indicator that changes colour to show the pH of a solution
Litmus	An indicator. Blue litmus paper turns red on adding acid. Red litmus paper turns blue on adding alkali.
Neutralisation reaction	A chemical reaction where an acid cancels out a base, or a base cancels out an acid

Key points to learn

Base	A substance that neutralises an acid
Alkali	A soluble base
pH adjustment of crops	Adding bases or acids to soil can change its pH and make it suitable for different crops
pH adjustment of lakes	Adding a base to a lake increase the lake pH, making it suitable for different plants and animals
Neutralisation products	If an acid reacts with a base two products are formed; a salt and water
Salt	A salt is a compound that forms when an acid reacts with a metal element or compound
Metal + acid	If an acid reacts with a metal two products are formed; a salt and hydrogen
Salt names	Sulfuric acid makes sulfate salts, hydrochloric acid makes chloride salts and nitric acid makes nitrate salts

KS3: C1.4 Acids & Alkalis Knowledge Organiser

Big picture

Chemistry

- 1.1 Particles and their behaviour
- 1.2 Elements, atoms and compounds
- 1.3 Reactions
- **1.4 Acids and alkalis**
- 2.1 The Periodic Table
- 2.2 Separation techniques
- 2.3 Metals and acids
- 2.4 The Earth

Foul fact!

Murderer John Haig, also known as the Acid Bath Murderer, disposed of his victims in baths of concentrated sulfuric acid. The acid pH was between 0 and 1.

Additional Information

▲ Universal indicator turns orange in vinegar. It turns red in stomach acid.

Key points to learn

Forces	Are pushes or pulls
Newton meter	What you measure force with in newtons (N)
Interaction pair	Forces always exist as pairs and are produced when objects interact
Effect of forces	Forces can deform, compress or stretch objects or change their speed or direction of motion
Contact forces	Occur when objects are touching. Examples are friction, air resistance and water resistance
Friction	Can be reduced by lubrication
Drag forces	Water and air resistance are examples of drag forces. Drag forces can be used to slow down objects such as parachutes
Stream-lining	Air resistance and water resistance can be reduced by streamlining
Non-contact forces	Occur when objects are not touching. Examples are gravitational, electrostatic and magnetic forces

Key points to learn

Support surfaces	Solid surfaces provide a support force when objects are compressed
Springs and ropes	Extend when you apply a force
Hooke's Law	(For some objects) if you double the force the extension doubles
Field	A region where something feels a force, for example, a mass in a gravitational field
Mass	The amount of stuff an object is made up of, measured in kilograms
Weight	Is the force of the earth on an object
Balanced Forces	When forces acting on an object are equal in size and acting in opposite directions, they are balanced. The object is in equilibrium.
Unbalanced forces	If the forces acting on an object are not in balance, the object will speed up, slow down or change direction

KS3: P1.1 Forces Knowledge Organiser

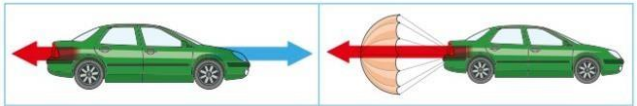
Content

Physics

Foul fact!

Astronauts on the International Space Station cannot burp. The gas and liquid does not separate in their stomachs while they are in orbit.

Additional Information



The driving force is bigger than the resistive forces acting on the car.	The only forces acting on the car are resistive forces.
The speed of the car increases.	The speed of the car decreases.

Key points to learn

Waves	Are oscillations or vibrations that have amplitude, wavelength and frequency. The top of a wave is a crest and the bottom is a trough.
Amplitude	The distance from the middle to the top or bottom of a wave
Wavelength	The distance from one point on a wave to the same point on the next wave
Frequency	The number of waves that go past a particular point per second, measured in Hertz (Hz)
Transverse wave	In a transverse wave the oscillation is at 90° to the wave direction
Longitudinal wave	In a longitudinal wave the oscillation is parallel to the wave direction
Reflection	Wave can reflect from barriers. The wave coming into the barrier is the incident wave. The wave bouncing of the barrier is the reflected wave.
Superpose	Waves when put together superpose meaning they add up or cancel out
Sound wave	Is produced by vibrating objects and is longitudinal. Sound needs a medium like a solid, liquid or gas to travel through.

Key points to learn

Speed of sound	Sound travels at 340 m/s. It travels fastest in solids and slowest in gases and cannot travel through a vacuum.
Loudness	The loudness of a sound depends upon its amplitude and is measured in decibels (dB)
Pitch	The pitch of a sound depends its frequency
Human's audible range	Is from 20-20000 Hz
Ear	Made up of three parts. The outer ear consists of the pinna, auditory canal and eardrum. The middle ear contains your ossicles. The inner ear contains your cochlea and semi-circular canals.
Hearing sound	Vibrations travel from your eardrum to the hairs in your cochlea. This produces a signal that is sent to the brain.
Echo	A reflection of sound that can use to work out distance. Soft materials absorb sound and don't produce echoes.
Ultrasound	Sound with a frequency of more than 20000 Hz. Used by humans to produce images of inside the body and to find the depth of water.

KS3: P1.2 Sound Knowledge Organiser

Content

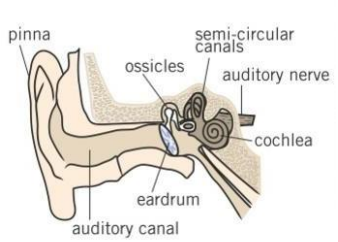
Physics

- 1.1 Forces
- **1.2 Sound**
- 1.3 Light
- 1.4 Space
- 2.1 Electricity and magnetism
- 2.2 Energy
- 2.3 Motion and pressure

Fantastic fact!

Grasshoppers make sounds that they cannot hear.

Additional Information



▲ Structure of the ear.

▲ Without these tiny hairs inside your cochlea you would not be able to hear.

Key points to learn

Light	Is emitted from luminous sources and can be transmitted through, reflected or absorbed by non-luminous objects
Transparent objects	Objects that light travels through
Translucent objects	Objects that light can travel through but the light is scattered so you cannot see through it
Opaque objects	Do not transmit light
Speed of light	Light travels through a vacuum at 300,000 km/s
Light-year	Is the distance light travels in one year. Light years are used to measure very large distances.
Virtual image	Where the image in the mirror appears to be behind the mirror
Law of reflection	States that the angle of incidence equals the angle of reflection
Normal	An imaginary line at 90° to the mirror
Specular reflection	Where light is reflected from a smooth surface; an image will be formed
Diffuse scattering	Where light is scattered when it reflects from a rough surface; an image is not formed
Medium	A substance that light travels through such as air, glass and water.
Refraction	Occurs when light slows down and the light ray is refracted towards the normal when light travels from one medium to another

Key points to learn

Focal point	The point where light rays cross after passing through a lens
Lens	Can focus light to a focal point
Pupil	The part of the eye where through which light enters
Cornea	The transparent outer part of your eye
Retina	The part of the eye where the image is formed
Iris	The muscle that controls the size of the pupil
Photoreceptor	Where a chemical reaction produces an electrical signal that travels up the optic nerve to the brain
Digital camera	Store images produced when light hits a pixels in a charge-coupled device (CCD)
Prism	A transparent object that disperses light and can be used to split white light into a continuous coloured spectrum
Primary colours of light	Red, green and blue. They can be used to produce the secondary colours, cyan, magenta and yellow. You get white light if you mix all three primary colours.
Filters	Subtract colours from white light by transmitting or reflecting the colour that they are and absorbing the rest

KS3: P1.3 Light Knowledge Organiser

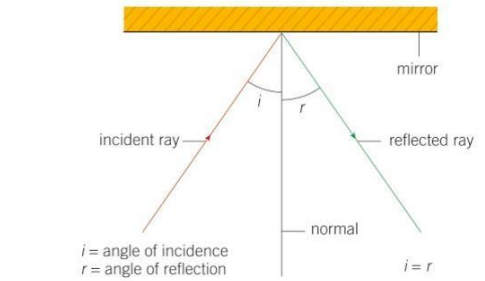
Content

Physics

Fantastic fact!

If light from the Sun only travelled at 100 mph it would take 100 000 years to reach Earth.

Additional Information



▲ Light is reflected at equal angles.

Key points to learn

Observable objects in the night sky	We can see satellites, the International Space Station, the Moon, comets, meteors, planets, stars and galaxies
Comets	Huge snowballs that orbit the Sun
Meteors	Bits of dust or rock that burn up as they move through the Earth's atmosphere
Light-time	Used to measure the distance to objects in the night sky
Light year	The distance travelled by light in one year
Natural objects in the night sky	Natural objects in the night sky are made of gas, dust, rock and ice
The Universe	Consists of millions of galaxies. Each galaxy contains billions of stars. Each star may have planets, asteroids and comets in orbit around them. Each planet may have moons in orbit around them.
Solar system	Is made up of four rocky inner planets (Mercury, Venus, Earth and Mars), an asteroid belt and four outer planets made of gas (Jupiter, Saturn, Uranus and Neptune)

Key points to learn

Planet temperatures	The further a planet is from the Sun the colder it is. Venus though is hotter than Mercury because mercury does not have an atmosphere to trap energy.
Day & Night	The earth spins on its axis once a day. This is why we have day and night and why the Sun and stars appear to move across the sky
An Earth year	The Earth orbits the Sun in one year. The axis of the Earth is tilted and this explains the height of the Sun at noon, day length, temperature and constellations that you see change during the year.
Phases of the Moon	You see phases of the Moon because the Moon is orbiting the Earth and half the Moon is always lit by the Sun
Solar eclipse	Happens when the Moon is between the Sun and the Earth
Lunar eclipse	Happens when the Earth is between the Sun and the Moon.

KS3: P1.4 Space Knowledge Organiser

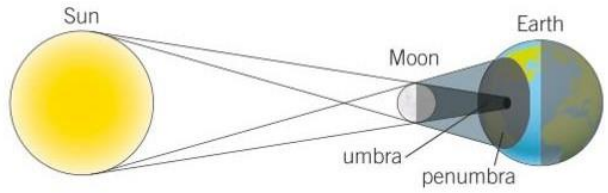
Content

Physics

Fantastic facts!

Venus spins in the opposite direction to all other planets in the Solar System.
The odds of being killed by falling space debris are one in five billion.

Additional Information



A solar eclipse happens when the Moon blocks the light from the Sun.

Key points to learn

Nutrients	Essential substances that your body needs to survive. They are carbohydrates, lipids, proteins, vitamins, minerals, water and fibre
Food tests	Used to find out which nutrients a food contains
Balanced diet	To remain healthy you need to eat a balanced diet. This means eating foods containing the right nutrients in the correct amounts
Underweight people	People underweight lack energy or may suffer from vitamin or mineral deficiency which can cause problems like a poor immune system
Overweight people	Have a risk of heart disease, stroke, diabetes and some cancers
Vitamin and mineral deficiency	If a person does not have enough of a certain vitamin or mineral they are said to have a deficiency. This can damage a person's health.
Digestive system	Is a group of organs that work together to break down food. It consists of the mouth, stomach, small intestine, large intestine and rectum.
Digestion	Where large molecules like lipids and proteins are broken down into small molecules. They can then pass into the blood where they are used by the body

Key points to learn

Enzymes	Proteins that can break large molecules into small molecules. They are biological catalysts – they speed up digestion without being used up. The three main types are carbohydrase (breaks down carbohydrate), protease (breaks down proteins) and lipase (breaks down lipids).
Drugs	Substances that alter the chemical reactions that take place inside your body. Medicinal drugs have health benefits. Recreational drugs are taken for enjoyment.
Drug addiction	If a person becomes dependent on a drug they have an addiction. A person suffering from an addiction to drugs stops taking them they can suffer withdrawal symptoms.
Alcohol	Alcoholic drinks contain the drug ethanol. This is a depressant which slows down the nervous system. Drinking large amounts of alcohol over a long period of time can cause stomach ulcers, heart disease and brain and liver damage
Smoking	Smoking tobacco cause breathing problems, cancer, heart attacks and strokes. Tobacco smoke contains nicotine. This is a stimulant which speeds up the nervous system. It is also addictive

KS3: B2.1 Health & Lifestyle Knowledge Organiser

Big Picture

Biology

- 1.1 Cells
- 1.2 Structure and function of body systems
- 1.3 Reproduction
- **2.1 Health & lifestyle**
- 2.2 Ecosystem processes
- 2.3 Adaptation and inheritance

Foul fact!

If you eat a lot of beetroots your urine turns pink. Easting a lot of asparagus turns your urine bright yellow!

Additional Information

Enzymes are known as biological **catalysts** – they speed up digestion without being used up.

Key points to learn

Producers	Plants and algae are producers; they make their own food by photosynthesis
Photosynthesis	Plants make food through a process of photosynthesis. This is a chemical reaction: Carbon dioxide + water → glucose + oxygen
Chloroplasts	Photosynthesis takes place in chloroplasts. These contain chlorophyll, which traps the light needed for photosynthesis
Stomata	Allow gases to enter and leave a leaf. Guard cells open the stomata during the day and close them at night
Plant minerals	All plants need minerals for healthy growth. For example, nitrates are needed for to make amino acids. Amino acids join together to form proteins which are used for growth
Chemosynthesis	Some species of bacteria use a variety of chemical reactions to make glucose. This process is known as chemosynthesis.

Key points to learn

Aerobic respiration	Glucose + oxygen → carbon dioxide + water (+energy)
Mitochondria	To transfer energy from glucose aerobic respiration takes place inside mitochondria
Fermentation	A type of anaerobic respiration performed by microorganisms. It is used in bread making and beer making Glucose → ethanol + carbon dioxide (+energy)
Food chains	Show the transfer of energy between organisms
Food web	A set of linked food chains
Bioaccumulation	The build-up of toxic chemicals in organisms in a food chain until they reach harmful levels
Interdependence	Is the way in which organisms depend upon each other to survive, grow and reproduce

KS3: B2.2 Ecosystem Processes Knowledge Organiser

Big Picture

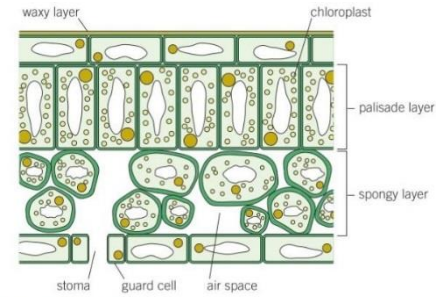
Biology

- 1.1 Cells
- 1.2 Structure and function of body systems
- 1.3 Reproduction
- 2.1 Health & lifestyle
- **2.2 Ecosystem processes**
- 2.3 Adaptation and inheritance

Fantastic fact!

Leaves come in all shapes and sizes but most are green because they contain lots of chlorophyll.

Additional Information



Cross section of a leaf.

Key points to learn

Animal competition	Animals compete for food, water, mates and space
Plant competition	Plants complete for light, water, space and minerals
Adaptations	Are characteristics that help an organism to survive and reproduce
Predator and prey	Predator and prey species are interdependent – a change in the population of one animal directly affects the population of the other
Variation	Differences in characteristics within a species are known as variation. There are two types; inherited and environmental. Many characteristics are affected by both.
Inherited variation	Inherited variation comes from characteristics inherited from your parents.
Environmental variation	Variation caused by your surroundings is called environmental variation.
Discontinuous variation	Characteristics that can only have certain values show discontinuous variation. Eye colour is an example.
Continuous variation	Characteristics that can have any values within a range show continuous variation. Height of a person is an example.

Key points to learn

DNA (Deoxyribonucleic acid)	DNA is arranged in long strands called chromosomes. Each chromosome is divided into sections of DNA. The sections of DNA that contain the information to produce a characteristic are called genes.
Inherited characteristics	You inherit characteristics from your parents in your DNA
DNA structure	Watson, Crick, Franklin and Wilson worked together to produce a model of the structure of DNA
Evolution	All living organisms have evolved from a common ancestor through the process of natural selection where organisms slowly over time show variation and become better adapted to their environment. Fossils provide evidence for evolution.
Extinction	If a species is not adapted to its environment, it will not survive and eventually will become extinct
Gene banks	To help prevent the extinction of organisms we have set up gene banks to store genetic material of organisms

KS3: B2.3 Adaptation & Inheritance Knowledge Organiser

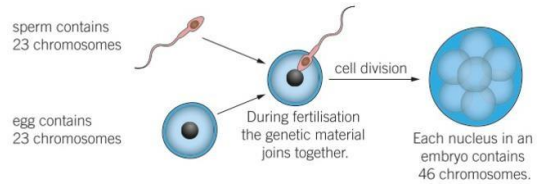
Big Picture

- Biology
  - 1.1 Cells
  - 1.2 Structure and function of body systems
  - 1.3 Reproduction
  - 2.1 Health & lifestyle
  - 2.2 Ecosystem processes
  - **2.3 Adaptation and inheritance**

Fantastic fact!

More proof for evolution comes from your DNA. You share about 97% of your DNA with a gorilla and 50% with a banana!

Additional Information



▲ You get half of your genetic material from your mother, and half from your father.

Key points to learn

Metals & Non-metals	In the Periodic Table metals are on the left of the stepped line and non-metals are on the right
Properties of metals	Most metals have high melting points. They are good conductors of heat and electricity. They are shiny and have high densities. They are malleable, ductile and sonorous.
Properties of non-metals	Most non-metals have low melting points. They are poor conductors of heat and electricity. In the solid state they are dull and brittle.
Metalloids	The elements near the stepped line are metalloids. Their properties are between those of metals and non-metals.
Metal Oxides	Are basic. Those that dissolve in water form alkaline solutions. Non-metal oxides are acidic.
Physical properties	Describe things that you can observe and measure
Chemical properties	Describe how substances take part in chemical reactions
Periodic table and properties	You can use the arrangement of elements in the Periodic Table to explain and predict patterns in physical and chemical properties

Key points to learn

Periods	In the Periodic Table the horizontal rows are called Periods
Groups	In the Periodic Table the vertical columns are called Groups
Patterns in properties	Going across periods and down groups there are patterns in the elements' properties
Group 1 elements	Have low melting and boiling points and low densities. They are reactive.
Group 1 elements + water	Group 1 elements react vigorously with water to make hydroxides and hydrogen. The reactions get more vigorous from top to bottom of the group
Group 7 elements	Going down Group 7, melting and boiling points increase. The colours get darker. They are reactive
Displacement reactions	In a displacement reaction a more reactive element displaces a less reactive element from its compounds
Group 0	Group 0 elements are called noble gases. They are unreactive

KS3: C2.1 The Periodic Table Knowledge Organiser

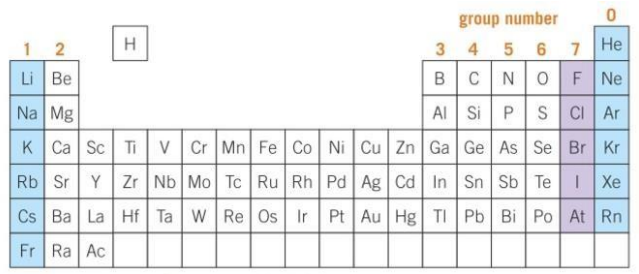
Big picture

- Chemistry
  - 1.1 Particles and their behaviour
  - 1.2 Elements, atoms and compounds
  - 1.3 Reactions
  - 1.4 Acids and alkalis
  - **2.1 The Periodic Table**
  - 2.2 Separation techniques
  - 2.3 Metals and acids
  - 2.4 The Earth

Fantastic fact!

The Periodic Table has this name because there is a repeating pattern of properties, like the repeating pattern of menstrual periods.

Additional Information



▲ Some groups of the Periodic Table.

Key points to learn

Mixture	A mixture is made up of substances that are not chemically joined together
Properties of mixtures	In a mixture, the substances keep their own properties. You can change the amounts of the substances
Pure substances	Pure substances have sharp melting points
Impure substances	Impure substances do not have sharp meting points
Solution	A solution is a mixture of a liquid with a solid or gas. All parts of the solution are the same. You cannot see the separate substances
Solute	The substance that dissolves in a solution is called the solute
Solvent	The liquid in which the solute dissolves is called the solvent. Solvents include water, propanone and ethanol.
Dissolving	When a substance dissolves, solvent particles surround the solute particles
Saturated solution	Is a solution in which no more solute can dissolve.

Key points to learn

Solubility	The solubility of a substance is the mass that dissolves in 100g of water. Every substance has its own solubility. Solubility of a substance varies with temperature
Insoluble	Substances that cannot dissolve in a certain solvent are insoluble in that solvent
Filtration	Separates a liquid from an insoluble solid. It also separates a solution from a solid that is mixed with it, but not dissolved.
Evaporation	You can separate a solute from its solution by evaporation
Distillation	You can separate a solvent from its solution by distillation
Chromatography	You can separate substances in a mixture by chromatography if all the substances are soluble in the same solvent
Insoluble	Substances that cannot dissolve in a certain solvent are insoluble in that solvent

KS3: C2.2 Separation Techniques
Knowledge Organiser

Big picture

Chemistry

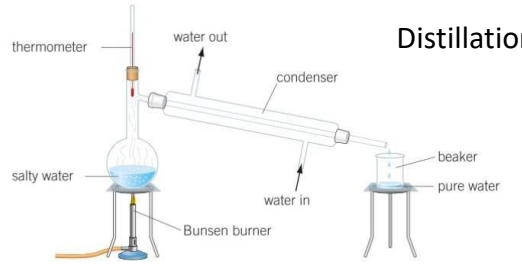
- 1.1 Particles and their behaviour
- 1.2 Elements, atoms and compounds
- 1.3 Reactions
- 1.4 Acids and alkalis
- 2.1 The Periodic Table
- **2.2 Separation techniques**
- 2.3 Metals and acids
- 2.4 The Earth

Fantastic fact

One of the most soluble salts is potassium nitrite. You can dissolve 306 g of this salt in 100 g of water at 20 °C.

Additional Information

Distillation



Key points to learn

<table>
<tr><td>Reactivity series</td><td>The reactivity series lists metals in order of how vigorously they react. The most reactive metals are at the top.</td></tr>
<tr><td>Reaction of metals with dilute acid</td><td>
<table>
<tr><td>Potassium</td><td rowspan="3">Explode. Products are metal salts and hydrogen.</td></tr>
<tr><td>Sodium</td></tr>
<tr><td>Lithium</td></tr>
<tr><td>Calcium</td><td rowspan="5">React, making bubbles. Products are metal salts and hydrogen.</td></tr>
<tr><td>Magnesium</td></tr>
<tr><td>Zinc</td></tr>
<tr><td>Iron</td></tr>
<tr><td>Lead</td></tr>
<tr><td>Copper</td><td rowspan="3">Do not react</td></tr>
<tr><td>Silver</td></tr>
<tr><td>Gold</td></tr>
</table>
</td></tr>
<tr><td>Reaction of metals on heating in air</td><td>
<table>
<tr><td>Potassium</td><td rowspan="6">Burn vigorously. Products are metal oxides.</td></tr>
<tr><td>Sodium</td></tr>
<tr><td>Lithium</td></tr>
<tr><td>Calcium</td></tr>
<tr><td>Magnesium</td></tr>
<tr><td>Zinc</td></tr>
<tr><td>Iron</td><td rowspan="2">Do not burn. Form oxide layer on surface.</td></tr>
<tr><td>Lead</td></tr>
<tr><td>Copper</td><td rowspan="2">Do not react</td></tr>
<tr><td>Silver</td></tr>
<tr><td>Gold</td></tr>
</table>
</td></tr>
<tr><td>Reaction of metals with water</td><td>
<table>
<tr><td>Potassium</td><td rowspan="3">React vigorously. Products are metal hydroxide solution and hydrogen.</td></tr>
<tr><td>Sodium</td></tr>
<tr><td>Lithium</td></tr>
<tr><td>Calcium</td><td rowspan="4">React with steam. Products are hydrogen and a metal oxide.</td></tr>
<tr><td>Magnesium</td></tr>
<tr><td>Zinc</td></tr>
<tr><td>Iron</td></tr>
<tr><td>Lead</td><td rowspan="3">Do not react</td></tr>
<tr><td>Copper</td></tr>
<tr><td>Silver</td></tr>
<tr><td>Gold</td></tr>
</table>
</td></tr>
</table>

Key points to learn

Displacement	More reactive metals displace less reactive metals from compounds
Extracting metals using carbon	Zinc and metals below it in the reactivity series are extracted by heating their oxides with carbon
Ceramics	Ceramic materials include pottery and brick. They are hard and brittle, with high melting points.
Polymers	Polymers have long molecules. There are hundreds of polymers. Each has unique properties that make it suitable for particular purposes.

KS3: C2.3 Metals & Acids Knowledge Organiser

Big picture

- Chemistry
  - 1.1 Particles and their behaviour
  - 1.2 Elements, atoms and compounds
  - 1.3 Reactions
  - 1.4 Acids and alkalis
  - 2.1 The Periodic Table
  - 2.2 Separation techniques
  - **2.3 Metals and acids**
  - 2.4 The Earth

Fantastic fact!

The ceramic hafnium carbide has the highest melting point of all known ceramics, at about 3900 °C.

Additional Information

▲ This is part of a molecule of a polymer called poly(ethene). One molecule has hundreds of $-C_2H_4-$ units, joined in a long chain. The black spheres represent carbon atoms. The white spheres represent hydrogen atoms.

KS3: C2.4 The Earth Knowledge Organiser

Key points to learn

Structure of the Earth	The Earth consists of the crust, mantle, outer core and inner core
Atmosphere	The atmosphere is the mixture of gases around the Earth. It is mainly nitrogen and oxygen with smaller amounts of argon and carbon dioxide.
Sedimentary rocks	Form as a result of weathering, erosion, transport, deposition and compaction or cementation
Metamorphic rocks	Form when heating, high pressure or both change existing rock. They consist of crystals. They are non-porous.
Igneous rock	Form when liquid rock cools and freezes
Rock cycle	The rock cycle shows how materials in rock are recycled over millions of years
Uplift	Huge forces inside the Earth push rocks upwards to form mountains. This called uplift.

Key points to learn

Carbon stores	Carbon stores include the atmosphere, the oceans, sedimentary rocks, fossil fuels and organisms
Carbon cycle	The carbon cycle shows how carbon compounds enter and leave carbon stores
Sedimentary rocks	Form as a result of weathering, erosion, transport, deposition and compaction or cementation
Carbon Dioxide in the atmosphere	The concentration of carbon dioxide in the atmosphere is increasing because of deforestation and burning fossils fuels. Extra carbon dioxide in the atmosphere causes climate change.
Recycling	Recycling involves collecting and processing materials that have been used to make new objects

Big picture

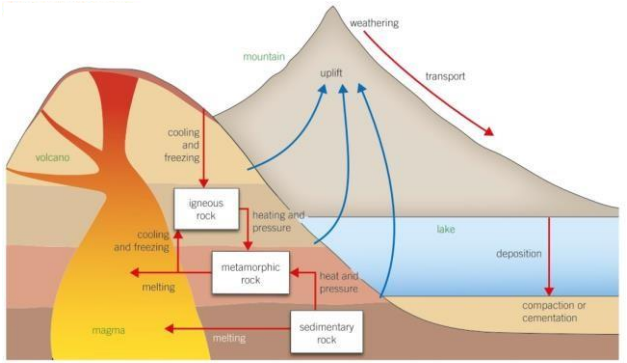
Chemistry

- 1.1 Particles and their behaviour
- 1.2 Elements, atoms and compounds
- 1.3 Reactions
- 1.4 Acids and alkalis
- 2.1 The Periodic Table
- 2.2 Separation techniques
- 2.3 Metals and acids
- **2.4 The Earth**

Fantastic fact!

For each mile you drill down into the Earth, the temperature increase by 40 °C.

Additional Information



▲ The rock cycle.

Key points to learn

Charged objects	Objects can be charged positively or negatively by transferring electrons
Attraction and repulsion	Like charges repel and unlike charges attract
Electric field	An electric field is a region where there is a force on charged particles or materials
Electric current	Is the amount of charge flowing per second. You measure current in Amps (A) using an ammeter.
Potential difference of a cell	This tells you the size of the push on the charges and how much energy can be transferred by them. The rating of a cell or battery tells you the potential difference at which it operates. You measure potential difference in Volts (V) using a voltmeter.
Series circuits	Contain only one loop and the current is the same everywhere.
Parallel circuits	Have branches and the currents in all the branches add up to make the total current

Key points to learn

Resistance	A component with a high resistance has a small current through it. Resistance is measured in Ohms (Ω). You calculate the resistance using the potential difference across a component and the current through it.
Insulators	Have a very high resistance
Conductors	Have a very low resistance
Magnets	Magnets have a north pole and a south pole. Like poles repel and unlike poles attract.
Magnetic field	Magnetic materials feel a force in the region around a magnet called a magnetic field. Magnetic field lines show the pattern of the magnetic field.
Electromagnet	A current flowing in a coil of wire wrapped around a magnetic material is an electromagnet. Electromagnets are used in maglev trains, hospitals and cars.

KS3: P2.1 Electricity & Magnetism
Knowledge Organiser

Content

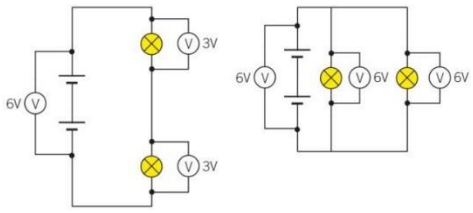
Physics

- 1.1 Forces
- 1.2 Sound
- 1.3 Light
- 1.4 Space
- **2.1 Electricity and magnetism**
- 2.2 Energy
- 2.3 Motion and pressure

Fantastic fact!

Since you took your last breath lightning has struck the Earth 100 times. On average airliners will get struck by lightening once a year.

Additional Information



Series Parallel

Key points to learn

Chemical stores of energy	There is energy in the chemical stores associated with food and fuel. Energy is measure in joules (J). You need different amounts of energy for different activities.
Conservation of energy	Energy can neither be created nor destroyed. It can only be transferred between stores. This is known as the law of conservation of energy.
Transferring energy between stores	Light, sound, and electricity are ways of transferring energy between stores
Temperature	Temperature is measured using a thermometer. The temperature does not depend upon on the amount of material, but the amount of energy in the thermal store does.
Hot to cold	When a hot object is in contact with a colder one energy is transferred from the hot object to the colder one. Energy will be transferred and the temperature difference will decrease until the objects are in equilibrium.
Conduction and convection	Energy is transferred by conduction in solids, by convection in liquids and gases.

Key points to learn

Radiation	Energy transfer by radiation does not need a medium to travel through. All objects emit radiation. Infrared radiation can be detected by your skin or a thermal imaging camera.
Cooling	If the energy transferred to an object is less that the energy transferred from it the object will cool down
Fossil fuels	Fossil fuels such as coal, oil and gas were formed over millions of years and are non-renewable. They can be used to drive a generator in a thermal power station.
Renewable energy resources	Wind, water and solar sources are known as renewable energy resources
Power	Power = energy/time and electrical power = potential difference x current. You can work out the energy transferred by appliances in your home using the unit kilowatt hours.
Work	You calculate work by multiplying a force by a distance. Simple machines like levers and gears can make it easier to do work but you do not get more energy out than you put in.

KS3: P2.2 Energy Knowledge Organiser

Content

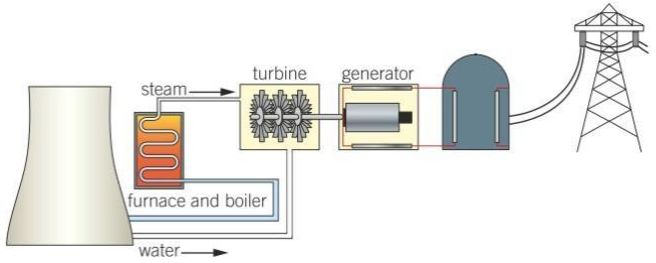
Physics

- 1.1 Forces
- 1.2 Sound
- 1.3 Light
- 1.4 Space
- 2.1 Electricity and magnetism
- **2.2 Energy**
- 2.3 Motion and pressure

Fantastic fact!

When you make popcorn you are boiling water. The water inside the popcorn kernel turns to steam and it explodes.

Additional Information



▲ A power station burns fossil fuels to drive a generator.

Key points to learn

Speed	Speed = distance/time measured in metres per second (m/s). Average speed is the total distance travelled/total time taken.
Distance-time graphs	You can show what is happening to the position of an object on a distance-time graph. The slope of the distance-time graph is the speed.
Gas pressure	Gas pressure is due to the collisions of gas molecules with the sides of the container or object. If the gas is hotter, or compressed, there will be more collisions and the pressure will be greater.
Atmospheric pressure	Atmospheric pressure is due to the collisions of air molecules with objects. Atmospheric pressure decrease with height because there are fewer air molecules higher up.
Liquid pressure	The pressure at a particular depth of a liquid depends upon the weight of water above it. Pressure increase with depth. Liquids are incompressible.
Calculating pressure	Pressure = force/area measured in N/m^2 or N/cm^2. The pressure tells you how the force is spread out over an area.

Key points to learn

Moments	The turning effect of a force is called a moment. You calculate a moment by multiplying the force by the distance from a pivot.
Equilibrium	If the clockwise moments acting on an object equal the anticlockwise moments the object will be in equilibrium. This is how see-saws balance.
Centre of gravity	The centre of gravity is the point at which all the weight of the object appears to act
Turning force	The weight of an object acting through the centre of mass can produce a turning effect

KS3: P2.3 Motion & Pressure Knowledge Organiser

Content

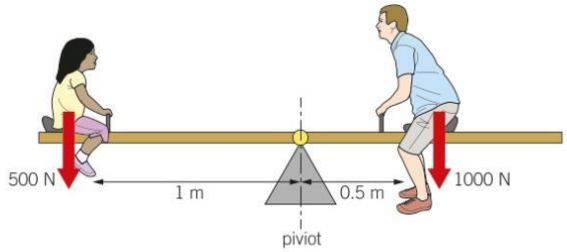
Physics

- 1.1 Forces
- 1.2 Sound
- 1.3 Light
- 1.4 Space
- 2.1 Electricity and magnetism
- 2.2 Energy
- **2.3 Motion and pressure**

Fantastic fact!

To produce the same pressure on the floor that you exert when you push in a drawing pin, you would need over 5000 people standing on your shoulders.

Additional Information



▲ The see-saw doesn't turn if it is in equilibrium.