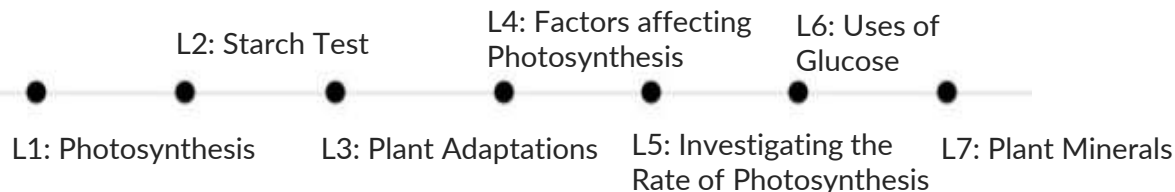




Y8 Ecosystems: Photosynthesis Knowledge Organiser

Key Question: How do plants produce food?



This unit develops your understanding of how plants produce their own food through photosynthesis and how they obtain the resources needed for growth. You will learn how light energy is converted into chemical energy stored in glucose, how plants are adapted for photosynthesis, and how environmental factors affect the rate of photosynthesis. This knowledge provides the foundations required for success in AQA GCSE Combined Science, particularly B4 Bioenergetics and B7 Ecology. The key concept of 'ecosystems' will be revisited throughout KS3 during units on plant reproduction and interdependence. This key concept also links well to units within the 'organism's' key concept.

L1 Photosynthesis

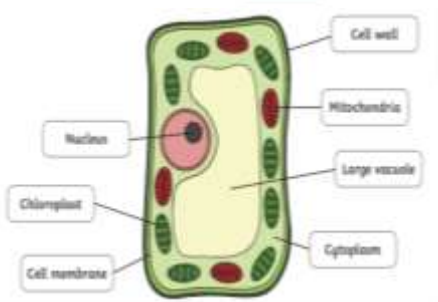
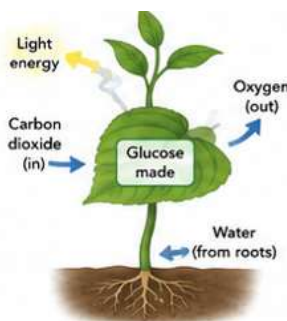
Plants make their own food in a process called photosynthesis.

They need:

- Light energy
- Carbon dioxide (from the air)
- Water (from the soil)
- Chlorophyll (in the leaves)

They produce:

- Glucose (food)
- Oxygen (released into the air)



L2 Starch Test

Iodine solution is used to test for starch.

1. Boil the leaf in water
2. Boil the leaf in ethanol (in a water bath)
3. Rinse in warm water
4. Add iodine solution

Excess glucose is converted into starch for storage. The starch test shows whether a plant has recently photosynthesised or not.



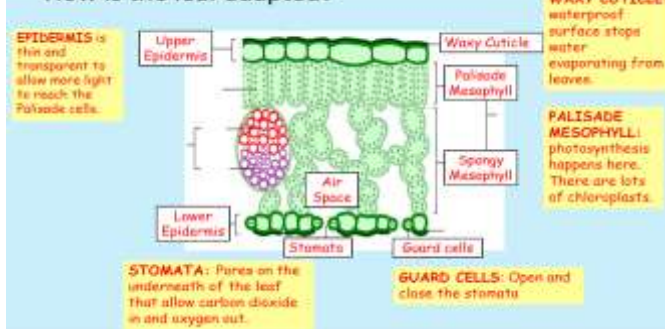
No starch – stays brown/yellow



Starch present – turns blue-black

L3 Plant Adaptations

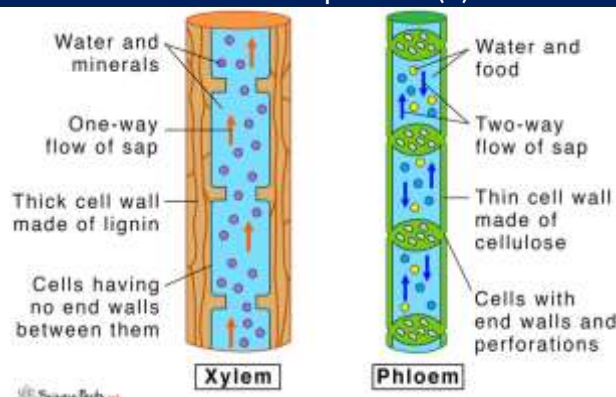
How is the leaf adapted?



Vocabulary Power

Photosynthesis	A chemical reaction where green plants and algae use light energy to convert carbon dioxide water into glucose and oxygen.
Fertilisers	A substance containing minerals that plants need for healthy growth.
Chloroplast	The plant cell organelle where photosynthesis takes place; it contains chlorophyll.
Chlorophyll	The green pigment in a plants chloroplast that absorbs light energy for photosynthesis.
Stomata	Small pores in leaves that allow gases to enter and leave the plant.
Starch	A storage molecule made from chains of glucose.
Limiting Factor	A factor that slows down the rate of a process when it is in short supply.
Adaptation	A feature that helps an organism survive in its environment.
Rate	The speed at which a process happens.

L3 Plant Adaptations (2)



L4 Factors affecting Photosynthesis

The rate of photosynthesis can be affected by:

- Light intensity
- Temperature
- Carbon dioxide concentration
- Amount of chlorophyll
- Water availability



Increasing these factors (up to a point) increases the rate of photosynthesis.

When a process depends on two or more factors, the *rate* of that process is *limited* by the factor which is in *shortest* supply. This is the limiting factor.

L5 Investigating the Rate of Photosynthesis



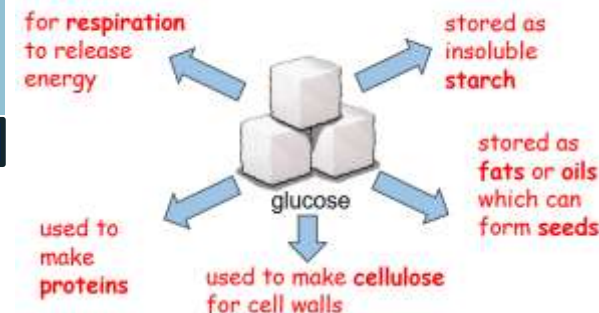
This is a GCSE required practical to measure the rate of photosynthesis. Watch the video to see how the rate can be determined by measuring the volume of oxygen produced or number of bubbles produced

L7 Plant Minerals

Plants need minerals for growth. Nitrates make proteins, magnesium makes chlorophyll, phosphates support roots and potassium supports leaves and flowers. A mineral deficiency is a lack of one of more of these substances; fertilizers replace missing minerals and are often used by farmers or gardeners to increase crop yields.

L6 Uses of Glucose

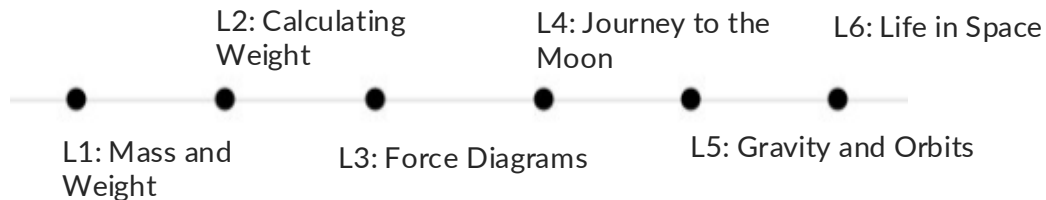
Uses of glucose by plants





Y8 Forces: Gravity Knowledge Organiser

Key Question: What is gravity and how does it affect the motion of objects?



This unit develops your understanding of the forces and gravity, including the relationship between mass, weight and gravitational field strength. You will learn how gravity affects objects on Earth and in space, and how gravity keeps planets and moons in orbit. This knowledge provides the foundations required for success in AQA GCSE Combined Science, particularly Physics topics on forces in combined science and space physics in triple science. The key concepts of "forces" will be revisited throughout KS3 during units on speed, contact forces and pressure.

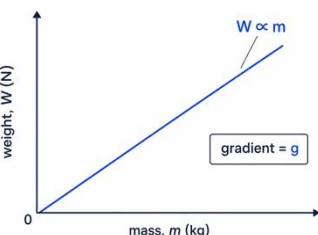
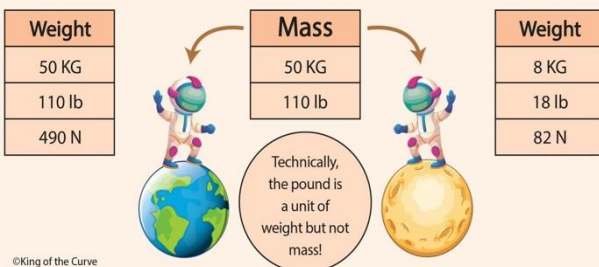
L1 Mass and Weight

Mass

- Mass is how much matter an object contains.
- Mass is a constant for a body and does not change with location.
- The kilogram is a unit of mass.

Weight

- Weight is the force exerted on a mass by gravity.
- Weight is not a constant. It changes from place to place.
- The newton is a unit of weight.



Mass (Kg) and weight (N) are **directly proportional** ($\propto$), so that as mass doubles weight also doubles.

L2 Calculating Weight

$$\text{Weight (N)} = \text{Mass (kg)} \times g \text{ (N/kg)}$$

Rearranging the formula:

- $\text{Mass (kg)} = \text{Weight (N)} \div g \text{ (N/kg)}$
- $g \text{ (N/kg)} = \text{Weight (N)} \div \text{Mass (kg)}$

Gravitational Field Strength (g)

The strength of gravity at a location.
It is the force of gravity acting on 1 kg of mass.
Unit = N/kg



Weight

The force of gravity acting on an object.
Measured in Newtons (N).
Depends on mass and g.

Examples of g on different bodies in space

Body	Gravitational Field Strength (g)	What this means
Earth	10 N/kg	A 1 kg object weighs 10 N
Moon	1.6 N/kg	A 1 kg object weighs 1.6 N
Mars	3.7 N/kg	A 1 kg object weighs 3.7 N
Jupiter	24.8 N/kg	A 1 kg object weighs 24.8 N



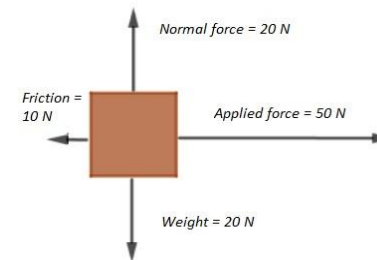
Mass stays the same wherever you go.
Weight changes when gravitational field strength changes.

Vocabulary Power

Gravitational Field Strength	The force of gravity acting on 1 kg of mass (N/kg).
Mass	The amount of matter in an object (kg).
Weight	The force of gravity acting on an object (N).
Orbits	The path an object follows around another object due to gravity.
Gravity	A force of attraction between objects with mass.
Newtons	The unit used to measure forces (and therefore weight).
Force	A push or pull that can change an object's motion.

L3 Force Diagrams

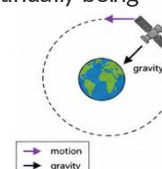
A **free body diagram** models the forces acting on an object. The object or 'body' is shown as a box. The forces are shown as thin arrows (vectors) pointing away from the centre of the box or dot. It is important to label each arrow to show the force it represents. The diagram should be drawn to scale so that the length of the arrow is proportional to the magnitude of the force.



The **centre of mass** of an object is the point where weight can be considered to act.

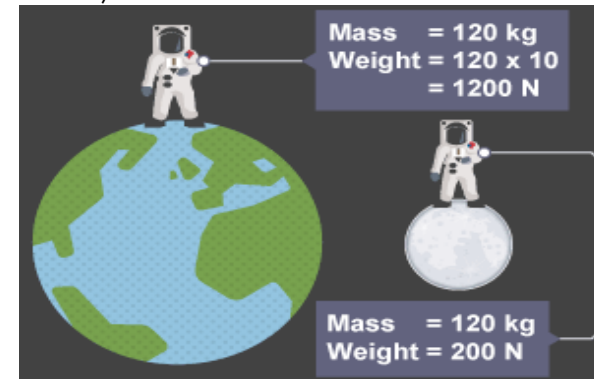
L5 Gravity and Orbits

Gravity keeps all planets in the solar system in **orbit** around the Sun. It also keeps the Moon in orbit around the Earth. Without gravity, the Moon would continue in a straight line; however, the pull of gravity from the Earth turns that path into an orbit. The pulled object is travelling sideways fast meaning it keeps "falling" around the Earth continually being pulled towards its centre of mass.



L4 Journey to the Moon

Gravity is a non-contact force that acts between all objects with mass. The more mass an object has the stronger gravitational field strength it will have. Therefore, objects on larger planets have a greater weight than smaller planetary objects (e.g. Earth vs Moon).



The greater the distance between two objects the weaker the gravitational force.

L6 Life in Space

International Space Station (ISS)

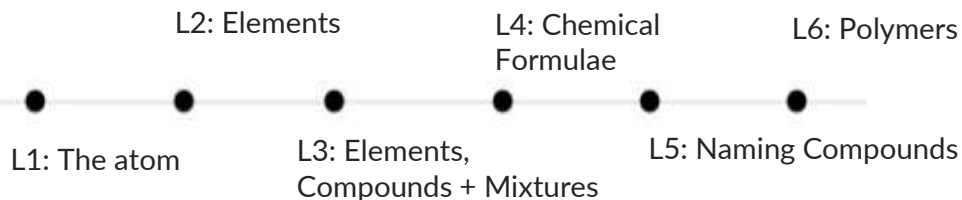
- Home to an international crew of **6 astronauts**.
- Continuously occupied since **November 2000**.
- Larger than a **six-bedroom house**.
- Scientists conduct research on the station all year round
- British astronaut Sir Tim Peake spent ~186 days in Space on the ISS





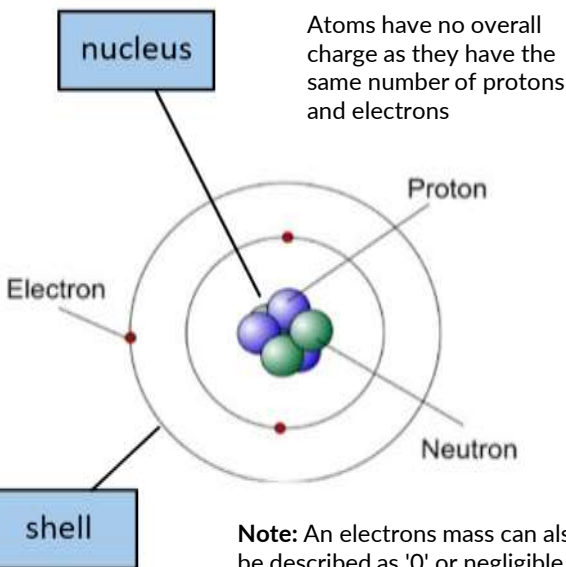
Y8 Matter: Elements Knowledge Organiser

Key Question: What are atoms, elements and compounds?



This unit develops your understanding of atoms, elements, molecules, compounds, chemical formulae and polymers. You will learn how atoms combine to form substances and how chemical formulae can be used to represent them. This knowledge provides the foundations required for success in AQA GCSE Combined Science, particularly Chemistry topics on atomic structure, the periodic table, chemical bonding, formulae and chemical reactions. The key concepts of 'matter' will be revisited throughout KS3 during units of particle model, separating mixtures, elements and the periodic table

L1 The Atom



Atoms have no overall charge as they have the same number of protons and electrons

Note: An electrons mass can also be described as '0' or negligible

Subatomic Particle	Relative Charge	Relative Mass
Proton	+1	1
Neutron	0	1
Electron	-1	$\frac{1}{1836}$

L2 Elements

- **Elements** are substances that contain **one type of atom**.
- Every material is made up of one or more elements. It is not possible to break down an element into other substances.
- There are 98 naturally occurring elements and a few man-made elements; all of which are found on the periodic table (around 118 exist in total)

- Every element has its own chemical symbol which always start with a capital letter.

1	atomic number
H	element symbol
Hydrogen	element name
1.008	atomic weight

Hydroxide = OH^-
Nitrate = NO_3^-
Sulphate = SO_4^{2-}
Carbonate = CO_3^{2-}

Vocabulary Power

Atom	The smallest particle of an element.
Element	A substance made of only one type of atom.
Molecule	A substance made from two or more atoms chemically joined together.
Compound	Two or more different elements chemically bonded together.
Mixture	Two or more different substances NOT chemical bonded together
Chemical Formula	A symbol showing the types and numbers of atoms in a substance.
Polymer	A large molecule made from many repeating units joined together

L4 Chemical Formulae

The formula of a compound tells you:

- which elements the compound is made from.
- how many atoms of each element there are.

Carbon dioxide has the formula CO_2 .

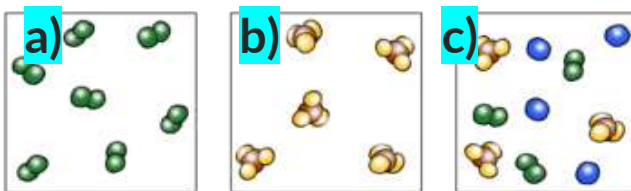


C is the symbol for carbon. There are no subscript numbers after the C, so we know there is only one atom of carbon in the compound.



O is the symbol for oxygen. There is a subscript 2 after the O, so we know there are two atoms of oxygen in the compound.

L3 Elements, Mixtures and Compounds

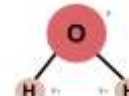


- a) Is an **element** as all the atoms are the same type
- b) Is a **compound** as it contains more than one different types of atom (chemical bonded)
- c) Is a **mixture** because it contains multiple different substances not chemical bonded together

L5 Naming Compounds

Mono – means that there is **one** of them
Di – means that there are **two** of them
'ide' – means it contains two elements
'ate' – means that there 3 or more elements AND one of which is oxygen

Water is a compound made from one oxygen atom and two hydrogen atoms. Its formula is H_2O .



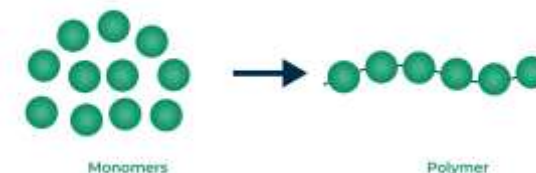
L6 Polymers

Polymers are very large molecules made of many smaller molecules, called monomers, in a repeating pattern. They often have properties in common:

- chemically unreactive
- solids at room temperature
- they can be moulded into shape
- electrical insulators
- strong and hard-wearing

Composite materials are made from two or more different types of material that combine to make a more useful one.

Polymerization

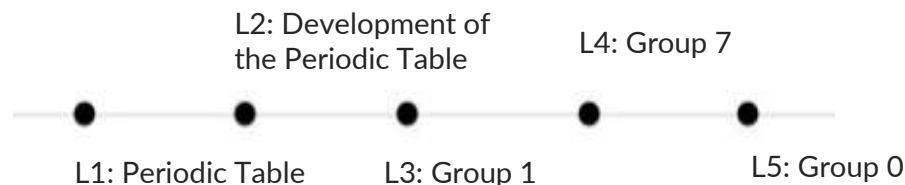


Examples: MDF, Carbon Fibre Reinforces Polymer (CFRP) and Reinforced Concrete



Y8 Matter: Periodic Table Knowledge Organiser

Key Question: How can we use the Periodic Table to predict element properties?



This unit develops your understanding of how the periodic table organises elements according to their atomic structure and properties. You will learn how elements are grouped, identify patterns in physical and chemical properties, and use trends to predict the behaviour of unfamiliar elements. This knowledge provides the foundations required for success in AQA GCSE Combined Science, particularly Chemistry topics C1 atomic structure and the periodic table. The key concept of *matter* will be revisited throughout KS3 during units on elements, particle model and separating mixtures.

L1 Periodic Table

Groups																		Periods	
1	2																		
Li	Be																	1	He
Na	Mg																	2	
K	Ca	Sc	Ti	V	Cr	Mn	Fe	Co	Ni	Cu	Zn	Ga	Ge	As	Se	Br	Kr	3	
Rb	Sr	Y	Zr	Nb	Mo	Tc	Ru	Rh	Pd	Ag	Cd	In	Sn	Sb	Te	I	Xe	4	
Cs	Ba	La	Hf	Ta	W	Re	Os	Ir	Pt	Au	Hg	Tl	Pb	Bi	Po	At	Rn	5	
Fr	Ra	Ac	Rf	Db	Sg	Bh	Hs	Mt	Ds	Rg	Cn	Nh	Fl	Mc	Lv	Ts	Og	6	
																		7	

Metals (Yellow) | Non-metals (Blue)

Mass Number	7
Symbol	Li
Element Name	lithium
Proton Number	3

Each element has its own symbols which will always begin with a capital letter.

L2 Development of the Periodic Table

Dmitri Mendeleev arranged his periodic table into order of **atomic mass** (instead of atomic number like we do nowadays). He also left gaps for undiscovered elements and used trends to make accurate predictions about their properties and was later proved to be correct



Vocabulary Power

Periodic Table	A chart that arranges all known elements by their atomic structure and properties.
Physical Properties	A characteristic that can be observed or measured without changing the substance.
Chemical Properties	A characteristic that describes how a substance reacts with other substances.
Groups	A vertical column in the periodic table. Elements in the same group have similar properties number of electrons in their outer shell.
Periods	A horizontal row in the periodic table. Elements in the same period have the same number electron shells
Reactivity	How easily an element reacts with other substances.
Element	A substance made from only one type of atom.
Trend	An observable pattern

L3 Group 1

7	Li
3	Na
11	K
19	Rb
37	Cs
55	Fr

The alkali metals (Group 1)

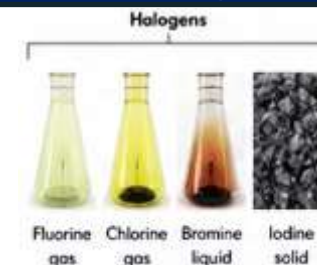
- React with oxygen in air, kept under oil.
- Soft, can cut with knife.
- Shiny, until react with air (tarnish)
- Good conductors of electricity and heat.
- Low density, float on water.
- Melting points and boiling points are low



Alkali metals react vigorously with water to produce hydrogen gas and an alkaline solution. **The reactivity increases as you go down the group** because the atoms get larger / increased atomic radius. This greater distance and therefore increased "shielding" makes its outer electrons easier to lose when reacting



L4 Group 7



- The halogens have low melting points and low boiling points.
- Reactivity of the halogens decreases as you go down the group.**
- Halogens are toxic non-metals
- They do not conduct electricity.
- Halogens are diatomic molecules (2 atoms in the molecule – eg Cl₂)
- Iodine is a brittle solid (snaps easily)

L5 Group 0

- Unreactive (inert) gases
- They exist as single atoms.
- Low melting and boiling points.
- Colourless gases at room temperature.
- Low density
- Poor conductors of heat.
- They glow brightly when high voltage electricity passes through them.

The periodic table arranges all the known 118 elements. This is done in increasing atomic number.

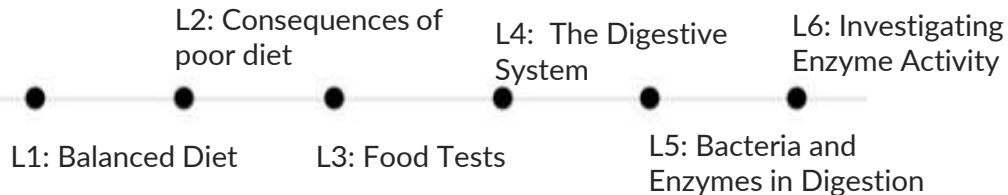
The rows on the periodic table are called **periods**. Elements in the same period can be very different in terms of their properties, but they will all have the same number of electron shells (e.g. elements in period 3 all have 3 shells).

The periodic table was arranged so elements with similar properties put into the same column. We call these columns **groups**. This explains why metals are found on the left and non-metals on the right.



Y8 Organisms: Digestion Knowledge Organiser

Key Question: How does the body break down the foods you eat?



This unit develops your understanding of how the digestive system breaks down food into smaller soluble molecules that can be absorbed and used by the body. You will study nutrients, digestion, enzymes, food tests, deficiency diseases, and the role of organs in digestion. This unit provides the foundations required for success in AQA GCSE Combined Science, particularly Biology topics on organisation, digestion, enzymes, the human digestive system, and the transport of substances. The key concepts of "organisms" will be revisited throughout KS3 during units on cells, movement, breathing and respiration as well as microbes and disease.

L1 Balanced Diet

Nutrient	Function
Carbohydrate	Main source of energy
Protein	Growth and repair of tissues
Fats (Lipids)	Energy store and insulation (warmth)
Vitamins	Keeps the body working + healthy
Minerals	Keeps the body working + healthy
Fibre	Helps food pass through the digestive system
Water	Chemical reactions and hydration

MINERAL	FUNCTION	FOOD
Calcium	Builds and maintains strong bones and teeth, aids in muscle contraction and nerve function	Dairy products, leafy greens, sardines, almonds
Iron	Produces haemoglobin, which carries oxygen in the blood, supports energy levels and immune function	Red meat, poultry, fish, beans, lentils, spinach

L2 Consequences of Poor Diet

Starvation	If a person continuously takes in too little energy from food, their mass will decrease . The body does not get enough nutrients and they may suffer from starvation . They may suffer serious health issues such as: • severe weight and muscle loss • anorexia • infertility • tiredness and fatigue • kidney problems • depression If a person does not eat enough of the correct nutrients, the person could become malnourished .
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Obesity	If a person continuously takes in too much energy from food, their mass will increase . People with a high excess of body fat could suffer from obesity . A person who is obese could suffer serious health issues such as: • coronary heart disease • type 2 diabetes • be more likely to develop some types of cancer • depression • strokes • joint pain • high blood pressure • difficulties breathing
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Obesity and Starvation

A balanced diet is a diet which contains adequate proportions of each food group. If someone does not eat the correct amount of each nutrient, they are said to have an unbalanced diet.

Vocabulary Power

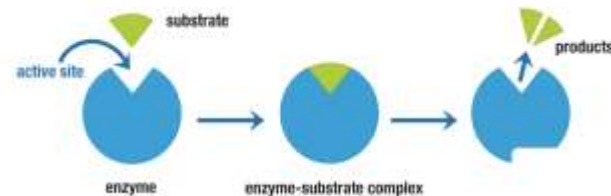
Digestion	The breakdown of large food molecules into smaller molecules that can be absorbed.
Nutrient	A substance needed by the body for energy, growth and health.
Deficiency	A lack of a nutrient needed for healthy body function
Reagent	A chemical used to test for the presence of a substance.
Enzyme	A protein that speeds up chemical reactions, including digestion.
Intestine	An organ where digestion is completed and nutrients are absorbed.

L3 Food Tests

Food Test	Colour of reagent	Positive test result	Negative test result
Iodine for starch	orange-brown	blue-black	orange-brown (no change)
Benedict's for sugar	light blue	green to brick-red	light blue (no change)
Ethanol for lipid	colourless	cloudy emulsion	colourless (no change)
Biuret for protein	blue	lilac-purple	blue (no change)

L5 Bacteria and Enzymes in Digestion

Enzymes are proteins that act as biological catalysts. They speed up chemical reactions and don't get used up in the process.



Types of digestive enzyme:

Amylase breaks down starch into simple sugars
Protease breaks down protein into amino acids
Lipase breaks down lipids (fats) into fatty acids and glycerol

Gut Bacteria (microbiome)

- Break down undigested food.
- Produce Vitamin K and Vitamin B.
- Help keep the digestive system healthy.

L4 The Digestive System

1. MOUTH Salivary enzymes begin carbohydrate digestion and break up food particles.	2. ESOPHAGUS A process named peristalsis pushes the food down your esophagus into your stomach.	3. STOMACH Secretes gastric juice. Hydrochloric acid kills bacteria. Enzymes break down proteins.
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PARTS & FUNCTIONS

4. LIVER The liver provides bile that helps break up fat into smaller bits. Processes the digested food from blood before it gets sent to various places in our body to be used.	 How for Kids	6. LARGE INTESTINE The colon absorbs water and electrolytes. Contains beneficial bacteria that break down remaining nutrients and make vitamin K.
5. PANCREAS Provides additional enzymes to help digest all sorts of food.	7. SMALL INTESTINE Food is mixed with bile from liver and juices from pancreas to be sent back to your liver for more processing. Digests fat, proteins and carbohydrates.	9. ANUS Controls the expulsion of unused material such as feces.
6. GALLBLADDER Stores bile. When you eat, your gallbladder squeezes bile through the bile ducts into your small intestine.		

L6 Investigating Enzyme Activity

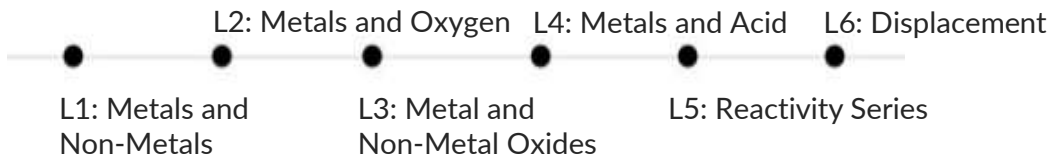
To revise the practical activity on enzyme activity watch the video at the QR code here:





Y8 Reactions: Metals and Non-Metals Knowledge Organiser

Key Question: How do metals and non-metals react with different substances?



This unit develops your understanding of the properties and reactions of metals and non-metals. You will learn how to compare elements using their physical properties, explain reactions with oxygen and acids, and use the reactivity series to predict displacement reactions. This knowledge provides the foundations required for success in AQA GCSE Combined Science, particularly Chemistry topics on C5 Chemical Changes and C6 Energy Changes. The key concept of reactions will be revisited throughout KS3 during units on elements, compounds, chemical reactions, separation techniques and the periodic table.

L1 Metals and Non-Metals

Metals are found on the lefthand side of the periodic table, and the Non-Metals are on the right hand side

Metals:

- Usually shiny and strong.
- Good conductors of heat and electricity.
- Usually solid at room temperature.
- Can be bent into shape (malleable).



Non-metals:

- Usually dull and brittle.
- Poor conductors of heat and electricity.
- Can be solids, liquids or gases.



Examples of metals

Iron, copper, aluminium, magnesium, zinc

Examples of non-metals

Oxygen, carbon, sulfur, bromine, chlorine

Metals are also ductile which means they can be stretched into wires and generally have a high melting points

L2 Metals and Oxygen

When metals or non-metals join with **oxygen**, an **oxidation** reaction occurs. In the reaction the new substance made is a **compound** called an **oxide**. This can happen quickly or very slowly (e.g. rusting)



L3 Metal and Non-Metal Oxides



Metal oxides are bases (many are insoluble) but bases that dissolve in water are called alkalis and have a pH of 8–14. They turn universal indicator blue/purple and are found in cleaning products, antacids and toothpaste.

Non-metal oxides are acidic and insoluble and have a pH of 1–6. They turn universal indicator red/yellow.

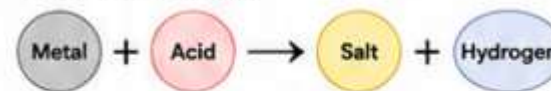
Acids & bases neutralise each other forming neutral solutions (pH 7).

Vocabulary Power

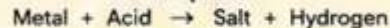
Metal	A substance that is often shiny, strong, malleable and a good conductor of heat and electricity
Non-Metal	A substance that is usually dull, brittle and a poor conductor of heat and electricity.
Displacement	A reaction where a more reactive element replaces a less reactive element from its
Oxidation	A reaction where a substance gains with oxygen (or loses electrons)
Reactivity	How easily a substance reacts with other substances.
Acid	A substance with a pH less than 7 (contains H ⁺ ions)
Alkali	A soluble base (pH 8-14)
Base	Any substance that can neutralise an acid (pH 8-14)
Soluble	Can dissolve in a solvent (e.g. water)
Metal Oxide	A compound formed when a metal reacts with oxygen.

L4 Metals and Acid

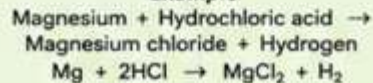
Some metals react with acids to produce a salt and hydrogen.



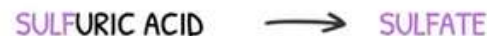
Word equation



Example



The name of the salt produced depends on the metal and acid used. In the example above the salt made is Magnesium Chloride because the metal used was Magnesium and the acid used was Hydrochloric. If it was Nitric acid – Magnesium Nitrate salt would be made instead.



L5 Reactivity Series

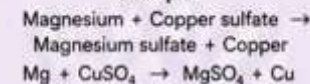
Metals can be arranged from most reactive to least reactive.

Most reactive	Potassium	Key idea A more reactive metal can replace a less reactive metal in a compound.
	Sodium	
	Lithium	
	Calcium	
	Magnesium	
	Aluminium	
	Carbon	
	Zinc	
	Iron	
	Copper	
	Silver	
	Gold	
Least reactive		

L6 Displacement

A displacement reaction occurs when a more reactive element replaces a less reactive element from its compound

Example



Magnesium is more reactive, so it replaces copper.

We know this because of the reactivity series above