Rayner Stephens
HIGH SCHOOL

Curriculum Intent

for

Science

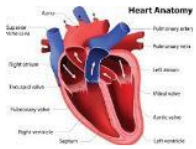
The intent of science at Rayner Stephens High School is to provide students with a high-quality science education that provides the foundations for understanding the world through the specific disciplines of biology, chemistry and physics. Science has changed our lives and is vital to the world's future prosperity, and all our pupils should be taught essential aspects of the knowledge, methods, processes and uses of science. Through building up a body of key foundational knowledge and concepts, our pupils will be encouraged to recognise the power of rational explanation and develop a sense of excitement and curiosity about natural phenomena. They will be encouraged to understand how science can be used to explain what is occurring, predict how things will behave, and analyse causes.

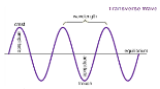
Rayner Stephens High School

Science Learning Journey

Written Exam
6 x 1hr 15 min for combined
6 x1hr45min for separate science

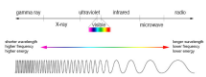
Revision
Ecology
Variation and Evolution
Using Resources
Magnetism
Chemistry and the atmosphere
Homeostasis
Organic Chemistry
Rate of chemical change

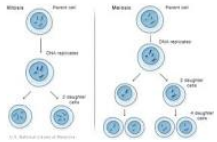




YEAR 11

Bioenergetics
Energy Changes
Particle Model of Matter
Chemical Changes
Infection and Response
The Periodic Table
Forces
Human Nervous system
Chemical Analysis
Waves
Reproduction



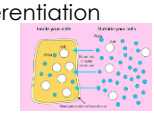


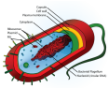
YEAR 10

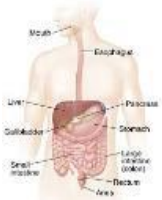
Electricity
Bonding, structure and matter
Quantitative Chemistry
Cell Division
Using Resources
Home Electricity
Heating
Human Interaction

YEAR 9

Light
Nutrition
Growth and Differentiation
Acceleration
Chemistry of the Atom
Genetics
Sound and Waves
Life Diversity
Changing Substances
Movement and Pressure
Tissues and Organs





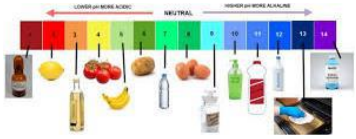


YEAR 8

Electric Circuits: Resistance
Earth Systems
Magnetism
Respiration and Photosynthesis
Acids and Alkalis
Electric Circuits: Current and Voltage
Mixtures

YEAR 7

Particles
Reproduction
Gravity
Cells
Contact Forces
Elements, atoms and compounds
Interdependence
Energy Transfer



Year 8 - Science						
Curriculum intent	Throughout year 8 learners will build on the foundations of the Year 7 Science curriculum to develop scientific knowledge and conceptual understanding through the specific disciplines of biology, chemistry and physics. Learners will further develop an understanding of the nature, processes and methods of science through different types of scientific enquiries that help them to answer scientific questions about the world around them. Through this, learners will continue to develop the scientific knowledge required to understand the uses and implications of science, today and for the future.					
Term	**Autumn 1**	**Autumn 2**	**Spring 1**	**Spring 2**	**Summer 1**	**Summer 2**
Knowledge	**Movement & Pressure -** Learners will make measurements of distance and time in order to plot a distance-time graph, analyse it and use it to calculate speed. They will look at what gas pressure is and how you can increase and decrease it. Learners will calculate density **Tissues & Organs -** Learners will look at hierarchical organisation of multicellular organisms and the biomechanics of how these organ systems interact to create movement. .	**Acids & Alkalis-** Learners will understand the difference between acids & alkalis and how to make salts using acids and alkalis during neutralisation reactions. **Changing Substances -** Learners will learn about the difference between chemical and physical changes. They will also learn how to construct chemical formula and both word and symbol equations for various reactions. Learners will also investigate different chemical reactions.	**Respiration & Photosynthesis -** Learners will learn about aerobic and anaerobic respiration and use a range of investigative techniques to understand how a plant is adapted for this process. **Magnetism -** Learners will learn about magnetic fields, how they impact other objects and how the force naturally exists within the Earth.	**Life Diversity -** Learners will look at how variation is caused by differences in the genomes, lifestyles and environments of the individuals. They will also look at how organisms reproduce and pass on their characteristics.	**Electric Circuits: Resistance** - Learners will use a range of investigative techniques to understand Ohms Law and how resistance varies in series and parallel circuits. **Earth's Systems -** Learners will look at the structure of the Earth, how magma and lava create the properties found in igneous rocks and the effects of weathering and erosion on sedimentary rocks over time.	**Light:** Learners will use a range of investigative techniques to understand how light travels and how it behaves when it travels through different mediums. **Nutrition -** Learners will learn about the different nutrients needed for a balanced diet, which foods contain which nutrients and how to test for them. They will also look at the side effects of having an unbalanced diet, and how it impacts the body.

<table>
<tr><td>Skills</td><td colspan="6">The following skills will be developed throughout the whole of year 8 and will enable learners to build a deep understanding of science:

Scientific attitudes:
 pay attention to objectivity and concern for accuracy, precision, repeatability and reproducibility
 understand that scientific methods and theories develop as earlier explanations are modified to take account of new evidence and ideas, together with the importance of publishing results and peer review
 evaluate risks.

Experimental skills and investigations:
 ask questions and develop a line of enquiry based on observations of the real world, alongside prior knowledge and experience
 make predictions using scientific knowledge and understanding
 select, plan and carry out the most appropriate types of scientific enquiries to test predictions, including identifying independent, dependent and control variables, where appropriate
 use appropriate techniques, apparatus, and materials during fieldwork and laboratory work, paying attention to health and safety
 make and record observations and measurements using a range of methods for different investigations; and evaluate the reliability of methods and suggest possible improvements
 apply sampling techniques.

Analysis and evaluation:
 apply mathematical concepts and calculate results
 present observations and data using appropriate methods, including tables and graphs
 interpret observations and data, including identifying patterns and using observations, measurements and data to draw conclusions
 present reasoned explanations, including explaining data in relation to predictions and hypotheses
 evaluate data, showing awareness of potential sources of random and systematic error
 identify further questions arising from their results.

Measurement:
 understand and use SI units and IUPAC (International Union of Pure and Applied Chemistry) chemical nomenclature
 use and derive simple equations and carry out appropriate calculations
 undertake basic data analysis including simple statistical techniques.</td></tr>
<tr><td>Assessments</td><td>End of half term tests & HFL'S</td><td>End of half term tests & HFL'S</td><td>End of half term tests & HFL'S</td><td>End of half term tests & HFL'S</td><td>End of half term tests & HFL'S</td><td>End of half term tests & HFL'S</td></tr>
<tr><td>Enrichment</td><td colspan="6">Science Trip to Chester ZOO
Lab rats</td></tr>
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Year 8 Science Spring Term Knowledge Organiser – Respiration & Photosynthesis

Key Vocabulary:

1	Aerobic	Requiring oxygen.
2	Anaerobic	Without oxygen.
3	Biodomes	A self-contained and self-sufficient environment.
4	Breathing	The movement of air into and out of the lungs through the nose and mouth.
5	Chloroplast	Organelle that contains the green pigment, chlorophyll, which absorbs light energy for photosynthesis
6	Chlorophyll	One among a group of pigments used to convert sunlight energy into chemical energy through the process of photosynthesis.
7	Epidermis	Epidermis is the outermost layer of (skin or leaves).
8	Fermentation	An anaerobic process in which energy can be released from glucose even if oxygen is not available.
9	Glucose	One of a group of carbohydrates known as simple sugars
10	Lactic acid	An acid present in muscle tissue as a product of anaerobic respiration.
11	Mitochondria	Part of the cell where energy is released.
12	Oxygen Debt	The volume of extra oxygen the body needs after exercise to react with the accumulated lactic acid and remove it from the cells.
13	Transpiration	Movement of water through a plant from where is absorbed at the roots to where it evaporates from stomata.
14	Stomata	Microscopic pores found on the epidermis of plants.

Respiration

15. Aerobic Respiration

- Respiration is a chemical reaction that gives out heat (exothermic)
- All living things respire.
- Respiration is carried out in all cells continuously.
- The purpose of respiration is to release energy for organisms to use.
- Living things need energy for movement, keeping warm and for other chemical reactions to build molecules
- Aerobic means 'requiring oxygen'
- The word equation for aerobic respiration is:

Glucose + oxygen → carbon dioxide + water

16. Anaerobic Respiration

- Anaerobic means 'without oxygen'
- Anaerobic respiration takes place without oxygen and releases less energy than aerobic respiration
- During intense exercise, if there is not enough oxygen then anaerobic respiration takes place
- Aerobic respiration uses oxygen and releases more energy than anaerobic respiration
- Anaerobic respiration in muscle cells causes a build-up of lactic acid which results in an oxygen debt
- The word equation for anaerobic respiration in animals is:

Glucose → lactic acid

- Anaerobic respiration in yeast cells is called fermentation and is used to make bread and alcoholic drinks
- The word equation for fermentation is:

Glucose → ethanol + carbon dioxide

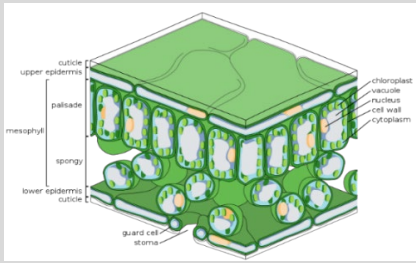
17 Photosynthesis

- Plants and algae make their own food using a process called photosynthesis.
- Light provides the energy needed for photosynthesis
- Water and carbon dioxide are the reactants required for photosynthesis.
- Plants make carbohydrates in their leaves by photosynthesis and gain mineral nutrients and water from the soil via their roots.
- The products of photosynthesis are oxygen and glucose.
- The word equation for photosynthesis is:

carbon dioxide + water → glucose + oxygen

Photosynthesis

18. The Leaf



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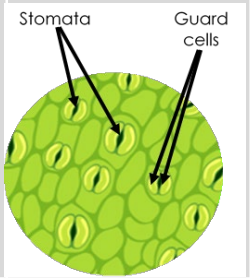
- Epidermis – thin and transparent to allow more light to pass through leaf to get to chloroplasts
- Palisade mesophyll - site of photosynthesis and contains lots of chloroplasts to absorb max sunlight
- Spongy mesophyll – contains lots of air spaces to increase surface area and allow carbon dioxide and oxygen to diffuse easily
- Stomata – holes in the leaf to allow carbon dioxide to diffuse in and oxygen to diffuse out
- Guard cells – to open and close the stomata to let substances in and out and to close it in order to prevent water loss
- Xylem - transport water from roots to leaves and the wall is strengthened with cellulose and lignin
- Phloem - transport water and glucose in a two way system.

20 The Leaf

- Leaves are the primary site of photosynthesis in plants.
- Chloroplasts in plant cells contain a green pigment called chlorophyll which uses the energy in light for photosynthesis.
- Leaves have a number of adaptations which allow them to carry out photosynthesis effectively.
- Water leaves the plant via the stomata on the underside of leaves.



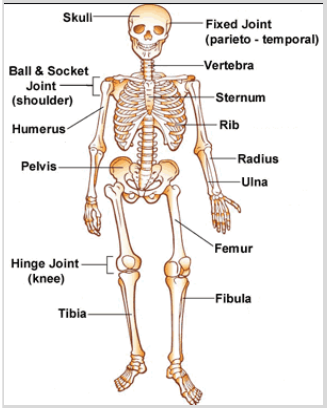
Year 8 Science Autumn Term Knowledge Organiser – Tissues and Organs

Key Vocabulary:

1	**Alveoli**	Small air sacs found at the end of each bronchiole. Alveoli are the site of gas exchange with blood.
2	**Antagonistic pair**	Two muscles which carry out opposite actions at the same time to bring about a change in movement.
3	**Cilia**	Microscopic hairs that line the inside of the trachea and bronchi.
4	**Diaphragm**	Sheet of muscle that sits under the lungs and ribcage.
5	**Diffusion**	The net movement of particles from a region of higher concentration to a region of lower concentration.
6	**Epithelial cells**	A type of cell found on the surfaces of organs. *There is a layer of **epithelial cells** on the surface of the skin that act as a barrier.*
7	**Exhalation**	The process of breathing out.
8	**Inhalation**	The process of breathing in.
9	**Respiration**	A chemical reaction that releases energy mitochondria.
10	**Trachea**	A tube that carries air from the mouth and nose, to and from the lungs. (Also called the **windpipe**)
11	**Depressant**	A drug that slows down the nervous system.
12	**Hallucinogen**	A drug that affects the brain, causing hallucinations and changes a person's perception of reality.
13	**Stimulant**	A drug that affects the nervous system, causing increased alertness and activity.

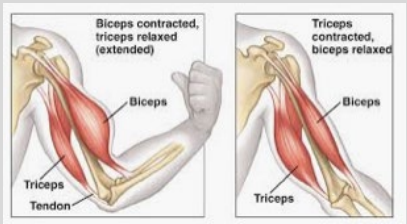
Organ Systems

14 Skeletal System



2. The skeleton is made up of bones. It has 4 important functions:
- to support the body and give it shape
- to protect the internal organs
- to allow body movements
- to produce blood cells

15 Antagonistic Muscles



6. Antagonistic muscles work in pairs.
7. An example of antagonistic muscles is the biceps and triceps.

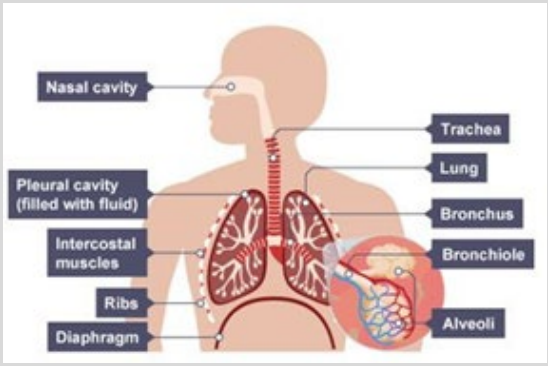
16 Drugs

- A drug is any substance that has an effect on the body
- A drug taken to treat an illness is called a medicine.
- Recreational drugs are taken by people for enjoyment. They can often be addictive
- Drugs are classified as illegal if they cause serious harm to the body.
- Opium-related painkillers cause feelings of pleasure and trance state.
- Hallucinogens cause 'out of body' experiences and mood swings

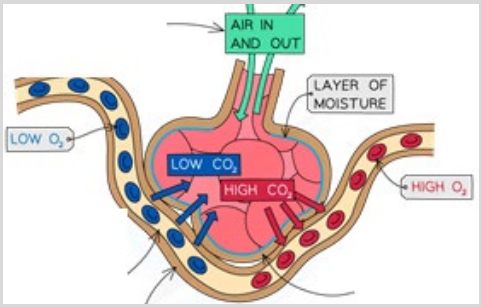
Organ Systems

17 The Respiratory System

Air enters the body through the nose and mouth. It then travels down the windpipe (trachea), through a bronchus then a bronchiole into an alveolus. Oxygen diffuses into the blood at the alveoli.



18 The Alveoli and Gas exchange



The alveoli provide an efficient exchange surface because:

a) The walls are thin, made of just one layer of epithelial cells
b) They have a large surface area: There are lots of them and they are spherical in shape
c) They have a good blood supply: There are lots of blood capillaries wrapped around them.
d) They are moist, which helps gases to diffuse across more easily.

Year 8 Science Spring Term - Magnetism

Key Vocabulary:

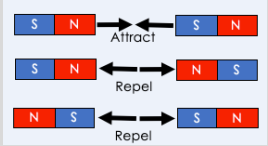
1	Attract	A pulling force causing objects to move towards each other.
2	Bar magnet	A permanent magnet with a North pole and South pole.
3	Coil	A length of wire wrapped to form a spiral.
4	Core	The centre of an object.
5	Current	The rate of flow of charge.
6	Electromagnet	A solenoid (coil of wire) with a current flowing through it, containing an iron core.
7	Field Lines	Imaginary lines running from the North to South pole of a magnet, showing the direction and strength of the magnetic field.
8	Geographical Pole	Either of the two points on Earth where the axis of rotation meets the surface.
9	Induced	When something is caused or produced as a result of being near something else.
10	Magnet	A material that produces a magnetic field, causing other magnetic materials to be attracted or repelled.
11	Magnetic	Relating to magnetism and magnetic fields.
12	Magnetic Field	The area around a magnet that is affected by the non-contact magnetic force.
13	Permanent	Lasting forever or indefinitely.
14	Repel	A pushing force causing objects to move away from each other.
15	Solenoid	A coil of wire with a current flowing through it.
16	Steel	An alloy made up of iron and other substances.
17	Temporary	Lasting for a limited period of time, not permanent.

18 Magnetic Force

- The magnetic force is a non-contact force.
- Only some metals are magnetic: iron, cobalt, nickel and their alloys (such as steel).

19 Magnets

- Magnets have a north and a south pole.
- The poles of a magnet are where the magnetic force is the strongest.
- Opposite poles attract and like poles repel (remember, opposites attract!)



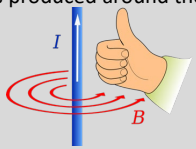
- Permanent magnets are magnetic all the time. Bar magnets are permanent magnets.
- Magnetic materials, including the Earth, create magnetic fields.

20 Magnetic Fields

- Magnetic field lines are used to describe the strength and direction of the magnetic field.
- The direction of the magnetic field at any point is given by the direction of the force that would act on another north pole placed at that point
- The arrows on the magnetic field lines always point from the North pole to the South pole.
- Magnetic field lines never cross or touch.
- Field lines flow from the North pole to the South pole.
- Closer field lines demonstrate that the magnetic force is stronger.

21 Induced Magnetism

- Induced magnets are materials that become magnetic when placed in a magnetic field and when removed, lose their magnetism.
- When a current flows through a conducting wire a magnetic field is produced around the wire.

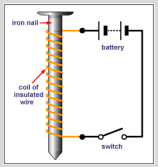


21 Induced Magnetism

- The strength of the magnetic field depends on the current through the wire and the distance from the wire.
- When a wire is wrapped around into a coil shape, we call it a solenoid.
- Shaping a wire to form a solenoid increases the strength of the magnetic field created by a current through the wire. The magnetic field inside a solenoid is strong.
- The magnetic field around a solenoid has the same pattern as the magnetic field around a permanent bar magnet.

22 Electromagnets

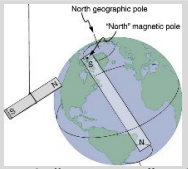
- An electromagnet is a solenoid with an iron core. We can make an electromagnet by wrapping a wire around an iron nail and turning on the current.



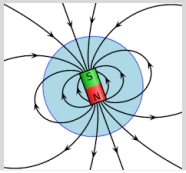
- The strength of the magnetic field around a solenoid is increased by adding more turns in the coil, adding a magnetic material as a core or increasing current.

23 Earth's Magnetic Field

- The Earth has a magnetic field.



- A compass will point to Earth's North "magnetic" pole which is different to Earth's geographic North pole which is also different to the true North pole of the Earth's magnetic field.
- The Earth behaves like it has a giant bar magnet inside it, because of currents of molten iron and nickel in its core.
- Molten means melted.
- The Earth's magnetic field has the same pattern as a permanent bar magnet.



Year 8 Acids & Alkalis. Science Autumn Term

Key Vocabulary:

1	Acid	A substance which has a pH lower than 7.
2	Alkali	A base which is soluble in water.
3	Base	A substance that has a pH value of greater than 7 and can neutralise an acid.
4	Corrosive	A substance that can cause irreversible damage when touched. *Some common **corrosives** include hydrochloric acid, sulphuric acid, ammonium hydroxide, and sodium hydroxide.*
5	Indicator	A substance that changes colour to show whether a solution is acid or alkaline. *Universal indicator and Litmus paper are examples of **indicators**.*
6	Neutralisation	A chemical reaction that occurs when an alkali reacts with an acid to produce a neutral solution.
7	pH Scale	The reference frame used to determine whether a solution is acidic, alkaline or neutral. *The **pH scale** is a measure of the acidity or alkalinity of a substance.*

8 The pH Scale

Substances can be classified into acidic, alkaline and neutral solutions

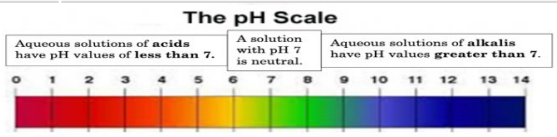
The pH scale, from 0 to 14, is a measure of the acidity or alkalinity of a solution

The pH scale can be measured using litmus, universal indicator or a pH probe.

A solution with pH 7 is neutral.

Aqueous solutions of acids have pH values of less than 7

Aqueous solutions of alkalis have pH values greater than
An aqueous solution is any solution in which the solvent is water



9 Litmus Indicator

Litmus indicator is red in an acidic solution.

Litmus indicator is blue in an alkaline solution.

Litmus indicator remains the same colour in a neutral solution

To remember this, it might be helpful to memorise the rhyme
Blue to red, acid is said
Red to blue, acid untrue

10 Universal Indicator

Universal indicator is sometimes called UI

Universal indicator can be used as a liquid solution or as paper strips to dip into a solution.

Acids will turn universal indicator red or orange.

Neutral solutions will turn universal indicator green.

Alkaline solutions will turn universal indicator blue or purple.

11 Neutralisation

In neutralisation reactions an acid reacts with an alkali to form a salt and water.

Neutralisation forms a neutral (pH7) solution.

A salt is a metal compound made from acid.

A salt is formed when the hydrogen in an acid is replaced by a metal.

Acids + alkali/base → salt + water
Acronym: A + A/B → S + W

12 Metal Carbonates

Metal carbonates react with acids in neutralisation reactions to form a salt, water and carbon dioxide

In an open system these products can escape, and the system is neutral

In a closed system carbon dioxide reacts with water to form carbonic acid, which makes the system acidic

Year 8 Changing Substances Science Autumn Term

Key Vocabulary:

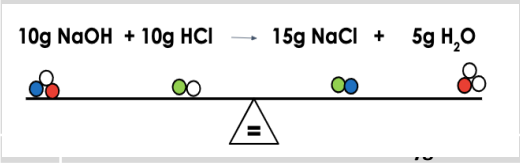
1	**Atom**	The smallest particle of an element that can exist. *The element magnesium is made up of only magnesium **atoms**.*
2	**Chemical formula**	The symbols that show how many of each type of atom are present in an element or compound. *The **chemical formula** for water is H_2O.*
3	**Chemical change**	A chemical reaction where a new substance is formed. *A **chemical change** takes place when magnesium reacts with oxygen.*
4	**Combustion**	A high temperature reaction with oxygen (burning). *The **combustion** of magnesium produces magnesium oxide.*
5	**Compound**	A substance made up of two or more elements chemically bonded together. *Carbon dioxide is a **compound** because it is made up of carbon and oxygen chemically bonded together.*
6	**Conservation of mass**	The law that says atoms cannot be created or destroyed in a chemical reaction so the total mass of products is equal to the total mass of reactants. *According to the law of **conservation of mass**, the mass of magnesium oxide product will be equal to the mass of oxygen and magnesium reactants.*
7	**Oxidation**	The gain of oxygen. *When magnesium burns in oxygen, it is an **oxidation** reaction.*

8 Chemical and Physical Changes

A chemical change produces a new substance whereas in a physical change no new substance is produced.
A chemical change is irreversible whereas a physical change is reversible.
Melting, evaporating, condensing, freezing and sublimation are examples of physical changes because they only change the <u>*state*</u> (solid, liquid or gas) of the substance.
These processes only change the energy that each particle has (how much it moves) and <u>not</u> its arrangement or properties (e.g. its boiling or melting point).

9 Chemical Reactions

A chemical change can also be called a chemical reaction.
The number and type of atoms do not change in a chemical change and are only rearranged.
The total overall mass is conserved in a chemical change (the mass of the reactant is equal to the mass of the products).
Every reactant atom will become a product atom.
Extra atoms cannot be made, and atoms cannot disappear.



Metals react with oxygen to produce metal oxides.
The general equation is: Metal + oxygen à Metal oxide
Example 1: Copper + oxygen → copper oxide
Example 2: Lithium + oxygen → lithium oxide
These reactions are oxidation reactions because the metals gain oxygen
Reduction is the loss of oxygen
Oxidation is the gain of oxygen

11 Reactions of Metals with Acid

Acids react with some metals to produce salts and hydrogen
Metal + acid à salt + hydrogen
This can be remembered by MASH: Metal + Acid → Salt + Hydrogen
Example 1:
Copper + Hydrochloric acid → copper chloride + hydrogen
Example 2:
Sodium + Nitric Acid à sodium nitrate + hydrogen

12 Reactions of Acids with Alkalis, Bases and Metal Carbonates

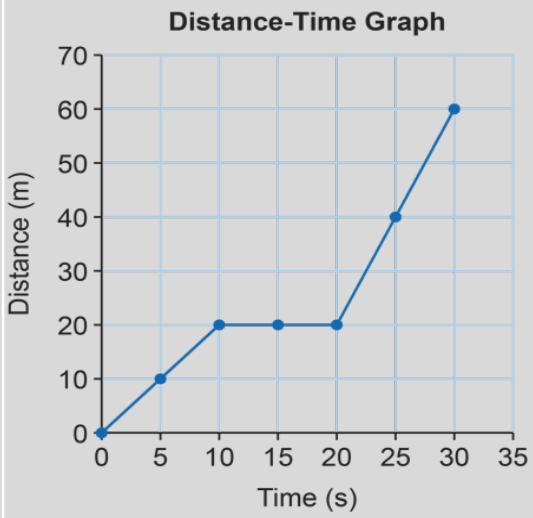
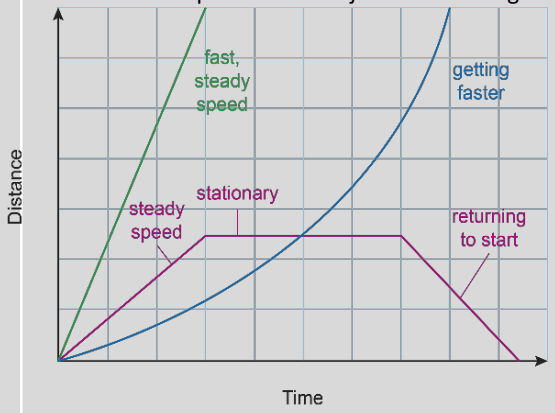
Acids are neutralised by alkalis (e.g. soluble metal hydroxides) and bases (e.g. insoluble metal hydroxides and metal oxides) to produce salts and water,
Acid + alkali →salt + water
Acid + base → salt + water
Acids are neutralised by metal carbonates to produce salts, water and carbon dioxide.
Acid + metal carbonate → salt + water + carbon dioxide
The particular salt produced in any reaction between an acid and a base or alkali depends on the acid and metal in the base, alkali or carbonate
Hydrochloric acid produces chloride salts,
nitric acid produces nitrate salts,
and sulfuric acid produces sulfate salts

13 Tests for Gases

The test for hydrogen uses a burning splint held at the open end of a test tube of the gas. Hydrogen burns rapidly with a squeaky pop sound.
The test for carbon dioxide uses a solution of calcium hydroxide (limewater).
When carbon dioxide is shaken with or bubbled through limewater the limewater turns milky (cloudy)

Year 8 Science Autumn Term Knowledge Organiser – Movement and Pressure

Speed	
1	Speed is how much distance is covered per unit time
2	Speed = Distance/Time
3	The SI unit for speed is m/s
4	If an object is stationary its speed is 0 m/s
5	Average speed is the overall distance divided by the overall time taken for a journey $Speed = \frac{Distance}{Time}$ $Time = \frac{Distance}{Speed}$ $Distance = Speed\ x\ Time$
6	Relative motion describes how different observers judge speed differently if they are in motion too
7	If an observer is stationary, the relative motion of the moving object will be the same as its actual speed
8	If an observer is travelling in the same direction as the moving object, the relative motion is the difference in their speeds and the object will seem to be moving more slowly
9	If an observer is travelling in the opposite direction as the moving object, the relative motion is their speeds added together and the object will seem to be moving faster
10	Acceleration describes how quickly a speed is changing (either speeding up or slowing down)
11	An object speeding up has positive acceleration
12	An object slowing down has negative acceleration
13	Acceleration can also refer to a change in direction

Distance-Time Graphs	
14	A distance-time graph can be used to describe an object's motion 
15	A horizontal line represents a stationary object (speed = 0m/ s)
16	A straight line represents an object moving at constant speed
17	The gradient of a distance-time graph represents speed
18	The steeper the gradient the greater the speed
19	A line returning to the x-axis represents an object returning to its starting position
20	A curved line represents an object accelerating 

Pressure	
21	Pressure is the force applied per unit area.
22	Pressure (N/m^2) = Force (N)/ area (m^2)
23	Pressure is increased by a smaller area and decreased by larger area
24	Pressure is increased by a larger force and decreased by a smaller force $p = F / A$ $F = p \times A$ $A = F / p$

Year 8 Science Summer Term Knowledge Organiser - Light

Key Vocabulary:

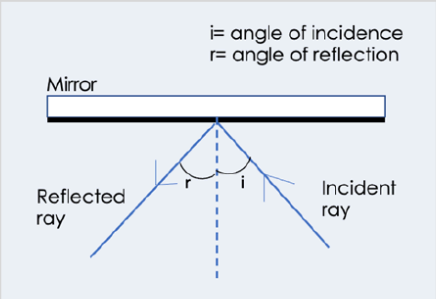
1	**Angle of incidence**	The angle between the incident (incoming) ray and the normal.
2	**Angle of reflection**	The angle between the reflected (outgoing) ray and the normal.
3	**Boundary**	The edge of a material or medium.
4	**Concave lens**	A lens that spreads out rays of light.
5	**Convex lens**	A lens that brings rays of light to a focal point.
6	**Cornea**	The transparent layer at the front of the eye.
7	**Dispersion**	The splitting of white light into the colour spectrum.
8	**Emit**	Produce or give out.
9	**Law of reflection**	The angle of incidence is equal to the angle of reflection.
10	**Lens**	A piece of dense transparent material that causes light to refract.
11	**Luminous**	Something that gives off light.
12	**Medium**	The substance through which a wave travels.
13	**Non-luminous**	Something that does not give off light.
14	**Normal**	An imaginary line perpendicular (at right angles) to the surface of a medium, from where angles are measured.
15	**Pupil**	The round opening in the centre of the eye through which light passes.
16	**Reflection**	When light bounces back to the medium it came from when it hits a boundary between materials.
17	**Refraction**	The change in speed of light as it moves from one medium to another, causing it to change direction.
18	**Retina**	The layer at the back of the eye that is sensitive to light and passes signals to the brain via the optic nerve.
19	**Spectrum**	The colours that make up white light.

18 Understanding Light

1. Light travels at 300 million metres per second (m/s).
2. Light travels faster than sound.
3. Light always travels in straight lines from a luminous object.
4. Shadows form when light is blocked by an opaque object.
5. Ray diagrams can show how light reflects off mirrors, forms images, and refracts.
6. Ray diagrams are always drawn with a ruler and pencil.
7. Angles are measured from the normal line with a protractor.
8. The normal line is the dotted line from which angles are measured, at right angles (90°) to the surface.
9. Arrows are used to show the direction the light is travelling in.
10. Transparent: A material that allows most light to pass through it.
11. Translucent: A material that allows some light to pass through it.
12. Opaque: A material that allows no light to pass through it.

19 Reflection

1. Reflection occurs when light hits a smooth surface (e.g. a mirror).
2. The light hits the surface and is reflected into the eye.
3. The angle of incidence is equal to the angle of reflection – this is the law of reflection.



20 Refraction

1. Refraction is the change in the direction of light going from one material (medium) into another.
2. This change in direction is because light changes speed when it moves from one medium to another.
3. When light enters a more dense medium it bends towards the normal.
4. When light enters a less dense medium it bends away from the normal.
5. Refraction in water makes objects look as though they are nearer the surface than they actually are.

21 Lenses

1. Lenses refract light.
2. Convex lenses are thicker in the middle and refract light to a focal point. In the eye, the cornea and lens are both convex lenses and help to focus light onto the retina.
3. Concave lenses are thinner in the middle and scatter the light (there is no focal point).

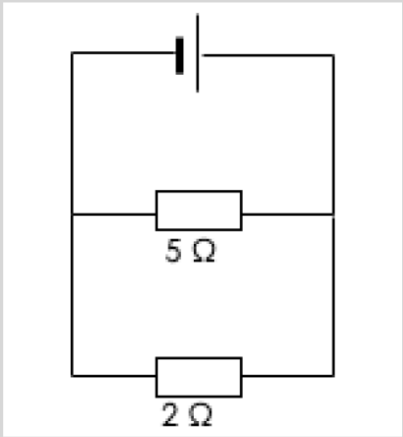
22 Drag Forces & Friction

1. Prisms cause light to be dispersed, this is when white light to split into seven component colours called a spectrum.
2. Spectrum: A band of colours produced by separation of the components of light because they are each refracted differently.
3. The order of the colours is always the same ROYGBIV: red, orange, yellow, green, blue, indigo, violet.
4. Red light is refracted the least and violet is refracted the most.
5. Red, green and blue are called the primary colours of light.
6. Yellow, magenta and cyan are the secondary colours of light, made from combinations of the primary colours.
7. White light is produced from the combination of all the colours.
8. Objects appear the colour that they reflect, e.g. a red apple appears red because it reflects red light and absorbs all other colours
9. White objects appear white because they reflect all colours
10. Black objects appear black because they absorb all colours

Year 8 Science Summer Term Knowledge Organiser – Circuits and Resistance

Key Vocabulary		
1	**Ammeter**	A component used to measure current in electrical circuits, connected in series. Ammeters measure current in Amps.
2	**Current**	The rate of flow of charge. The current in a circuit is measured using an ammeter.
3	**Electrical Conductor**	A material that has a low resistance and allows current to flow through it easily. Metals are electrical conductors.
4	**Series**	A circuit in which there is only one branch through which current can flow. Current is the same at all points in a series circuit
5	**Parallel**	A circuit in which there is more than one branch through which current can flow. Current splits at branches in a parallel circuit.
6	**Voltage**	The amount of energy shifted from the power source to the moving charges or from the charges to the component. Adding another cell can increase the voltage in a circuit.

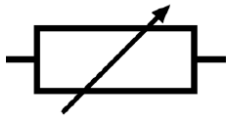
11	Resistance decreases current.
12	Resistance is measured in **ohms** (Ω).
13	Resistance is added by **all components.**



15	Current through a component depends on both resistance of the component and voltage cross the component. Increasing the voltage gives the charges a bigger push, which increases the current. Increasing the resistance makes it harder for the current to flow, which decreases the current.

16	Resistance is measured by measuring voltage and current and using R = V/I
17	A longer wire has a greater resistance.
18	Resistance of a wire is also affected by the type of metal the wire is made of.
19	Resistance in series is the sum of individual resistors.

Resistance	
21	The total resistance of this circuit is 10 Ω.
22	Resistance in parallel is less than the lowest resistance branch.
23	Electrical insulators have high resistance
24	Current transfers energy.



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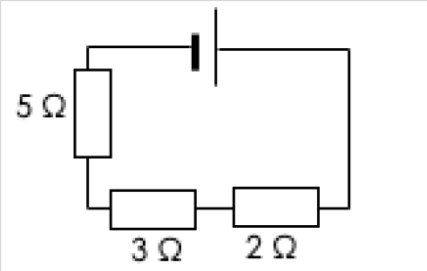


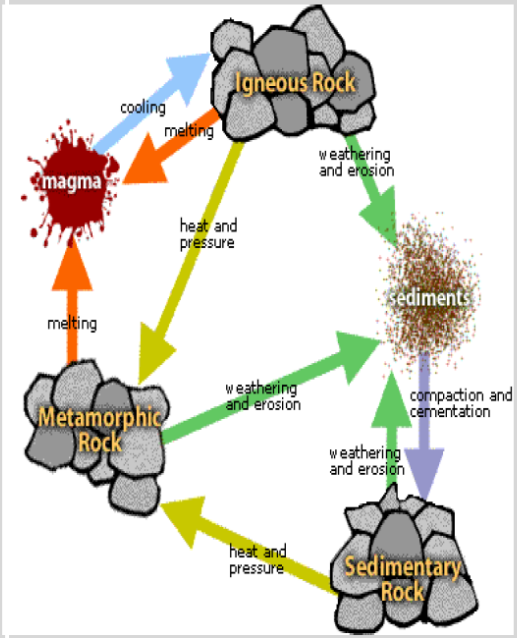
Year 8 Science Summer Term Knowledge Organiser – Earth

Key Vocabulary		
1	Magma	Molten rock underground
2	Lava	Molten rock above ground
3	Intrusive	Rocks that have cooled slowly and have large crystals
4	Extrusive	Rocks that have cooled quickly and have small crystals
5	Weathering	Breaks down rocks on the surface of the Earth; Biological, Chemical or Physical
6	Erosion	Movement of pieces of rock away from where they started
7	Sedimentation	Layers of sediment build in layers and the bottom layer becomes compressed
8	Cementation	Dissolved minerals fill any spaces and bind rock particles together
9	Precipitation	Where droplets in clouds are heavy, they fall back to earth as hail, rain, sleet or snow
10	Transpiration	Plants take water from the ground and move it to their leaves where it evaporates into the atmosphere

11	Magma and lava are molten (melted, very hot liquid) rock
12	When molten rock cools it solidifies to form igneous rocks
13	Igneous rocks formed from magma underground are intrusive rocks

The Rock Cycle

14



15 **1.Sedimentary** rocks can change into **metamorphic** rocks due to heat and pressure from the movements of the Earth.
2.Those metamorphic rocks can be weathered, eroded, and the pieces transported away.
3.The pieces of rock could be deposited in a lake or sea, eventually forming new **sedimentary** rock.

16	If rocks are pushed deep underground they experience tremendous heat and pressure
17	Heat and pressure change the structure of igneous and sedimentary rocks to form metamorphic rocks (E.g. marble formed from chalk)
18	The formation of rocks is related to each other in the rock cycle
19	Sedimentation, compression, and cementation form sedimentary rocks. E.g., chalk or sandstone.

Water Cycle

21	Water constantly evaporates from land surface, rivers and the sea
22	As water vapour rises it condenses into droplets. Clouds are formed from **condensed** water droplets.
23	When droplets in clouds are heavy, they fall back to earth as **precipitation**. Precipitation is hail, rain, sleet, and snow.
24	Water that falls over the sea goes back into the sea.Water that falls over land goes into rivers or groundwater and makes its way back to the sea. This cycle is called the water cycle

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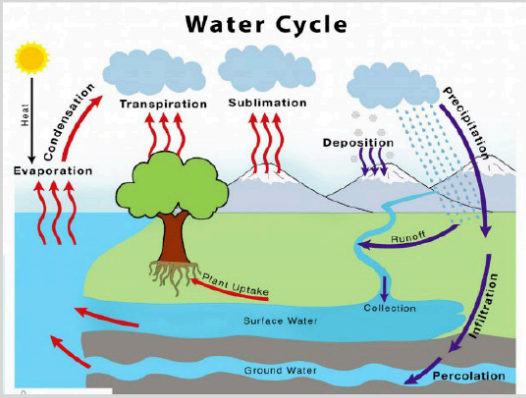

Year 8 Science Summer Term Knowledge Organiser Life Diversity

Key Vocabulary:

1	**Abiotic**	Something that is not to do with a living thing. *Light, temperature and water availability are all **abiotic** factors.*
2	**Adaptation**	**A characteristic that allows an organism to survive and reproduce in its habitat.** *Some prey animals camouflage to their surroundings, which is an **adaptation**.*
3	**Biotic**	**Something to do with a living thing.** *Food availability, disease and predators are all **biotic** factors.*
4	**DNA**	The molecule that contains all the genetic information (code) for each organism. *We inherit half our **DNA** from each parent.*
5	**Evolution**	**The change in inherited characteristics of a population over time caused by natural selection.** *Charles Darwin proposed the theory of **Evolution**.*
6	**Extinction**	**When there are no living individuals of a species left in the wild and/or in captivity.** *Global warming is putting many different species at risk of **extinction**.*
7	**Extremophile**	**Organisms that live in extreme conditions of temperature, pH, salt or pressure.** *Some **extremophile** fish are able to live under great pressure deep in the sea.*
8.	**Genotype**	**The DNA inherited that causes a characteristic.** *The girl's genotype is having DNA that codes for brown hair.*

9. Variation

Variation is the different characteristics between individual organisms.
There is variation between populations of different species.
There is also variation within a species.
Examples of variation within humans include hair colour, eye colour, height, weight, skin colour, nose shape and finger length.
Variation can be caused by inherited (genetic) factors, environmental factors or a combination of the two.
Characteristics can be physical, behavioural, and physiological.
Characteristics are inherited from parents through reproduction.
Inherited variation is caused by the fusing of gametes in sexual reproduction and by random mutations in DNA.
The DNA inherited that causes a characteristic is called the genotype.
The phenotype is the physical characteristic resulting from the genotype.
DNA that is passed to offspring can be randomly mutated and result in new phenotypes that were not present in previous generations.

10. Artificial Selection

Crops and domesticated animals are the result of artificial selection (selective breeding).
Selective breeding is when humans choose plants or animals with particular characteristics to breed.
Selective breeding is continued over many generations until the desired characteristic in the offspring are present.
These characteristics are chosen for appearance or for their usefulness to humans.
Examples of selective breeding are pet dogs, crops resistance to disease, cows that make a lot of milk.
Selective breeding can cause inbreeding if closely related individuals are used so that offspring have inherited disease

11. Natural Selection

Within a community, organisms compete for biotic and abiotic factors to survive and reproduce.
Adaptations are characteristics that allow an organism to survive and reproduce in its habitat.
Adaptations can be physical structures, behavioural or functional.
Natural selection is when variation in the population makes some organisms better suited to live and reproduce in a particular environment.

12. Evolution.

Evolution is a change in the inherited characteristics of a population over time, caused by natural selection.
Evolution can cause the formation of a new species.
If two populations cannot interbreed to form fertile offspring, then they are different species.
The Theory of Evolution by Natural Selection states that all life has evolved from simple organisms more than three billion years ago.

13. Extinction and Human Impact

Extinction is when there are no living individuals of a species left in the wild and in captivity.
Extinction can be caused by changes to habitats, new predators or competitors, or new diseases.
Extremophiles are organisms that live in extreme conditions of temperature, pH, salt or pressure.
This is an extreme example of how environmental pressures result in species specifically suited to thriving in that environment.
An ecosystem is made up of populations of different species interacting with each other and the abiotic environment.
Each species competes with other species for natural resources.
A variety of species helps to maintain the cycling of nutrients and population control.
The more species and the more variation in the ecosystem, the more resilient it can be to environmental disturbance.